

**B.Sc STATISTICS Degree Course**  
**UG - SCHEME OF EXAMINATIONS : CBCS PATTERN**  
(For the students admitted during the academic year 2018-2019 and onwards)

Part	Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext- Min.	Total Pass Mark	Credits
<b>Semester - 1</b>									
I	18TAM11L	Part-I :Language: Tamil I	6	25	75	100	30	40	3
II	18ENG12L	Part-II: English I	6	25	75	100	30	40	3
III	18BST13C	Core I : Descriptive Statistics	5	25	75	100	30	40	4
III		Core Practical – I: Statistics Practical - I	3						
III	18BST14A	Allied – 1: Mathematics for Statistics - I	8	25	75	100	30	40	5
IV	18ENV1GE	Environmental Studies	2	25	75	100	30	40	2
<b>Semester – II</b>									
I	18TAM21L	Part-I:Language:Tamil II	6	25	75	100	30	40	3
II	18ENG22L	Part-II: English II	6	25	75	100	30	40	3
III	18BST23C	Core II: Time series and Index Numbers	5	25	75	100	30	40	4
III	18BST24P	Core Practical – I: Statistics Practical - I	3	40	60	100	24	40	4
III	18BST25A	Allied – 2: Mathematics for Statistics - II	8	25	75	100	30	40	5
IV	18VAL2GE	Value Education– Gandhian Thoughts	2	25	75	100	30	40	2

Part	Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext- Min.	Total Pass Mark	Credits
<b>Semester – III</b>									
<b>*I</b>	<b>18TAM31L</b>	<b>*Part–I:</b> Language: Tamil III	6	25	75	100	30	40	3
<b>II</b>	<b>18ENG32L</b>	<b>*Part–II:</b> English III	6	25	75	100	30	40	3
<b>III</b>	<b>18BST33C</b>	<b>Core III:</b> Probability and Distributions - I	5	25	75	100	30	40	4
<b>III</b>		<b>Core Practical – II:</b> Statistics Practical - II	3						
<b>III</b>	<b>18BST34A</b>	<b>Allied – 3:</b> C Programming for Statistical Analysis	6	25	75	100	30	40	5
<b>IV</b>	<b>18BST35S</b>	<b>Skill Based Subject–I:</b> Demographic Methods	4	25	75	100	30	40	3
<b>Semester – IV</b>									
<b>I*</b>	<b>18TAM41L</b>	<b>*Part–I:</b> Language:Tamil IV	6	25	75	100	30	40	3
<b>II</b>	<b>18ENG42L</b>	<b>*Part–II:</b> English IV	6	25	75	100	30	40	3
<b>III</b>	<b>18BST43C</b>	<b>Core IV:</b> Probability and Distributions - II	5	25	75	100	30	40	4
<b>III</b>	<b>18BST44P</b>	<b>Core Practical – II:</b> Statistics Practical - II	3	40	60	100	24	40	4
<b>III</b>	<b>18BST45A</b>	<b>Allied – 4:</b> Elements of Econometrics	6	25	75	100	30	40	5
<b>IV</b>	<b>18BST46S</b>	<b>Skill Based Subject – II:</b> Psychological Statistics	4	25	75	100	30	40	3
<b>V</b>	<b>18EXA4GE</b>	<b>@Extension Activities:</b> <b>NCC/NSS/SPORTS/YRC</b>	-	-	-	-	-	-	1

Part	Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext- Min.	Total Pass Mark	Credits
<b>Semester – V</b>									
III	18BST51C	Core V : Statistical Inference I	5	25	75	100	30	40	4
III	18BST52C	Core VI: Basic Sampling Theory	5	25	75	100	30	40	4
III	18BST53C	Core VII: Design of Experiments	5	25	75	100	30	40	4
III	18BST54C	Core VIII: AOS: Elements of Operations Research	5	25	75	100	30	40	4
III		Core Practical – III: Statistics Practical - III	3						
IV	18BST55S	Skill Based Subject – III: Elements of Actuarial Statistics	4	25	75	100	30	40	3
IV	18BST5EL	Non-Major Elective Paper – I:	3	25	75	100	30	40	2
<b>Semester – VI</b>									
III	18BST61C	Core IX: Numerical Analysis	5	25	75	100	30	40	4
III	18BST62C	Core X: Statistical Inference II	5	25	75	100	30	40	4
III	18BST63C	Core XI:AOS: Statistical Quality Control	5	25	75	100	30	40	4
III	18BST64P	Core Practical – III: Statistics Practical - III	3	40	60	100	24	40	4
III	18BST65P	Core Practical – IV: Statistics Practical - IV	3	40	60	100	24	40	4
III	18BST66V	Project & Viva – Voce	2	20	80	100	32	40	15
IV	18BST67S	Skill Based Subject – IV: Optimization Techniques	4	25	75	100	30	40	3
IV	18BST6EL	Non-Major Elective Paper – II:	3	25	75	100	30	40	2
		<b>Total/Credits</b>	<b>180</b>			<b>3600</b>			<b>140</b>

\*Courses offered with four semester Language Papers

@ No External Examinations. Only Continuous Internal Assessment(CIA)

Includes 25/40 continuous internal assessment marks for theory and practical papers respectively  
Project evaluation done by both Internal and External examiner for 80 Marks

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	Core I: DESCRIPTIVE STATISTICS	I	18BST13C

**Objective:** To impart the basic knowledge of statistics

### UNIT-I

Statistics - Definition, Origin, Scope and Limitations – Collection of data - Primary and Secondary data – Classification and Tabulation of Statistical Data - Formulation of Frequency Distributions- Diagrammatic Representation - One Dimensional and Two Dimensional Diagrams - Graphical Representation - Histogram, Frequency Polygon, Frequency Curve and Ogives.

### UNIT-II

Measures of Central Tendency - Characteristics of a Good Average - Arithmetic Mean, Median, Mode, Geometric Mean and Harmonic Mean - Weighted Arithmetic Mean -- Merits and Demerits .

### UNIT-III

Absolute and Relative measures of Dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation and Co-efficient of Variation - Lorenz Curve – Merits and Demerits .

### UNIT-IV

Measures of Skewness - Karl-Pearson's Co-efficient of Skewness - Bowley's Co-efficient of Skewness - Measures of Moments – Kurtosis – Correlation - Types of Correlation - Uses - Properties - Scatter Diagram – Karl Pearson's Co-efficient of Correlation - Spearman's Rank Correlation - Concurrent Deviation Method of Correlation – Properties of correlation coefficient.

### UNIT-V

Regression Analysis - Regression Equations – Properties of Regression Co-efficients - Simple problems – Curve fitting – Principle of Least Square Technique – Linear Model – Parabola – Exponential model.

**Theory 60% and Problem 40%**

#### Text Books:

1. S.C.Gupta and V.K.Kapoor - Fundamentals of Mathematical Statistics, Sultan Chand & Sons Publishers, New Delhi, 11<sup>th</sup> thoroughly Revised Edition, 2002, Reprint 2013.
2. S.P.Gupta - Statistical Methods, Sultan Chand & Sons Publishers, New Delhi, 42<sup>nd</sup> Revised Edition, 2012.

#### Reference Book:

1. B.L. Agarwal – Programmed Statistics, New Age International Publishers, New Delhi 2<sup>nd</sup> Edition, 2009.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	ALLIED- I: MATHEMATICS FOR STATISTICS – I	I	18BST14A

### Objectives:

- To understand the concept of solving the higher degree polynomial equations, solving the non-linear equations and finding the Eigen values and Eigen vectors using matrices.
- To understand the methods of solving the differential calculus, integral calculus and solving the ordinary differential equations.

**UNIT I: THEORY OF EQUATIONS :** In an equation with real coefficients imaginary roots occur in pairs – In an equation with rational coefficients irrational roots occur in pairs – Relations between the roots and coefficients of equations – Reciprocal equation.  
(Chapter 6- Sections: 9, 10, 11, 16)

**UNIT II : MATRICES:** System of non-homogeneous linear equations – Eigen values and Eigen vectors – Cayley – Hamilton theorem (proof not needed) Problem based on this theorem.  
(Chapter 2 : Section 16).

**UNIT III : DIFFERENTIAL CALCULUS:** Standard forms – General theorems on differential coefficients– Product rule, Quotient rule, Differential coefficient of  $\tan x, \cot x, \sec x, \operatorname{cosec} x$ , function of function rule, Inverse function, differential of hyperbolic and Inverse hyperbolic function – Logarithmic differentiation. (Chapter 2 : Sections 2-4)

### UNIT IV : INTEGRAL CALCULUS

Methods of Integration- Integrals of functions containing linear functions of  $x$ , Integrals of functions involving  $a^2 \pm x^2$  - integrals of the functions of the form  $\int f(x)^n x^{n-1} dx$  - Integrals of the functions of the form  $\int \{f(x)\}^n f'(x) dx$ , integrals of the form  $\int F\{f(x)\} f'(x) dx$  - Integrals of rational algebraic functions ( Type I, Type –II) –Special Cases. (Chapter: I, Sections 5 -7.5)

### UNIT V: ORDINARY DIFFERENTIAL EQUATION

Differential Equations of First order and Higher degree – Equations solvable for  $p$  - Equations solvable for  $y$  - Equations solvable for  $x$  – Clairaut’s Equation, Linear Homogeneous Equation and variation of parameter. (Chapter 1 – Sections:1,5,6.1 and 10)

### TEXTBOOKS

1. **ALGEBRA VOLUME I** - T. K. MANICAVACHAGOM PILLAY and OTHERS, S. Viswanathan Printers and Publisher Private Limited, 2013 (For UNIT-I).
2. **ALGEBRA VOLUME II** - T. K. MANICAVACHAGOM PILLAY and OTHERS, S. Viswanathan Printers and Publisher Private Limited, 2011(For UNIT-II).
3. **CALCULUS VOLUME I** - T. K. MANICAVACHAGOM PILLAY and OTHERS, S. Viswanathan Printers and Publisher Private Limited, 2009 (For UNIT III)
4. **CALCULUS VOLUME II** - T. K. MANICAVACHAGOM PILLAY and OTHERS, S. Viswanathan Printers and Publisher Private Limited, 2007 (For UNIT-IV).
5. **CALCULUS VOLUME III** - T. K. MANICAVACHAGOM PILLAY and OTHERS, S. Viswanathan Printers and Publisher Private Limited, 2011 (For UNIT-V).

**REFERENCE BOOK:**

1.ANCILLARY MATHEMATICS - P. R. VITTAL, Margam Publication, Chennai, 1998.

Year	Subject Title	Sem.	Sub Code
2018 -19 Onwards	ENVIRONMENTAL STUDIES (For all UG courses)	I	18ENV1GE

**UNIT: I**

Environment – Introduction – Nature- Scope – Content – Need for study. Natural resources - Forest and energy resources - Use and overexploitation- deforestation. Energy resources - renewable and non renewable energy resources.

**UNIT: II**

Ecosystem – concept – types- Forest, Grassland, Desert and Aquatic(Pond) - Structure and function of an ecosystem – Producers - consumers and decomposers – Food chain – food web- ecological pyramids - energy flow. Biodiversity and its conservation- *in situ* and *ex situ* conservation - Mega biodiversity centers and hotspots.

**UNIT: III**

Environmental pollution – definition – causes - effects and control measures of air, water, soil, thermal and nuclear pollutions - Waste management - Industrial and solid waste. Disaster management – earthquake, cyclone, flood and landslides.

**UNIT: IV**

Social Issues and the environment – Urbanization - Urban problems related to energy and watershed management. Environmental Ethics - Issues and possible solutions - Wasteland reclamation - Climate change - Global warming - Acid rain - Ozone layer depletion- Public awareness. Environmental laws - Environment Protection Act, Wildlife Protection Act, Forest Conservation Act.

**UNIT: V**

Human population and its impact on environment - Population growth - Resettlement and Rehabilitation of project affected persons - Case studies – Sardar Sarovar Project, Maharashtra and Bandipur National Park - Project Tiger, Karnataka, NTPC, India. Role of Indian and Global religions and Cultures in environmental conservation - Case study: sacred groves in Western Ghats (kavu) & Chinese culture. Human and Wildlife Conflicts.

**Test books:**

1. Text Book of Environmental Studies, Bharucha. E, 2003, UGC New Delhi & Bharathi Vidyapeeth Institute of Environmental Education and Research, Pune- 361.
2. Environmental Studies (Tamil Version), Arumugam. M & Kumaresan. V, 2016. Saras Publications, Nagerkoil.

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	Core II: TIME SERIES AND INDEX NUMBERS	II	18BST23C

**Objective:** To impart the knowledge about the basics of trend analysis and index numbers.

#### UNIT-I

Time Series: Definition- Components of Time Series - Uses – Additive and Multiplicative Models - Measurement of Trend: Graphical Method, Semi-Average Method, Method of Moving Averages - Merits and Demerits - Method of Least Squares – Straight line, Parabolic, Exponential Curve of type  $Y=ab^x$  - Exponential Smoothing.

#### UNIT-II

Seasonal Variation – Measurement of Seasonal Variations - Method of Simple Averages, Ratio-to-Trend Method, Ratio-to-Moving Average Method and Link Relative Method – Cyclical Variations and Random Variations (Concepts only).

#### UNIT-III

Index numbers: Meaning, Definition, Uses and Types– Limitations of Index Numbers - Problems in the Construction of Index Numbers – Un-weighted Index Numbers – Simple aggregative method – Simple average of Price relative method.

#### UNIT-IV

Weighted Index Numbers – Price Index, Quantity Index, Value Index – Selection of Weights - Average of Price Relatives Method – Laspeyre’s Price Index – Paasche’s Price Index – Dorbish & Bowley’s Price Index – Marshall Edgeworth Price Index – Fisher’s Index Number.

#### UNIT-V

Criteria of a Good Index Number -: Unit Test, Time Reversal Test, Factor Reversal Test and Circular Test – Construction of Chain Base Index Numbers -Cost of Living Index Numbers – uses – Construction - Aggregate Expenditure and Family Budget Methods.

**Theory 60% and Problem 40%**

#### Text Books:

1. S.C. Gupta and V.K.Kapoor - Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi 4<sup>th</sup>Edition 2015.
2. S.P.Gupta - Statistical Methods, Sultan Chand & Sons, New Delhi, 42<sup>nd</sup> revised Edition, 2012.

#### Reference Books:

1. Croxton and Cowden - Applied General Statistics, Prentice - Hall of India (Private) Ltd, New Delhi.
2. B.L.Agarwal – Programmed Statistics, New Age International, Chennai

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	Core Practical – I: STATISTICS PRACTICAL - I (Using MS - EXCEL)	I & II	18BST24P

1. Formation of Frequency Distribution.
2. Formation of Charts and Diagrams:  
Bar Diagrams, Pie Diagram, Frequency Polygon, Frequency Curve and Ogive Curves.
3. Calculation of Measures of Central Tendency: Mean, Median, Mode, Geometric Mean, and Harmonic Mean - Calculation of Percentiles.
4. Calculation of Measures of Dispersion: Range, Quartiles, Mean Deviation, Standard Deviation and Variance.
5. Calculation of Coefficient of Skewness and Kurtosis.
6. Correlation : Scatter Diagram - Calculation of Correlation Coefficients.
7. Regression : Finding Regression Coefficients and Formation of Regression Lines.
8. Time Series: Graphic method, Semi-Average method and Calculation of Trend Values using Moving Average Methods.
9. Problems Related to Curve Fitting - Fitting a Straight Line, Second Degree Parabola and Exponential Curve.
10. Calculation of Index Numbers : Un-weighted Index numbers - Simple Aggregative Method, Simple Average of Price Relative Method.
11. Calculation of Index Numbers: Weighted Index Numbers – Price and Quantity Index – Laspeyre’s, Paasche’s, Fisher’s, Bowley’s and Marshal-Edgeworth methods.
12. Calculation of Chain Base Index numbers and Cost of Living Index numbers.



Year	Subject Title	Sem	Sub Code
2018-19 Onwards	Allied II: MATHEMATICS FOR STATISTICS – II	II	18BST24A

**Objective:**

To understand the concept Sets and functions, Sequence and series of real numbers and limits and metric spaces of Real and Analysis.

**UNIT I : SETS AND FUNCTIONS**

Sets and elements – Operation on sets – Functions – Real valued functions – Equivalence, Countability – Real numbers – Least upper bounds  
(Chapter 1 : Sections 1.1 – 1.7)

**UNIT II : SEQUENCE OF REAL NUMBER**

Definition of Sequence and Subsequence – Limit of a Sequence – Convergent Sequence – Divergent sequence – Bounded Sequence – Monotone Sequence – Operation on Convergent Sequence – Operation on Divergent sequence  
(Chapter 2 : Sections 2.1-2.8)

**UNIT III : SERIES OF REAL NUMBERS**

Convergence and Divergence – Series with non-negative terms – Alternating Series – Conditional Convergence and Absolute Convergence – Test for absolute convergence  
(Chapter 3 : Sections 3.1 – 3.4, 3.6)

**UNIT IV: SERIES OF REAL NUMBERS (Continuation)**

Test for Absolute Convergence – Series whose terms form a non-increasing Sequence – Summation by Parts – (C,1) Summability of Series.  
(Chapter 3 : Section 3.6 – 3.9)

**UNIT V : LIMITS AND METRIC SPACES**

Limits of a function on the real line – Metric spaces – Limits in Metric space  
(Chapter 4 : Sections 4.1 – 4.3)

**TEXTBOOK:**

**METHODS OF REAL ANALYSIS**

- Richard R. Goldberg, Oxford & IBH Publishing Co. PVT. LTD., NewDelhi, 1963.

Year	Subject Title	Sem.	Sub Code
2018 -19 Onwards	VALUE EDUCATION – GANDHIAN THOUGHTS (For all UG courses)	II	18VAL2GE

**UNIT: I**

Birth and Parentage - Childhood - At the High school - Stealing and Atonement - Glimpses of Religion - Gandhi's choice - Experiments in Dietetics - Acquaintance with Religions - The Great Exhibition.

**UNIT: II**

The first case - Preparing for South Africa - same experiences - on the way to Pretoria - Coolie - Natal Indian Congress - Education of Children - Brahmacharya.

**UNIT: III**

Simple life - The Boer war - Sanitary Reform and Famine Relief - Lord Curzon's Darbar - A month with Gokhale - Experiments in Earth and water treatment - Indian opinion - Coolie Locations or Ghettoes - The Black plague.

**UNIT: IV**

The Magic spell of a Book - The Zulu Rebellion - The Birth of Satyagraha - More experiments in Dietetics - Kasturbai's Courage - Domestic Satyagraha- Fasting - Shanti Niketan - Woes of Third Class passengers.

**UNIT: V**

Kumbha mela - Lakshman Jhula - Founding of the Ashram - Abolition of Indentured Emigration - The Kheda Satyagraha - The Rowlatt Bills - Navajivan and young India - Congress Initiation - The Birth of Khadi.

**TEXT BOOKS:**

1. The Story of My Experiments With Truth - An Autobiography, M.K.Gandhi , Apple publishing International(P) Ltd, Chennai.

- மகாத்மா காந்தியின் சுயசரிதை - சத்தியசோதனை தமிழாக்கம் -  
-ரா.வேங்கடராஜ், நவஜீவன் பரசுராலயம், அகமதாபாத

2.

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	Core III: PROBABILITY AND DISTRIBUTIONS - I	III	18BST33C

**Objective:** To impart the knowledge about the basics of Probability and Distributions

### Unit I

Probability: Basic definitions - Sample space - Classification of events - Mathematical, Statistical and Axiomatic definition of probability- Conditional Probability – Addition and Multiplication theorems for two events – Baye’s theorem – simple problems.

### Unit II

Random Variables – Distribution function – properties (without proof) – Discrete and Continuous Random Variables- Probability Mass function, Probability density function- Measures of central tendency for continuous random Variable – Mean, Median, Mode, Dispersion and moments- simple problems.

### Unit III

Mathematical Expectation – Properties – Expectations - variance, covariance- Linear combination of Random Variables - simple problems.

### Unit IV

Moment Generating Function – Limitations – properties of MGF- Uniqueness theorem (statement only) – Cumulants – properties (without proof) – Characteristics function – properties (without proof) –Chebychev inequality – Weak law of large number – Concept of Central limit theorem – De Moivre’s Theorem (Statement only).

### Unit V

Concept of Bivariate Distributions - Marginal and conditional Distributions – Independence of Random Variables, Marginal and conditional expectations, conditional variance.

### Text Books:

1. S.C. Gupta and V.K.Kapoor- Fundamentals Of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 11<sup>th</sup> edition, June 2012.
2. R.V. Hogg and A.H. craig – Introduction to Mathematical Statistics, Seventh Edition, Pearson Education, 2012.

### Reference Book:

1. J.N. Kapoor and H.C. Saxena – Mathematical Statistics, Sultan Chand & Sons, New Delhi 2011.

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	Allied III: C - PROGRAMMING FOR STATISTICAL ANALYSIS	III	18BST34A

**Objective:** To create software environment for statistical computing using C Language.

### UNIT I

Overview of C: Introduction to C – Importance of C – Structure of C Program – Programming Style – Executing a C Program – Constants, Variables and Data Types: Character Set – C Tokens – Keywords and Identifiers – Constants – Variables – Data Types – Declaration of Variables – Assigning Values to Variables – Symbolic Constants.

### UNIT II

Operators and Expression: Arithmetic Operator – Relational Operators – Logical Operators – Assignment Operators – Conditional Operators – Increment and Decrement Operators – Library Function. Managing Input and Output Statements: Single Character Input- getchar() function – putchar() function- scanf() function – output functions: printf() function – gets() and puts() function.

### UNIT III

Decision Making and Branching: Decision making with if statement – simple if statement – if – else statement – Nesting if-else statement – switch statement – break – continue statement – Looping and Branching using while statement – do-while statement – for loop statement – its syntax and simple examples.

### UNIT IV

Arrays: One Dimensional Arrays – Declaration - Initialization –two Dimensional arrays – syntax – initialization – Simple Programs to find Mean – Median – Standard Deviation – Correlations. – Character arrays and Strings – Declaration Syntax – Initialization – Reading Strings from the Keyboard – Output of the Strings using Printf() – String functions – strcat() – strcmp() – strlen().

### UNIT V

User Defined Functions – Need – Multi-function program – Elements of User Defined Functions – Definition of Functions – Function Calls – Return Types – Declaration – Category of Functions- Function program to sort an array of integers.

### Text Book:

1. E. Balagurusamy- Programming in ANSI C, Tata McGraw-Hill, New Delhi, Tenth Reprint 2009.

**Reference Book:**

1. Herbert Scheldt – The C Complete Reference -2012 Reprint.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Skilled Based Elective-I: DEMOGRAPHIC METHODS	III	18BST35S

**Objective:** To know the basic measures used in Demographic studies

**UNIT-I**

Demography: Definition - Importance of Demographic data – Sources of Demographic data- Population Census – Uses. Registration method - Vital Registration - Population Register- Records. Sample surveys - International publications. Demography in sociology and Economics.

**UNIT-II**

Fertility measurements: Fertility – Factors affecting fertility – Fertility Measures - Crude Birth Rate (CBR), General, Specific and Total Fertility Rates – Growth Rates- Gross and Net Reproduction Rates (GRR, NRR) - Simple Problems.

**UNIT III**

Mortality Measurements: Mortality – Mortality Measures - Crude Death Rate (CDR), Age, Sex and Cause Specific Death Rates - Standardized Death Rate - Infant Mortality Rate - Simple Problems.

**UNIT IV**

Life Table: Assumptions, Description of various columns of a Life table and their relationships - Construction of a Life table - Uses of a Life table - Simple Problems.

**UNIT V**

Migration: Definition – Types of Migration - Effects of Migration. Projection : Population Projection – Types and Methods of population projection – Importance and limitations - Basic ideas of Stationary and Stable population.

**Text Books:**

1. Jhingan M.L, Bhatt B.K and Desai J.N. - Demography, Vrinda Publications (P) Ltd, Delhi, 2003 2<sup>nd</sup> Revised Edition
2. S.C. Gupta and V.K.Kapoor - Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi 4<sup>th</sup> Edition 2015.

**Reference Book:**

1. Mishra.D.E – An Introduction to the Study of Population (South India publishers, Madras)

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Core IV: PROBABILITY AND DISTRIBUTIONS –II	IV	18BST43C

**Objective:** To impart the knowledge about the basics of Probability and Distributions.

### Unit I

Concept of theoretical probability distributions -Discrete distributions- Bernoulli, Binomial and Poisson distributions –Properties and uses -moments. Recurrence relation for moments, mode, MGF – additive property- Characteristic function – Cumulants

### Unit II

Hypergeometric distribution- mean and variance-Negative Binomial Distribution, - Deductions – MGF – Cumulants–Geometric distribution –Lack of Memory –moments – MGF.

### Unit III

Continuous Distributions –Rectangular distribution – moments – MGF – Characteristic Function - Normal distribution –Characteristics – Mode - Median – MGF – Cumulants – Moments – Area property – Simple problems.

### Unit IV

Exponential Distribution – MGF- moments-lack of memory. Beta distribution (first Kind) – moments – Gamma distribution – MGF – Cumulants – additive property.

### Unit V

Population-Sample- Concept of sampling distribution–Chi-square – derivation of density – Additive property- applications. Definition – Student’s t- Derivation of density – Applications – Definition of F variate – Derivation of density - Applications – Relationship between t, F and Chi-square Distributions.

### Text Books:

1. S.C. Gupta and V.K.Kapoor- Fundamentals Of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 11<sup>th</sup> edition, June 2012
2. R.V. Hogg and A.H. Craig – Introduction to Mathematical Statistics, Fifth Edition, Pearson Education, 2012 .

### Reference Book:

1. J.N. Kapoor and H.C. Saxena – Mathematical Statistics, Sultan Chand & Sons, New Delhi, 2011.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Core Practical – II: STATISTICS PRACTICAL - II (Using C)	III & IV	18BST44P

1. C program to find  $nC_x$ .
2. C program to Arrange Data in Ascending and Descending order Using Bubble Sort.
3. C program to find the Value of Mean and Standard Deviation for raw data.
4. C Program to determine Median and Mode for raw data.
5. C program to Calculate Correlation Coefficient.
6. C program to determine the regression equations.
7. C program to Calculate Cumulative Probabilities of Binomial Distribution.
8. C program to Calculate Cumulative Probabilities of Poisson Distribution.
9. C program to Calculate Laspeyre's, Paasche's and Fisher's Index Numbers.
10. C program to Calculate Seasonal Index by the Method of Simple Averages.
11. C program to fit a Linear Trend by the Method of Least Squares.
12. C program to find the sum of the series  $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{n}$ .
13. C program for Fitting Exponential Curve  $Y = ab^x$
14. C program for Fitting Exponential Curve  $y = ax^b$
15. C Program to determine the roots of the quadratic equation of the form  $ax^2 + bx + c = 0$ .

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	Allied IV: ELEMENTS OF ECONOMETRICS	IV	18BST45A

**Objective:** To provide knowledge to estimate numerical values to the parameters and to know the economic relationships

### UNIT I

Econometrics – Origin, Definition, Objectives, Characteristics and Scope of Econometrics – Limitations of Econometrics – Models in Econometrics – Relationship between economic theory, Mathematics and Statistics.

### UNIT II

Simple linear regression model - Error Term in Econometric Models - Statistical Assumptions in Linear Model - Least Square Estimation- Properties of Least Square Estimation - Testing of Parameters of the Model - Estimation of Error Variance - Simple Problems.

### UNIT III

Multiple Regression Model – Model with two explanatory variables – Measure of goodness of fit – Adjusted co-efficient of multiple determinations – Testing of significance of individual regression co-efficients.

### UNIT IV

Autocorrelation- Pure and impure serial correlation – Autocorrelation by omitted variable and incorrect functional form – visual inspection – positive and negative Autocorrelation – Consequences and sources of Autocorrelation - Durbin-Watson Test.

### UNIT V

Multicollinearity – Consequences of perfect and imperfect Multicollinearity- Detection of Multicollinearity – Auxiliary regressions - Variance Inflation Factor and its relation – Solution to the problem of Multicollinearity.

#### Text Books:

1. K.Dhanasekaran - Econometrics (II<sup>nd</sup> Edition), Vrinda Publications (P) Ltd, Delhi-91(2011).
2. A. Koutsoyannis - Theory of Econometrics, PALGRAVE, Replica Press Pvt. Ltd, India, second edition, Reprint 2004.

#### Reference Book:



1. S.P.Singh, Anil.K Parshar and H.P.Singh, – Econometrics and (Mathematical Economics), S.Chand & Company Ltd, New Delhi – 110055, seventh Edition, (1999).

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Skill Based Elective-II: PSYCHOLOGICAL STATISTICS	IV	18BST46S

**Objective:** To impart the knowledge of statistical methods in psychological studies.

### UNIT I

Introduction-scaling procedures-  $Z$  or  $\sigma$  scores-standard scores-Normalized scores- T-scores- Percentile score-Scaling of rankings in terms of Normal Probability curve-scaling of ratings in terms of Normal Probability curve

### UNIT II

Reliability of test scores- definition of reliability- index of reliability- Parallel tests- Methods for determining test reliability- the test-retest method- Alternate or parallel forms method- split half method- effect of test length on the reliability of the test- effect of different ranges on the reliability of the test – Cronbach’s alpha.

### UNIT III

Validity of test scores - Estimation of validity- types of validity- validity and test length-comparison between reliability and validity- Intelligence tests- Mental age- Intelligence quotient.

### UNIT IV

Biserial correlation- Standard deviation of Biserial Correlation – Point Biserial correlation – comparison of Biserial and Point Biserial correlation - correlation from fourfold tables – Tetrachoric  $r$  – calculation. The Phi ( $\Phi$ ) co-efficient – significance of Phi – comparison of Phi and Tetrachoric  $r$ . The contingency coefficient ( $c$ ) - curvilinear or non- linear relationship.

### UNIT V

Correlation ratio - intra-class correlation - partial and multiple correlation- definition- formula for three variables - simple problems - properties of multiple correlation co-efficient – limitations to the use of partial and multiple correlation.

#### Text Books:

1. S.C.Gupta and V.K.Kapoor - Fundamentals of Applied Statistics, Sultan Chand and Sons, 4<sup>th</sup> thoroughly revised edition, New Delhi, Reprint 2015.
2. Henry.E.Garrett - Statistics in Psychology and Education , Surjeet Publications, Fourth Indian Reprint 2014.

**Reference Book:**

1. S.C.Gupta & V.K.Kapoor - Fundamentals of Mathematical Statistics, Sultan Chand and Sons, 11<sup>th</sup> Revised Edition, June 2012.

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	Core V: STATISTICAL INFERENCE - I	V	18BST51C

**Objective:** To understand the knowledge in estimation and acquire practical experience in the estimation of parameters.

**UNIT I**

Basic Concepts - Population, Sample, Statistic, Parameter, Parameter Space - Point estimation: Meaning - Characteristics of Estimators - Unbiasedness - Simple Examples - Consistency - Invariance Property - Sufficient condition for consistency - Examples.

**UNIT II**

Efficiency - Efficient Estimators - Examples - Most Efficient Estimator - Examples - Minimum Variance Unbiased Estimators - Uniqueness of MVUE - Sufficiency - Neymann's Factorization Theorem - examples.

**UNIT III**

Cramer Rao Inequality- Assumptions-Conditions for equality - Minimum Variance Bound estimator - Examples based on Normal - Exponential - Cauchy distributions - Rao Blackwell Theorem.

**UNIT IV**

Methods of Estimation: Method of Maximum Likelihood - Properties of MLE (Without Proof) - Methods of Moments-Method of minimum chi-square - Simple Examples.

**UNIT V**

Interval estimation: Confidence Limits - Sampling Distribution and Standard Error - Confidence Intervals - Derivation of Confidence Intervals for Proportion, Mean, Variance based on Normal,  $t$ ,  $\chi^2$  and F distribution - Simple Problems.

**Text Books:**

1. S.C. Gupta and V.K. Kapoor - Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 11<sup>th</sup> Revised Edition, June 2012.
2. A.M.Goon, M.K. Gupta, & B.Das Gupta, - An Outline of Statistical Theory V-II, The World Press Kolkatta, (Nov 2017).

**Reference Books:**

1. C.W. Snedecor, and W.G.Cochran - Statistical Methods, Oxford and IBH.
2. P.G. Hoel – Introduction to Mathematical Statistics, Wiley International, 2012.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Core VI: BASIC SAMPLING THEORY	V	18BST52C

**Objective:** To create an overview about sampling and its various methods.

### UNIT I

Concept of Population and sample – Census method and survey method – Merits and limitations of sample survey-Need for Sampling – Design, Organization and Execution of Sample Survey – Principal Steps in Sample Surveys – Preparation of Questionnaire and Schedules – Pilot Survey – Sampling and Non-Sampling Errors

### UNIT II

Probability and non-probability sampling-Sampling from Finite Population – Simple Random Sampling With and Without Replacement – Unbiased Estimate of Mean and Variance – Finite Population Correction – Estimation of Standard Error– Simple Random Sampling of Attributes – Determination of sample size. Estimation of mean and variance

### UNIT III

Stratified Random Sampling: Concept of Stratifying Factor advantages of stratification- Unbiased Estimate of the Mean and Variance– Proportional and Optimum Allocation – Neyman’s Allocation - Comparison of Stratified and Simple Random Sampling.

### UNIT IV

Systematic Sampling: Linear – circular systematic sampling Estimation of the Mean and Variance – Comparison of Simple, Stratified and Systematic Sampling – Population with Linear Trend - advantages and disadvantages

### UNIT V

Cluster Sampling – estimation of mean and variance under equal and unequal cluster size. Two Stage Sampling with respect to Simple Random Sampling –Estimation of the Mean and Population Variance.

### Text Books:

1. Daroga singh, F.S.Chauwdhary – Theory And Analysis Of Sample Survey Designs, New Age International (P) Ltd, publishers, New Delhi, 2015.
2. S.C. Gupta and V.K.Kapoor- Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi, 4<sup>th</sup> Edition 2015.

### Reference Books:

1. P.V. Sukathme and B.V. Sukathme - Sampling Theory Of Survey With Applications, Asia Publishing House.

2. William.G. Cochran - Sampling Techniques, Wiley India (P)Limited, New Delhi, Reprint 2011.

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	Core VII: DESIGN OF EXPERIMENTS	V	18BST53C

**Objective:** To impart Statistical knowledge in field experiments

### UNIT I

Analysis of Variance (ANOVA): Definition – Assumptions – Importance – Linear Models – Fixed Effect Model – Random Effect Model – One-way ANOVA for Fixed Effect Model – Least Square Estimates of Parameters and the Variances - Sum of squares – Two-way ANOVA for Fixed Effect Model - Least Square Estimates of Parameters and the Variances – Sum of squares.

### UNIT II

Fundamentals of Design of Experiments – Phases of Experimentation – Experimental Error – Uniformity Trials – Principles of Experimental Design – Size and Shape of the Plots – Concept of Completely Randomized Design (CRD) - Layout - Statistical Analysis.- Merits and demerits.

### UNIT III

Concept of Randomized Block Design (RBD) – Layout – Statistical Analysis – Advantages and Disadvantages – Efficiency of RBD over CRD – Estimation of one Missing value and its ANOVA in RBD

### UNIT IV

Concept of Latin Square Design (LSD) - Layout – Advantages and Disadvantages – Statistical Analysis – Least Square Estimates – Estimation of one Missing Value- Efficiency of LSD over CRD and RBD.

### UNIT V

Factorial Experiments – Advantages and Limitations –  $2^2$  Factorial Design – Statistical Analysis of  $2^2$  Design – Yates method of Computing Factorial Totals –  $2^3$  Factorial Design - Statistical Analysis of  $2^3$  Design – confounding - Partial and Complete Confounding .

### Text Books:

1. S.C. Gupta and V.K.Kapoor- Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi, 4<sup>th</sup> Edition 2015.
2. R.Pannerselvam – Design and Analysis of Experiments – Prentice Hall of India, Feb 2012.

### Reference Books:

1. Montgomery - Design and Analysis of Experiments, Wiley India Pvt. Ltd, 5<sup>th</sup> Edition, Reprint 2009.
2. W.G.Cochran and G.M. Cox - Experimental Designs, John Wiley.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Core VIII: AOS - ELEMENTS OF OPERATIONS RESEARCH	V	18BST54C

**Objective:** To understand the optimization problems those translate to real life decision making problems.

### UNIT I

Definition and Scope of Operations Research – Uses and Limitations of Operations Research – Models in Operations Research – Phases of Operations Research - Linear Programming Problem – Formulation of LPP – Solution by Graphical Method-unbounded solution-infeasible solutions

### UNIT II

Canonical and Standard Form of LPP – Maximization and Minimization Problems – Simplex Method – Big M Method - Duality in LPP – Formulation of Dual LPP (concept only) –Dual primal relationship.

### UNIT III

Transportation Problem – Balanced and Unbalanced Transportation Problem – Initial Basic Feasible Solution – North West Corner Rule, Least Cost Method, Vogel's Approximation Method – Optimum Solution – MODI Method.

### UNIT IV

Assignment Problem – Balanced and Unbalanced Assignment Problem – Maximization and Minimization Problems – Hungarian Method – Travelling Salesman Problem.

### UNIT V

Inventory Control –Types – Need for inventory control – Costs involved in Inventory – Lead Time – Reorder Level –EOQ – Purchasing and Manufacturing Models with No Shortages – ABC and VED analysis (concept only).

### Text Books:

1. Kanti Swarup, P.K. Gupta and Manmohan - Operations Research (1980), Sultan Chand & Sons, New Delhi.
2. J.K. Sharma - Operations Research -Theory & Applications (2007), Macmillan India Ltd, Third Edition, 2007.

### Reference Books:

1. V.K.Kapoor - Problems in Operations Research, Sultan Chand & Sons, New Delhi.
2. Prof. V.Sundaresan, K.S. Ganapathy, Subramanian, K.Ganesan - Resource Management Techniques (2000), A.R. Publications, Tamil Nadu, New Revised Edition, June 2000.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Skill Based Elective -III: ELEMENTS OF ACTUARIAL STATISTICS	V	18BST55S

**Objective:** To understand and analyze future financial events.

### UNIT – I

Principles of Life Assurance: Nature of Insurance – Classification of Insurance – History of Life Insurance in India.

### UNIT – II

Basic Concepts of Mathematics of Finance – Elements of Simple Interest – Elements of Compound Interest – Effective and Nominal Rates of Interest – Depreciation.

### UNIT – III

Annuities – Present Value of Immediate Annuity- Present value of Immediate Annuity Certain – Accumulated value of Annuity- Present Value of Deferred Annuity Certain-Accumulated value of a Deferred Annuity Certain.

### UNIT – IV

Premiums: General Principles – Natural Premiums – Level Premiums – Office Premiums with Profit and Without Profit Premiums – Adequacy of Premiums.

### UNIT – V

Legal Environment – Motor Vehicles Act- Hit & Run Accidents Act- Public Liability Insurance Act- Marine Insurance ACT- Carriage of Goods by Sea Act- Merchant Shipping Act- Indian Railway Act- Indian Post Office Act- Carriage by Air Act- Consumer Production Act- Indian Information Technology Act .

### Text Books:

1. Insurance Institute of India - Mathematical Basis of Life Assurance Jan 2015.
2. Insurance Institute of India - Insurance Business Environment. IC-12, May – 2017.

### Reference Books:

1. PA. Navaneetham - Business Mathematics and Statistics, Jai Publishers, Trichy, May 2014.

2. CT-5 General Insurance, Life and Health Contingencies – Institute of Actuaries of India - 2016.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Core IX: NUMERICAL ANALYSIS	VI	18BST61C

**Objective:** To impart the mathematical skills of the students

### UNIT I

Finite Differences - Operators – Forward and Backward Difference Operators – Operator E and their basic Properties (without proof) - Interpolation with Equal Intervals - Newton's Forward and Backward Difference Formulae – Simple Problems – Equidistant Terms with One or More Missing Values .

### UNIT II

Central Difference Interpolation Formula – Gauss Forward Interpolation Formula – Gauss Backward Interpolation Formula – Stirling's Formula – Bessel's formula – Simple problems.

### UNIT III

Interpolation with unequal intervals – Divided Difference and their properties (without proof) – Newton Divided Difference Formula – Lagrange's Formula –simple problems – Inverse Interpolation using Lagrange's formula.

### UNIT IV

Numerical Differentiation - Newton's Forward and Newton's Backward Difference Formula to Compute the Derivative – Derivative using Stirlings Formula (Upto Second Order Only).

### UNIT V

Numerical Integration: Trapezoidal Rule, Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  Rules - Numerical Method of Solution of Ordinary Differential Equations - Taylor's Series Method - Euler Method and Runge - Kutta Method upto Second Order - Simple Problems Only.

**75% Problems and 25% Theory**

#### Text Books:

1. P.Kandasamy, K.Thilagavathy, K.Gunavathi - Numerical Methods , S.Chand Company Ltd, New Delhi Third Edition, 2016.
2. S.S. Sastry - Numerical Analysis, PHI Learning Pvt. Ltd, New Delhi.

#### Reference Book:

1. G.Shanker Rao - Numerical Analysis, New Age International (P) Ltd, Publishers, New Delhi.

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	Core X: STATISTICAL INFERENCE – II	VI	18BST62C

**Objective:** To understand distributions by analyzing population data.

### UNIT I

Testing of Hypothesis - Statistical Hypothesis - Simple and Composite Hypothesis, Null and Alternative Hypothesis - Two Types of Errors-Critical Region- Level of significance and Power of a Test - Most Powerful Test - Uniformly Most Powerful Tests -Neyman-Pearson Lemma.

### UNIT II

Tests Based on N P lemma - Likelihood Ratio test – Definition - Test for Mean and Variance for normal population (One Sample Only).

### UNIT III

Tests of Significance - Large Sample Tests - Mean, difference of Means, proportion- difference of proportions. Small Sample Tests - t-test for Mean, difference of Means, Paired t-test - Correlation Co-efficient

### UNIT IV

F-test for variance ratio - Chi-Square Test – Contingency Tables -Yate's correction – Test for Goodness of Fit and Independence of Attributes.

### UNIT V

Non-Parametric Tests: Advantages and limitations-Sign test, Run Test, Median Test and Mann-Whitney 'U' Test (One Sample and Two Sample Problems) - Kolmogorov's Smirnov One Sample Test- Kruskal Wallis Test – simple problems.

### Text Books:

1. S.C. Gupta, and V.K.Kapoor - Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 11<sup>th</sup> Revised Edition, June 2012.
2. Rohatgi V.K., - Statistical Inference, John Wiley and Sons, New York, 2013.

### Reference Books:

1. Lehmann, E.L - Testing Statistical Hypothesis (2<sup>nd</sup> Edition, 1986) Springer New York.
2. C.W. Snedecor and W.G.Cochran - Statistical Methods, Oxford and IBH.



Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Core XI: AOS - STATISTICAL QUALITY CONTROL	VI	18BST63C

**Objective:** To impart knowledge on quality control tools and techniques.

### UNIT I

Quality –meaning - concepts – Quality of design – Quality of conformance – Quality of performance - Statistical Quality Control – Meaning – Basic concepts of SQC – Uses – Causes of variation – Process Control – Basis of Control Charts – Uses of control charts - 3sigma control Limits.

### UNIT II

Criteria for deducting lack of control -Control Chart for attributes - p and np charts - Control Charts for number of defects - c Charts (for fixed and varying sample size) - Control Charts for Variables –  $\bar{x}$  and R Charts– Comparison of attribute and variable control charts

### UNIT III

Product Control - Acceptance Sampling – Meaning – Applications in Industry - Producer's Risk and Consumer's Risk - Definitions of AQL, LQL, IQL - Measures of performance - Concept of OC Function - Type A and Type B OC curves – Attribute Sampling Plans – Single Sampling Plans -OC Functions, AOQL, ASN and ATI Based on Hyper-geometric, Binomial and Poisson distributions.

### UNIT IV

Designing a Sampling Plan - Determination of the parameters in Single Sampling Plans - Operating Procedures of Double Sampling Plans for attributes - Conditions of Applications - OC, ASN, AOQ and ATI functions – Advantages – Disadvantages.

### UNIT V

Sequential Sampling Plan for Attributes – Wald's Sequential Probability Ratio Test – Operating Procedure - OC Curve – ASN Function – Five Points on OC Curve –Five Points on ASN.

#### Text Books:

1. S.C. Gupta, and V.K.Kapoor - Fundamentals of Applied Statistics, Sultan Chand & Sons Publishers, New Delhi, 4<sup>th</sup> Thoroughly Revised Edition, Jan 2007, Reprint 2015.
2. M. Mahajan - Statistical Quality Control Dhanpat Rai & Co (P) Ltd, Delhi, 2009.

#### Reference Books:

1. E.L.Grant and R.S. LeavenWorth - Statistical Quality Control, McGraw Hill, New

- York.  
2. A.J.Duncan - Quality Control and Industrial Statistics, Irwin Homewood,

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Core Practical – III: STATISTICS PRACTICAL - III	V & VI	18BST64P

### 1. Statistical Inference

- Estimation of Parameters of Distribution by the Method of Moments and
- Estimation of Parameters by the Method of Maximum Likelihood
- Testing of hypothesis- Large Sample Tests- Test for Mean – Difference of Mean. Proportion - Difference of proportion. Small sample tests - Test for mean - Difference of mean – Paired t-test -Test for variance ratio
- Chi – Square Test - Independence Test and Goodness of Fit
- Non – Parametric Tests – Median Test, Run Test, Mann-Whitney Test.

### 2. Design of Experiments :

- Analysis of CRD, RBD and LSD Layouts.
- Missing Plot Techniques in RBD and LSD.
- Analysis of  $2^2$  Factorial Experiments
- Analysis of  $2^3$  Factorial Experiments.

### 3. Basic Sampling Theory :

- Estimation of Mean and Variance of The Population - The Variance of the Estimator of the Mean Using Simple Random Sampling Procedure.
- Stratified Random Sampling, Estimation of the Mean and Variance of the Population Estimation of the Mean Under Proportional and Optimum Allocation.

### 4. Statistical Quality Control

- Control Charts for Attributes,  $p$ ,  $np$  and  $c$  charts. and Control Charts for Variables:  $\bar{x}$ ,  $R$ .
- Single Sampling Plan for Attributes : OC, ASN, ATI, AOQ Curves.

### 5. Operations Research

- Transportation Problem – Northwest Corner Rule – Least Cost Method – VAM method.
- Optimal Solution by MODI Method.
- Assignment Problem – Hungarian Algorithm.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Core Practical – IV:STATISTICS PRACTICAL - IV (Using SPSS)	VI	18BST65P

1. Functions of Statistics (Classification, diagrams and graphical representation of data)
2. Descriptive statistics
3. Correlation, Regression and obtaining Regression lines.
4. Calculation of probabilities under various distributions.
5. Inferential statistics for single through multiple samples (Chi-square, t, F and Z-Test )
6. Confidence interval for mean, variance, proportions
7. Non-parametric Tests – Wilcoxon, Mann-Whitney u-test.
8. ANOVA- one-way classification.
9. Curve fitting and Time series
10. Statistical quality Control charts- Determination of parameters for constructing basic control charts such as X, R, S, p and c charts

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Skill Based Elective - IV: OPTIMIZATION TECHNIQUES	VI	18BST67S

**Objective:** To solve the industrial problems under the given circumstances using optimization Techniques.

### UNIT I

Game Theory – Introduction – Two-Person Zero-Sum Games – Concept of Pure and Mixed Strategies – Games With and Without Saddle Points – Solving 2 x 2 Games – Dominance Property – Graphic Solution of 2 x n and m x 2 Games.

### UNIT II

Network analysis – Basic Concepts – Construction of Network – Critical Path Method (CPM) – Floats – Program Evaluation and Review Technique (PERT) – Difference between CPM and PERT – Resource allocation and scheduling (Concept only).

### UNIT III

Replacement Problems – Introduction – Replacement of Items that Deteriorates Gradually (Value of Money Does Not Changes With Time and Changes With Time) – Replacement of Items that Fails Suddenly – Individual and Group Replacement.

### UNIT IV

Queuing Theory: Introduction – Characteristics of Queuing Models – Classification of Queues – Problems from Single Server: Infinite Population Model.

### UNIT V

Sequencing Problem – Problems with n- jobs Through Two Machines – Problems with n- jobs on Three Machines – Idle Times and Total Elapsed Time Calculations.

### Text Books:

1. Kanti Swarup, P.K. Gupta and Manmohan - Operations Research, Sultan Chand & Sons, New Delhi, 14<sup>th</sup> edition, 2008 .
2. V.Sundaresan, K.S. Ganapathy Subramanian, K.Ganesan - Resource Management Techniques, A.R. Publications, Tamil Nadu, New Revised Edition, June 2000.

**Reference Book:**

1. J.K. Sharma - Operations Research -Theory & Applications, Macmillan India Ltd, Third Edition, 2007.

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	Non-Major Elective I: BASIC STATISTICS – I	V	18BST5EL

**Objective:** To give some fundamental concepts of Statistics to the students belonging to other disciplines.

**UNIT – I**

Statistics – Introduction – Definition - Functions of Statistics – Scope, uses and Limitations of Statistics – Collection of data – Primary and Secondary data – Methods of collecting primary data – Classification and Tabulation of data.

**UNIT – II**

Formation of Frequency Distribution - Diagrams and Graphs – Merits and Demerits. Bar diagrams – Pie diagram – Graphs of frequency distribution – Histogram, Frequency polygon and Frequency curve or Ogive curves.

**UNIT – III**

Measures of Central Tendency: Requisites of a good average - Arithmetic Mean, Median, Mode, Geometric Mean and Harmonic Mean – Merits and Demerits

**UNIT – IV**

Measures of Dispersion: Absolute and Relative Measures - Range, Quartile Deviation, Mean Deviation, Standard Deviation and Co-efficient of Variation – Simple problems.

**UNIT V**

Skewness: Measures of Skewness – Types - Karl-Pearson’s Co-efficient of Skewness - Bowley’s Co-efficient of Skewness, - Simple Problems.

**Text Book:**

1. P.A. Navanitham - Business Mathematics and Statistics, Jai Publishers, Trichy, July 2008.
2. R.S.N. Pillai and V. Bagavathi - Statistics – Theory and Practice, S.Chand & Sons Company Ltd, New Delhi.

**Reference Book:**

1. P. R. Vittal - Business Statistics, Margham Publications, Chennai.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	Non-Major Elective II: BASIC STATISTICS – II	VI	18BST6EL

**Objective:** To give some fundamental concepts of Statistics to the students belonging to other disciplines.

### UNIT I

Correlation – Meaning – Scatter diagram – Karl Pearson’s Correlation Coefficient – Merits and Demerits - Simple Problems.

### UNIT II

Rank Correlation – Spearman’s Rank Correlation Coefficient – Merits and Demerits – Concurrent Deviation Method – Simple Problems.

### UNIT III

Regression – Uses - Regression Equations – Properties - Simple Problems.

### UNIT IV

Time series – Uses – Components of Time Series – Measurement of Trend –Graphical method- Semi Average Method - Moving Average Methods – Simple Problems.

### UNIT V

Index Numbers – Uses – Characteristics - Construction of Weighted Index Numbers – Laspeyre’s, Paasches and Fisher’s Index Numbers – Cost of Living Index - Simple Problems.

#### Text Book:

1. P.A. Navaneetham - Business Mathematics and Statistics, Jai Publishers, Trichy.
2. R.S.N. Pillai and V. Bagavathi - Statistics – Theory and Practice, S.Chand & Sons Company Ltd, New Delhi.

#### Reference Book:

1. S.P. Gupta - Statistical Methods, Sultan Chand & Sons, New Delhi.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	I B.Sc. Geography -STATISTICS – I	I	

**Objective:** To impart the basic knowledge of Statistics and its various applications.

### UNIT I

Meaning, Scope and Limitations of Statistics – Primary and Secondary Data – Methods of Collecting Primary Data – Sources of Secondary Data – Classification and Tabulation of Data.

### UNIT II

Formation of Frequency Distribution – Presentation of Data – Diagrams: Bar Diagrams and Pie Diagram - Graphs: Histogram, Frequency Polygon, Frequency Curve and Ogives - Simple problems.

### UNIT III

Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean – Merits and Demerits – Properties of a Good Measure – Simple problems.

### UNIT IV

Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation and Co-efficient of Variation - Skewness: Meaning – Measures of Skewness – Karl Pearson's Co-efficient of Skewness and Bowley's Co-efficient of Skewness - Simple problems.

### UNIT V

Concept of Probability – Basic Concepts – Events – Equally Likely and Mutually Exclusive Events – Mathematical, Statistical Definitions of Probability – Addition and Multiplication Theorems (Without Proof) – Simple Problems.

**Note:** No derivation, only the Concepts and Simple Problems throughout the Syllabus.

### Text Book:

1. S.P.Gupta - Statistical Methods, Sultan Chand & Sons, New Delhi, 42<sup>nd</sup> revised Edition, 2012.

### Reference Book:

1. PA. Navneetham - Business Mathematics & Statistics, Jai Publishers, Trichy, July 2008.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	I B.Sc. (Computer Science) STATISTICS & NUMERICAL METHODS	I	

**Objective:** To improve the mathematical skills among the students

### UNIT I

Measures of Central Tendency: Mean, Median and Mode - Relationship among Mean, Median and Mode - Uses, Merits and Demerits - Measures of Dispersion: Range - Quartile Deviation - Mean Deviation - Standard Deviation and Coefficient of Variation.

### UNIT II

Skewness: Meaning - Bowley's and Karl Pearson's Measures of Skewness. Correlation (Two Variable Linear Case) - Meaning - Scatter Diagram - Types of Correlation - Karl Pearson Correlation Coefficient – Concurrent Deviation Method - Rank Correlation.

### UNIT III

Linear Regression - Regression Equations for Two Variables - Regression Coefficients - Properties - Curve Fitting: Linear - Simple Problems.

### UNIT IV

Numerical Methods - System of Simultaneous Equations: Gauss Elimination- Gauss Siedal Methods - Interpolation: Newton's Forward and Backward Interpolation Formula - Lagrange's Interpolation (No Derivations) - Simple Problems Only.

### UNIT V

Numerical Differentiation: Newton Forward Difference - Newton Backward Difference .  
Numerical Integration: Trapezoidal Rule, Simpson Rule  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rules.

### Text Books:

1. S.C.Gupta and V.K.Kapoor - Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 11<sup>th</sup> revised Edition, June 2012.
2. P.Kandasamy, K. Thilagavathy, K. Gunavathi - Numerical Methods, S. Chand & Company Ltd, New Delhi.

### Reference Books:



1. V.Rajaraman - Computer Oriented Numerical Methods.
2. P. R. Vittal - Business Statistics, Margham Publications, Chennai.

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	I B.Com (CA) BUSINESS MATHEMATICS	I	

**Objective:** To impart the knowledge of basic application of mathematics in business.

### UNIT I

Arithmetic and Geometric Series- Mathematics of Finance - Simple and Compound Interests – Annuities - Sinking Funds - Discounts and Present Values.

### UNIT II

Matrices - Basic Concepts - Types of Matrices - Addition and Multiplication of Matrices – Determinant and Inverse of a Matrix ( upto 3 x 3) - Rank of a Matrix ( upto 3 x 3).

### UNIT III

Variables - Constants and Functions - Differentiation - Meaning of Derivative – First and Second Order Derivatives - Maxima and Minima of Simple Algebraic Functions – Marginal Revenue and Marginal Cost - Simple Problems.

### UNIT IV

Integration – Meaning – Basic Integral Formulas - Integration of Simple Algebraic Functions - Integration by Parts – Simple Problems.

### UNIT V

Transportation Problem: Balanced and Unbalanced Problems – Initial Basic Feasible Solution – North-West Corner Rule, Least Cost Method and Vogel’s Approximation Method (VAM) - Assignment Problem – Hungarian Method - Simple Problems.

### Text Books:

1. PA. Navneetham - Business Mathematics & Statistics, Jai Publishers, Trichy, July 2008.
2. Kanti Swarup, P. K Gupta & Manmohan - Operations Research, Sultan Chand & Sons, New Delhi.

### Reference Book:

1. P. R. Vittal - Business Statistics, Margham Publications, Chennai.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	I BBA STATISTICS FOR MANAGEMENT-I	I	

**Objective:** To impart some basic knowledge of Statistics and Mathematics applied in business.

### UNIT I

Matrices - Basic Concepts - Types of Matrices - Addition and Multiplication of Matrices – Determinant of matrices – Rank and Inverse of a Matrix ( 2 x 2 and 3 x 3 only)

### UNIT II

Mathematics of Finance – Simple and compound Interest – Effective Rate of interests – Annuities – Sinking fund – Discount and present values.

### UNIT III

Meaning and Definition of Statistics – Collection of Data – Primary and Secondary - Classification and Tabulation – Diagrammatic and Graphical Representation.

Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean.

### UNIT IV

Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation and Co-efficient of Variation. Skewness: Meaning – Measures of Skewness - Pearson's and Bowley's co-efficient of Skewness.

### UNIT V

Correlation: Meaning and Definition – Scatter Diagram, Karl Pearson's Co-efficient of Correlation, Spearman's Rank Correlation. Regression: Meaning of Regression – Regression in Two Variables – Uses of Regression.

#### Text Books:

1. P. R. Vittal - Business Statistics, Margham Publications, Chennai.
2. PA. Navneetham - Business Mathematics & Statistics, Jai Publishers, Trichy, July 2008.

#### Reference Book:

1. S.P.Gupta - Statistical Methods, Sultan Chand & Sons, New Delhi, 42<sup>nd</sup> revised Edition, 2012.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	I B.Sc Geography-STATISTICS - II	II	

**Objective:** To impart the knowledge of Statistical Tools used for analyzing the geographical data.

#### UNIT I

Correlation – Scatter Diagram - Karl Pearson’s Co-efficient of Correlation - Spearman’s Rank Correlation – Regression – Construction of regression equations - Difference between Correlation and Regression – Simple Problems.

#### UNIT II

Sampling Methods – Advantages and Limitations – Sampling and Non-Sampling Errors – Random sampling methods - Simple Random, Systematic and Stratified Sampling Methods – Non-Random sampling methods (No Derivations, Only Concepts).

#### UNIT III

Sampling Distribution – Standard Error – Tests of Significance – Null and Alternative Hypotheses – Type I and Type II Errors – Large Sample Tests – Test for Single Mean, Difference of Means, Single Proportion and Difference of Proportions – Simple Problems.

#### UNIT IV

Small Sample Tests - Student’s ‘t’ test – Test for Single Mean and Difference of Means (independent and paired samples) – Chi-Square Test – Test for Independence of Attributes and Goodness of Fit – F- test for Equality of Two Variances.

#### UNIT V

Analysis of Variance – Assumptions – One way and Two way Classifications (No Derivations) – Simple Problems.

#### Text Book:

1. S.C.Gupta and V.K.Kapoor - Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 11<sup>th</sup> revised Edition, June 2012.

**Reference Book:**

1. S.P.Gupta - Statistical Methods, Sultan Chand & Sons, New Delhi, 42<sup>nd</sup> revised Edition, 2012.

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	I B.Sc. (IT) - Allied II : COMPUTER ORIENTED NUMERICAL & STATISTICAL METHODS	II	

**Objective:** To improve the mathematical skills among the students.

**UNIT I**

The solution of Numerical Algebraic & Transcendental equations – Iteration method - Bisection method – Newton – Raphson method.

The solution of Simultaneous Linear Algebraic Equations – Gauss Elimination method– Gauss – Siedal method. (Simple Problems)

**UNIT II**

Interpolation for Equal Intervals – Newton’s Forward and Backward Interpolation formulae – Interpolation for Unequal Intervals – Lagrange’s formula. Numerical Differentiation: Newton Forward Difference -Newton Backward Difference . Numerical Integration – Trapezoidal rule – Simpson’s one - third and three-eighth rules. (Simple Problems).

**UNIT III**

Measures of Central Tendency – Mean, Median and Mode – Relationship between Mean, Median and Mode – Measures of Dispersion – Range, Mean Deviation and Standard Deviation – Co-efficient of Variation.

**UNIT IV**

Skewness – Karl Pearson’s measures of Skewness – Correlation - Meaning – Types of Correlation – Scatter Diagram – Karl Pearson’s Co-efficient of Correlation – Rank Correlation (Simple Problems).

**UNIT V**

Linear Regression –Regression Equations for two variables – Regression co-efficients – Properties. Curve fitting: Linear (Simple problems).

**Text Books:**

1. P.Kandasamy, K.Thilagavathi, K.Gunavathi, - Numerical Methods, Sultan Chand & Sons Ltd.New Delhi, Revised Edition 2005.
2. S.P.Gupta - Statistical Methods, Sultan Chand & Sons, New Delhi, 42<sup>nd</sup> revised Edition, 2012.

**Reference Books:**

1. V.Rajaraman - Computer Oriented Numerical Methods, PHI Publication

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	I BBA STATISTICS FOR MANAGEMENT - II	II	

**Objective:** To understand the applications of Operations Research in industrial situations.

**UNIT-I**

Introduction to Operations Research - Meaning - Scope - Linear Programming Problem Advantages and Limitations of LPP - Mathematical Formulation - Graphical Method - Simple Problems.

**UNIT-II**

Transportation Problem : Balanced and Unbalanced Problems – Initial Basic Feasible Solution – North-West Corner Rule, Least Cost Method and Vogel’s Approximation Method (VAM) - Assignment Problem – Hungarian Method - Simple Problems.

**UNIT-III**

Game Theory: Pure and Mixed Strategies - Saddle Point - Value of a Game - Dominance Rule - Queuing Theory – Queuing System – Characteristics of a Queuing System - (M/M/1):(∞/FIFO) Model - Simple Problems.

**UNIT-IV**

Network Analysis: Basic Concepts - Rules of Network Constructions – Critical Path Method – Floats – PERT – Probability Considerations - Simple Problems.

**UNIT-V**

Replacement Problem – Replacement of items that Deteriorates Gradually - Replacement of items that Fails Suddenly - Simple Problems.

**Note:** Derivations and Proofs are Excluded.

**Text Book:**

1. Kanti Swarup, P. K Gupta & Manmohan - Operations Research, Sultan Chand & Sons, New Delhi.

**Reference Books:**

1. P. K Gupta & Manmohan - Problems in Operations Research, Sultan Chand & Sons, New Delhi.
2. V.K. Kapoor - Operations Research-Techniques for Management, Sultan Chand & Sons, New Delhi.

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	II B.Sc Psychology - STATISTICS - I	III	

**Objective:** To impart the basic knowledge of Statistical tools and their applications in Psychology.

**UNIT I**

Definition of Statistics - Importance of Statistics in Psychology and Research - Collection of Data - Primary and Secondary - Classification of Data - Formation of Frequency Distribution.

**UNIT II**

Diagrammatic and Graphical Representation of Statistical Data - Simple, Multiple, Sub-Divided, Percentage Bar Diagrams and Pie Diagram - Histogram, Frequency Polygon, Frequency Curve, Ogives - Measures of Central Tendency - Mean, Median, Mode, Geometric Mean and Harmonic Mean.

**UNIT III**

Measures of Dispersion – Range, Quartile Deviation, Mean Deviation (about Mean), Standard Deviation and Co-efficient of Variation – Concept of Skewness – Karl Pearson's and Bowley's Coefficient of Skewness – Simple Problems

**UNIT IV**

Correlation – Scatter Diagram – Karl Pearson's Coefficient of Correlation – Spearman's Rank Correlation. Regression Equations – Properties of Regression Coefficients – Simple Problems.

**UNIT V**

Concept of Probability – Basic Definitions – Mathematical and Statistical Approach – Addition and Multiplication Theorems (Without Proof) – Simple Problems.

**Note:** No derivation, only Concepts and Simple Problems throughout the Syllabus.

**Text Books:**

1. S.P.Gupta - Statistical Methods, Sultan Chand & Sons, New Delhi, 42<sup>nd</sup> revised Edition, 2012.

2. R.S.N. Pillai and V. Bagavathi - Statistics – Sultan Chand & Sons Company Ltd, New Delhi.
3. J.P Verma and Mohammed Ghufuran- Statistics for Psychology, Tata Mcgraw Hill Education (P) Ltd. New Delhi.

**Reference Books:**

1. Henry E. Garrett - Statistics in Psychology and Education, Paragon International Publishers, Twelfth Indian Reprint, 2007.
2. S.K.Mangal - Statistics in Psychology, PHI Learning Private Limited, New Delhi, Second Edition, 2009.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	II B.Com (CA) STATISTICS FOR BUSINESS	III	

**Objective:** To understand the applications of Statistics in Business.

**UNIT I**

Statistics - Meaning, Scope and Limitations – Collection of Data – Sources of data –Collection of Primary and Secondary Data – Classification and Tabulation of data – Diagrammatic Representations - Bar Diagrams and Pie Diagram – Graphical Representations - Histogram, Frequency Curve and Ogives.

**UNIT II**

Measures of Central Tendency - Mean, Median, Mode, Geometric Mean and Harmonic Mean – Measures of Dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation and their coefficients – Simple Problems.

**UNIT III**

Correlation – Scatter Diagram - Karl Pearson’s Co-efficient of Correlation - Spearman’s Rank Correlation – Regression – Construction of regression equations - Difference between Correlation and Regression – Simple Problems.

**UNIT IV**

Index Numbers – Definition and uses - Weighted and Un-weighted Methods of constructing Price index Numbers – Time Reversal and Factor Reversal Tests - Cost of Living Index Number – Uses - Construction by Family Budget Method – Aggregate Expenditure Method.

**UNIT V**

Time Series - Concept and Components - Estimation of Trend – Method of Moving Averages - Method of Least squares (Linear only). Estimation of Seasonal Variation – Method of Simple Averages – Ratio-to-Moving Averages Method.

**Text Book:**

1. P. R. Vittal - Business Statistics, Margham Publications, Chennai

**Reference Books:**

1. S.P.Gupta - Statistical Methods, Sultan Chand & Sons, New Delhi, 42<sup>nd</sup> revised Edition, 2012.
2. PA. Navneetham - Business Mathematics & Statistics, Jai Publishers, Trichy, July 2008.

Year	Subject Title	Sem	Sub Code
2018-19 Onwards	II B.Sc Psychology - STATISTICS - II	IV	

**Objective:** To impart the basic knowledge of Statistical tools and their applications in Psychology.

**UNIT I**

Probability Distribution – Binomial, Poisson and Normal Distributions – Properties and Applications (without Proof) – Simple Problems.

**UNIT II**

Sampling – Advantages and Disadvantages – Simple Random Sampling – Stratified Random Sampling – Systematic Sampling – (Concept Only) – Sampling Distribution – Standard Error – Tests of Significance – Type I and Type II Errors – Large Sample Tests for Single Mean and Two Means. Tests for single proportion and difference of two proportions.

**UNIT III**

Small Sample Tests – Test for Single Mean and Two Means – Paired ‘t’ Test Chi-Square Test for Independence of Attributes. Association of Attributes – Contingency Tables – Methods of Studying Association – Yule’s Coefficient of Association

**UNIT IV**

Measurement and scaling techniques- Categorical variables-Data types-Metric, Interval and Ratio data. Non-Metric data- Nominal, ordinal data. Scales of measurement -Comparative scale, paired Comparison scale, rank order scale, constant sum scale, Non-comparative scale-continuous rating scale, Itemized rating scale- Likert scale, Guttman scale

**UNIT V**

Non – Parametric Tests– Introduction advantages and disadvantages. Run test, Sign test, Median test, Mann-Whitney U test(one sample only) Kolmogrov Smirnov test(two samples).

**Text Books:**

1. R.S.N. Pillai and V. Bagavathi - Statistics – Theory and Practice, S.Chand & Sons Company Ltd, New Delhi.
2. S.C.Gupta and V.K.Kapoor - Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi, 11<sup>th</sup> revised Edition, June 2012.
3. J.P Verma and Mohammed Ghufuran- Statistics for Psychology, Tata Mcgraw Hill Education (P)Ltd. New Delhi.



**Reference Books:**

1. Henry E. Garrett - Statistics in Psychology and Education, Paragon International Publishers, Twelfth Indian Reprint, 2007.
2. S.K.Mangal - Statistics in Psychology, PHI Learning Private Limited, New Delhi, Second Edition, 2009.

Year	Subject Title	Sem	Sub Code
2018–19 Onwards	II B.Com & II B.Com(IB) BUSINESS STATISTICS	IV	

**Objective:** To understand the applications of Statistics in Business.

**UNIT I**

Scope and Limitations of Statistics – Primary and Secondary Data - Sources of Data – Methods of Collecting Data – Classification and Tabulation of Data – Diagrammatic Representation - Bar Diagrams – Pie Diagram – Graphical Representation - Histogram – Frequency Curve and Ogives.

**UNIT II**

Measures of Central Tendency - Mean, Median, Mode, Geometric Mean and Harmonic Mean – Measures of Dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation and their coefficients – Simple Problems.

**UNIT III**

Correlation – Scatter diagram - Karl Pearson’s Co-efficient of Correlation - Spearman’s Rank Correlation – Regression – Construction of Regression Equations – Difference between Correlation and Regression – Simple Problems.

**UNIT IV**

Index Numbers – Definition and Uses – Weighted and Un-weighted Methods of Construction of Price index Numbers –Time Reversal and Factor Reversal Tests - Cost of Living Index Number - Construction using Family Budget Method – Aggregate Expenditure Method.

**UNIT V**

Time Series – Concept and Components – Estimation of Trend – Method of Moving Averages - Method of Least squares (Linear only). Measurement of Seasonal Variation – Method of Simple Averages – Ratio-to-Moving Averages Method.

**Text Books:**

1. P. R. Vittal - Business Statistics, Margham Publications, Chennai.
2. S.P.Gupta - Statistical Methods, Sultan Chand & Sons, New Delhi, 42<sup>nd</sup> revised Edition, 2012.

**Reference Book:**

1. P.A. Navaneetham - Business Mathematics & Statistics, Jai Publishers, Trichy, July 2008.