GOVERNMENT ARTS COLLEGE

(AUTONOMOUS) SALEM-7

Reaccredited with B Grade by NAAC
(Affiliated to Periyar University)

B.Sc. STATISTICS

Regulations and Syllabus

(Effective from the Academic Year 2022-2023)

Department of Statistics

Vision

To uplift the lifestyle of the poor and downtrodden students through this department which is a full-fledged Center for statistical learning.

Mission

To ensure overall development of the students by imparting training in curricular and co-curricular activities.

Program Educational Outcomes (PEOs)	
On successful completion of the B.Sc Statistics program, the graduates will be able to:	
PEO1	Find employment utilizing their statistical knowledge in government, public and private sectors.
PEO2	Perform data analysis and make interpretations with knowledge attained during the course of study
PEO3	Gain knowledge to pursue higher studies in statistics
PEO4	Write code to extract and reformat real data and to utilize statistical programming environments.
PEO5	Serve as biostatistician, statistical investigator, statistical assistant with knowledge in statistics

Program Outcomes (POs)	
On successful completion of the B.Sc Statistics program, students will be able to	
PO1	Apply the concepts, principles and methods of statistics to various fields of study
PO2	Understand the importance and value of statistical principles and convert a problem description into testable research hypotheses.
PO3	Select appropriate statistical tools to investigate a research hypothesis.
PO4	Perform data analysis by apply appropriate statistical methodology and interpret result in a variety of settings.
PO5	Compute statistical measures using software and programs.
PO6	Apply likelihood principles and calculus to derive fundamental results in probability, estimation and hypothesis testing.
PO7	Select standard experiment designs, with consideration of selection process, data collection, issues of bias, causality and confounding, based on specifications of a scientific study.
PO8	Write code to extract and reformat real data and to utilize statistical programming environments.
PO9	Acquire skills to write competitive examinations and get opportunities for job placements in various sectors
PO10	Move for higher level learning

Program Specific Outcomes (PSOs)	
On successful completion of the B.Sc Statistics programme, the students are expected to	
PSO1	Realize the importance/ applications of statistics in various fields such as agriculture, medical science, demography,etc.,
PSO2	know the suitable statistical methods / Models for data analysis.
PSO3	know the different methods of Collection of Data.
PSO4	realize the goodness of fitting of Probability Distribution to the statistical data.
PSO5	understand different methods of estimation for an unknown parameters involved in probability distribution.
PSO6	write the computer programs for statistical calculation and analyzing the data under study.
PSO7	find the optimum solution to the problems using Statistical Methods.
PSO8	draw a valid inference about the population in which the samples have been taken.
PSO9	identify the quality of the product using the statistical tools.
PSO10	to develop the methods of measuring, comparing the intensity and analyzing the factors in demographic processes.

Graduate Attributes (GA)

1. **Disciplinary knowledge**: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

2. **Information/digital literacy**: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

3. **Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

4. **Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group.

5. **Leadership readiness/qualities:** Capability for mapping out the tasks of a team, formulating an inspiring vision, building a team who can help achieve the vision, and using management skills to guide people to the right destination, in a smooth and efficient way.

6. **Problem solving**: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

7. **Analytical reasoning** : Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; **Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

8. **Moral and ethical awareness/reasoning:** Ability to embrace moral/ethical values in conducting one's life; avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues.

9. **Multicultural competence**: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

10. **Self-directed learning:** Ability to work independently; identify appropriate resources required for a project, and manage a project through to completion.

GOVERNMENT ARTS COLLEGE(AUTONOMOUS), SALEM – 7

B.Sc STATISTICS

For the candidates admitted from the academic year 2022-2023

S. No	Part	Course code	Course Name	Hours	Credits	Marks		Max
						IA	SE	
			SEMESTER – I					
1	I	22FTL01	Foundation Tamil-I	5	3	25	75	100
2	II	22FEL01	Communicative English-I	5	3	25	75	100
3	III	22UST01	Core Course I : Descriptive Statistics	5	5	25	75	100
4	III	22AMT01	Allied – I- Course I : Mathematics-I	5	4	25	75	100
5	III	22USTP1	Core Practical - I: Descriptive Statistics and Probability Thory (Extended to Semester II)	3	--	--	--	--
6	III	22AMTP1	Allied – I – Practical : Mathematics - I (Extended to Semester II)	3	--	--	--	--
7	IV	22AECC1	AECC –I: Value Based Education	2	2	25	75	100
8	IV	22UPE01	Professional English-I	2	2	50	-	50
			TOTAL	30	19			550
			SEMESTER – II					
1	I	22FTL02	Foundation Tamil-II	5	3	25	75	100
2	II	22FEL02	Communicative English-II	5	3	25	75	100
3	III	22UST02	Core Course II : Probability theory	5	5	25	75	100
4	III	22AMT02	Allied – I- Course II : Mathematics-II	5	4	25	75	100
5	III	22USTP1	Core Practical- I:Descriptive Statistics and Probability Theory (Extended from Semester I)	3	4	40	60	100
6	III	22AMTP1	Allied – I - Practical : Mathematics- I (Extended from Semester I)	3	3	40	60	100
7	IV	22AECC2	AECC-II: Environmental Studies	2	2	25	75	100
8	IV	22UPE02	Professional English-II	2	2	50	-	50
			TOTAL	30	26	--	--	750
			CUM-TOTAL		45			1300

			SEMESTER – III					
1	I	22FTL03	Foundation Tamil-III	5	3	25	75	100
2	II	22FEL03	Foundation English – I:	5	3	25	75	100
3	III	22UST03	Core Course III : Distribution Theory	5	5	25	75	100
4	III	22ASTS1	Allied – II- Course I: Linear Programming and its Applications	5	4	25	75	100
5	IV	22USTS1	Skill Enhancement Course I: Basics for Statistics	2	2	25	75	100
6	IV	22USTN1	Non-Major Elective Course I: Statistics for Business Analysis - I	2	2	25	75	100
7	III	22USTP2	Core Practical II: Distribution Theory and Sampling Techniques (Extended to Semester IV)	3	-	--	--	-
8	III	22ASTSP	Allied – II –Practical: Operations Research (Extended to Semester IV)	3	-	--	--	-
9	V	**22EXAT1**	**Extension(Community Service)* : National Cadet Corps**	**(Self Study)**	**2**		**100**	**100**
		22EXAT2	**Extension(Community Service)* : National Social Service**					
		22EXAT3	**Extension(Community Awareness)* : Indian Heritage and Culture**					
		22 EXAT4	**Extension(Community Awareness)* : Public Health and Personal Hygiene**					
TOTAL				**30**	**22**			**700**
CUM-TOTAL					**66**			**2000**
			SEMESTER – IV					
1	I	22FTL04	Foundation Tamil-IV	5	3	25	75	100
2	II	22FEL04	Foundation English – II:	5	3	25	75	100
3	III	22UST04	Core Course IV : Sampling Techniques	5	5	25	75	100
4	III	22ASTS2	Allied – II-Course-II: Decision Theory and its Applications	5	4	25	75	100
5	IV	22USTS2	Skill Enhancement Course II: Computational Statistics - I	2	2	25	75	100
6	IV	22USTN2	Non-Major Elective Course - II : Statistics for Business Analysis - II	2	2	25	75	100
7	III	22USTP2	Core Practical –II: Distribution Theory and Sampling Techniques (Extended from Semester III)	3	4	40	60	100
8	III	22ASTSP	Allied – II – Practical: Operations Research (Extended from Semester III)	3	3	40	60	100
9	IV	**22AEEC1**	**Ability Enhancement Elective Course I : Gandhian Thoughts**	**(Self Study)**	**2**		**100**	**100**
		22AEEC2	**Ability Enhancement Elective Course II : Human Rights**					
		22AEEC3	**Ability Enhancement Elective Course III : Business Startup Fundamentals**					
		22AEEC4	**Ability Enhancement Elective Course IV : Professional Ethics & Cyber Netiquette**					
TOTAL				**30**	**28**			**900**
CUM-TOTAL					**94**			**2900**

SEMESTER – V

1	III	22UST05	Core Course V : Theory of Estimation	5	5	25	75	100
2	III	22UST06	Core Course VI : Demography	5	5	25	75	100
3	III	22UST07	Core Course VII : Statistical Quality Control	4	5	25	75	100
4	III	22USTM1	Major Based Elective I : Stochastic Process	4	4	25	75	100
		22USTM2	Major Based Elective II : Official Statistics					
5	III	22USTM3	Major Based Elective III : Econometrics	4	4	25	75	100
		22USTM4	Major Based Elective IV : Actuarial Statistics					
6	IV	22USTS3	Skill Enhancement Course III : Regression Analysis	2	2	25	75	100
7	III	22USTP3	Core Practical – III :Applied Statistics (Extended to Semester VI)	3	--	--	--	-
8	III	22USTP4	Core Practical – IV : Inference and Design of Experiments(Extended to Semester VI)	3	--	--	--	-
TOTAL				**30**	**25**			**600**
CUM-TOTAL					**119**			**3500**

SEMESTER – VI

1	III	22UST08	Core Course VIII : Testing of Hypothesis	5	5	25	75	100
2	III	22UST09	Core Course IX : Design of Experiments	5	5	25	75	100
3	III	22UST10	Core Course X: Applied Statistics	4	5	25	75	100
4	III	22USTM5	Major Based Elective V : MS - Excel	4	4	25	75	100
		22USTM6	Major Based Elective VI : Numerical Analysis and C - Programming					
5	III	22USTM7	Major Based Elective VII: Psychological Statistics	4	4	25	75	100
		22USTPR	Project Work					
6	IV	22USTS4	Skill Enhancement Course IV : Computational Statistics -II	2	2	25	75	100
7	III	22USTP3	Core Practical – III : Applied Statistics (Extended from Semester V)	3	4	40	60	100
8	III	22USTP4	Core Practical – IV: Inference and Design of Experiments (Extended from Semester V)	3	4	40	60	100
TOTAL				**30**	**33**			**800**
CUM-TOTAL					**152**			**4300**

For B.Sc., Statistics Course

S. No	Course Code	Title of the Course	Hours to be handled	Credits	Marks		
					I.A.	S.E.	Max
SEMESTER - III							
1	22ASTS1	Allied – II – Course –I: Linear Programming and its Applications	5	4	25	75	100
SEMESTER - IV							
2	22ASTS2	Allied – II – Course –II: Decision Theory and its Applications	5	4	25	75	100
3	22ASTSP	Allied – II – Practical: Operations Research (Extended from Semester III)	3	3	40	60	100

For Common to B.Sc. Mathematics, Computer Science and B.C.A.

S. No	Course Code	Title of the Course	Hours to be handled	Credits	Marks		
					I.A.	S.E.	Max
SEMESTER - III							
1	22ASTM1	Allied - II - Course –I: Mathematical Statistics – I	5	4	25	75	100
SEMESTER - IV							
2	22ASTM2	Allied – II - Course –II: Mathematical Statistics – II	5	4	25	75	100
3	22ASTMP	Allied – II - Practical : Mathematical Statistics (Extended from Semester III)	3	3	40	60	100

For B.Sc., Geography

S. No	Course Code	Title of the Course	Hours to be handled	Credits	Marks		
					I.A.	S.E.	Max
SEMESTER - I							
1	22ASTG 1	Allied – I - Course –I: Applied Statistics – I	5	4	25	75	100
SEMESTER - II							
2	22ASTG 2	Allied - I - Course –II: Applied Statistics – II	5	4	25	75	100
3	22ASTG P	Allied – I - Practical : Applied Statistics (Extended from Semester I)	3	3	40	60	100

For Common to B.Com. / B.Com. Co.operation / B.Com. C.A., / B.B.A.

S. No	Course Code	Title of the Course	Hours to be handled	Credits	Marks		
					I.A.	S.E.	Max
SEMESTER - III							
1	22ASTC1	Allied – II - Course – I: Business Statistics – I	5	4	25	75	100
SEMESTER - IV							
2	22ASTC2	Allied – II - Course – II: Business Statistics – II	5	4	25	75	100

SEMESTER - I

22UST01	Core Course - I : Descriptive Statistics

OBJECTIVE

1. Understand the origin, significance and scope of Statistics.

2. Know the significance of presenting data in the form of tables and diagrams.

3. Learn computational aspects of basic statistical measures.

SYLLABUS

UNIT I

Introduction: **Statistics:-** Definition, Scope , limitations. Data Collection and Presentation :collection of data-Sample surveys-Types of data- Nominal, Ordinal, Ratio and Interval scales — Classification and Tabulation – Diagrammatic and Graphical representation of data.

UNIT II

Measures of central tendency and Dispersion : Mean, Median, Mode, Geometric Mean, Harmonic Mean. Quantiles . Deciles and Percentiles . Range, Mean Deviation ,Quartile deviation , Standard Deviation ,Coefficient of Variation. Properties of Good Average.

UNIT III

Moments , Skewness and kurtosis: Raw and central moments - Measures of Skewness , Measures of kurtosis and their applications.

UNIT IV

Linear Correlation and Regression : Types of correlation – Scatter diagram – Pearson's Co-efficient of correlation, correlation in a bivariate table . Rank correlation - Regression equations - Properties of regression coefficients - Concepts of partial and multiple correlations and co-efficient.

UNIT V

Curve fitting: Least squares principle and curve fitting method - Fitting linear, quadratic and non-linear equations reducible to linear equations.

TEXT BOOKS

1. Gupta, S.C., and Kappor, V. K. (2020). Fundamentals of Mathematical Statistics, 12th Edition, Sultan Chand & Sons (Publisher), New Delhi, India .

2. Goon, A.M., Gupta, M. K., Dasgupta, B. (2016): Fundamentals of Statistics, Vol.I, World Press, Kolkata, India

3 . Agarwal, B. L. (2006). Basic Statistics, New Age International Private Limited,

New Delhi, India.

REFERENCE BOOKS

1. Goon, A.M., Gupta ,M.K., and B. Dasgupta (1977), An outline of Statistical Theory, The World Press Private Ltd, Calcutta.

2 . Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

3. Holcomb, Z. C. (2017).Fundamentals of Descriptive Statistics, Routledge, New York, US.

WEB RESOURCES

1. https://nptel.ac.in/courses/111/104/111104120/
2. https://www.iiserpune.ac.in/~bhasbapat/phy222_files/curvefitting.pdf
3. www.wikipedia.org / Correlation and regression.html

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Understand the scope and necessity of Statistics.	Remember, Understand
CO2	Tabulate and represent the data in diagrams and graphs.	Understand , Apply
CO3	Apply the formula and calculate descriptive measures of statistics.	Understand , Apply, Analyze
CO4	Analyze the nature of data and interpret the measures	Understand , Apply, Analyze
CO5	Analyze the data and predict the future values using curve fitting.	Analyze , Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	S	M	M
CO2	S	S	M	S	S	M	M	S	M	M
CO3	S	S	M	M	S	S	S	M	M	M
CO4	S	S	S	M	S	M	M	S	M	M
CO5	S	S	S	M	M	S	M	M	S	S

*S- Strong; M-Medium; L-Low

SEMESTER - I

Allied –I - Course – I: Mathematics – I   Course Code: 22AMT01

A. Objective:

The course is a pre-requisite for the students to learn further topics of Mathematics in their higher semesters. At the end of the course the students would develop an understanding of the appropriate role of the Mathematical concept.

B. Learning Outcomes:

After the completion of the chapters the students are expected to

- Be capable of identifying algebraic Eigen value problem and the Eigen value solutions in certain cases.

- Have knowledge about the formation of equations, solution of equations and handling roots.

- Have learnt the method of finding the solution of the radius of curvature in Cartesian coordinates and polar coordinates.

- Have an understanding about the definite integral and their properties, integration by parts and reduction formula.

- Have learnt finite differences, construction of difference table and interpolation

C. Syllabus

UNIT 1: Matrices

Definition of characteristic equation of a matrix - Characteristic roots of a matrix - Eigen values and the corresponding eigen vectors of matrix – Cayley- Hamilton theorem (Statement only) - Verifications of Cayley-Hamilton Theorem - Problems only.

Chapter: 5

UNIT II: Theory of Equations

Imaginary & Irrational roots - Transformation of equations – Multiplication of roots by m - Diminishing the roots of an equation-Removal of a term- Descarte's rule of sign – Problems only.

Chapter: 6

UNIT III: Radius of Curvature

Radius of curvature in Cartesian coordinates- Parametric coordinates and polar coordinates (no proof for formulae) - Problems only.

Chapter: 11

UNIT IV: Integral Calculus

Integral Calculus – Integration by parts – Definite integrals and its properties – Reduction formula for $\int cos^n x\, dx$, $\int sin^n x\, dx$, $\int_0^{\frac{\pi}{2}} cos^n x\, dx$, $\int_0^{\frac{\pi}{2}} sin^n x\, dx$, $\int x^n e^{ax}\, dx$, $\int_0^{\infty} e^{-x} x^n dx$ - Problems.

Chapters: 15 & 16

UNIT V: Finite Differences

Finite difference –Construction of difference table – Interpolation – Newton's forward and backward formula (without proof)-Lagrange's formula (without proof) – Problems only.

Chapter: 7

Text Book:

1. Dr.P.R .Vittal , Allied Mathematics, Margham publication, Chennai-17, Reprint 2012.

Reference Books:

1.S.G.Venkatachalapathi, Allied Mathematics, Margham publication, Chennai-17, Reprint 2011.

2.T.K.Manickavasagam pillai and S.Narayanan, Algebra Volume 1,Vijay Nicole Imprints Pvt Ltd, Chennai – 29,2004

D. Additional web resources:

1.en.wikipedia.org/wiki/

2.mathworld.wolfram.com

3.wiki.answers.com

E.Assignments:

Problems can be given in the following topics:

Matrices.

Theory of Equations.

Integration.

Interpolation

A. Group Tasks

Collect the applications of Matrices in physical sciences with examples.

What is the role of radius of curvature in civil engineering?

Semester- I

Course Code : 22AECC1

Ability Enhancement Compulsory Course - I : Value Based Education

Course Objectives:

1. 1.To make the learner enjoy the fruits of learning all through their life.
2. 2.To enable students comprehend the purpose and philosophy of life.
3. To help them to be prudent, humanistic and purposeful.
4. To develop their personality so as to be successful and peaceful.

Learning Outcomes:

1. Students will be clear about the safety measures to be adopted, ethics to be
2. cultivated and the attainment of wisdom.
3. Students can certainly achieve control over their thought, desire, anger and

   worries.

4. Students realize the value of true friendship and humanism.
5. Students also understand the essentiality of living in harmony with nature.

Syllabus:

Unit -I

Personality Development – Sublimation (Pages : 77 – 86)

Purpose and Philosophy of Life - Safety Measures - Ethics - Three Stages of Wisdom

Unit -II

Introspection (Pages : 87 – 101)

Nature of Thought - Analysis of Thought- Six Roots of Thought - Introspection for - Analysis

of Thoughts - Moralisation of Desire – Analyse Your Desires

Unit -III

Neutralization of Anger & Human Resource Development (Pages : 102 - 122)

Anger - Misconceptions about Anger - Will Power - Method of Neutralization of Anger

Eradication of Worries - Practical Exercise to Eradicate Worries

Unit- IV

Benefits of Blessings (Pages : 122 - 139)

Effect of Good Vibrations - Greatness of Friendship – Maharishi's Guidance for Good

Friendship - Individual Peace - Good – Cultured Behavioral Patterns – Is war necessary?

Unit -V

Law of Nature (Pages : 141 – 168)

Unified Force - Purity of Thought and Deed, and Genetic Centre - Love and Compassion

Cultural Education

Text Books:

1. Value Education compiled by VISION for Wisdom, Vethathiri Maharishi Institute for

   Spiritual and Institutional Education.

Assignments:

1. What are the pros and cons of achieving desire, for yourself and others?
2. Discuss the training method of neutralization of anger.
3. Explain friendship in detail.
4. Explain Cultural Values.

SEMESTER - II

22UST02	Core Course - II: Probability Theory

OBJECTIVE

The main objectives of this course are to

1. To know principle of probability, random variables and their distributions.
2. To understand the methods of deriving the statistical constants.
3. To understand the methods of analyzing a bivariate distributions.
4. To apply Chebychev's inequality to real life problems.

SYLLABUS

UNIT – I

Experiment: Random experiment – Sample space, events and its classification. Definition of probability – Classical, statistical and axiomatic approach – Conditional probability – Independence of events - pairwise and mutual independence – Addition and Multiplication theorems - Boole's inequality - Bayes theorem

UNIT – II

Random variables: Discrete and continuous – Probability mass function (p.m.f.) and Probability density function (p.d.f.), Distribution function and its properties

UNIT – III

Bivariate distribution: Distribution function of bivariate random variable and its properties – marginal probability mass, density functions and conditional distribution functions - Independence of random variables.

UNIT – IV

Mathematical expectation – Addition and multiplication theorem on mathematical expectations-Properties of mathematical expectation.-_Conditional expectation and variance. Moment generating function, Characteristic function, Probability generating function and their properties. Chebychev's inequality and its application (simple problems).

UNIT – V

Limit Theorems: Convergence in probability, Weak Law of Large Numbers -Bernoulli's theorem, Khintchine's theorem(Statements only)-Central limit theorem for i.i.d random variables-simple applications.

TEXT BOOKS

1. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Kapur, J.N. and H.C. Saxena (1999), Mathematical Statistics, S. Chand and Company Ltd., New Delhi.

3. Goon, A.M.Gupta, M.K. and Das Gupta, B.(1993),Fundamentals of Statistics, Vol.1, World press, Kolkatta

REFERENCE BOOKS

1. Hogg, R.V. and Allen T. Craig (1978), Introduction to Mathematical Statistics,

   Fourth edition. Macmillan Publishing Company, New York and Collier,

   Macmillan Publishers, London.

2. Mood, A.M, Franklin A. Graybill and Duane C. Boes (2005), Introduction to the

   Theory of Statistics, Third Reprint, Tata McGraw-Hill Publishing Company Ltd,

   New Delhi.

3. Bhat B.R, (2014), Modern Probability Theory (Fourth Edition), New Age International, New Delhi.

WEB RESOURCES

1. https://youtu.be/pCbFNf0NNhQ
2. https://youtu.be/82Ad1orN-NA
3. https://youtu.be/7MJ3b-J-ZCE
4. www.wikipedia.org / probability.html
5. www.wikipedia.org/ Random variables.html
6. www.wikipedia.org / Mathematical expectation.html

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Compute probabilities using classical, statistical and axiomatic approach.	Understand, Apply
CO2	Gain knowledge about conditional probability and applications of Baye's theorem	Apply to Evaluate
CO3	Understand the concept of random variables and solve the problems in mathematical expectations	Analyze, Evaluate
CO4	Apply the concept of Chebychev's inequality and solve the problems	Understand to Evaluate
CO5	Analyze the properties and applications of various probability functions and Weak law of Large Numbers	Remember to apply

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	S	S	M	S
CO2	S	S	L	S	S	S	S	S	M	S
CO3	S	S	L	S	S	S	S	S	M	S
CO4	S	S	M	S	S	S	S	S	M	S
CO5	S	S	M	S	S	S	S	S	M	S

*S- Strong; M- Medium; L- Low

Semester - II

Allied - I - Course – II: Mathematics – II   **Course Code: 22AMT02**

A.   Objective:

Many of the general laws of nature in Physics, Chemistry, Biology and Astronomy can be expressed in the language of differential equations and hence the theory of differential equations is the most important part of Mathematics for understanding Physical Sciences. Hence on completion of the course the students are expected to have learnt the method of solving systems of differential equations of certain types that they might encounter to their higher studies. The Laplace Transform is widely used in the theory of communication engineering, wave propagation and other branches of applied Mathematics.

B.   Learning Outcomes:

After the completion of the chapters the students are expected to

1. Have learnt the methods to solve second order differential equations with constant coefficients, complementary function and particular Integral.
2. Have learnt the method of formation of partial differential equations by eliminating the arbitrary constant and arbitrary functions.
3. Have learnt the methods to solve partial differential equations.
4. Have a sound knowledge of Laplace Transform and its properties.

C.   Syllabus

UNIT I: Second Order Differential Equations

Second order differential Equations with constant coefficients - Complementary function –Particular integral and solution of the type e^{ax}, sinax or cosax , x^n,$e^{ax}V$ where V is any of the function of cosax or sinax or x or x^2

Chapter:23

UNIT II: Partial Differential Equations

Formation of partial differential equations by eliminating the arbitrary constant and arbitrary functions – Problems – Definitions – Complete, particular, singular and general integrals

Chapter: 26

UNIT III: Partial Differential Equations (Continuation)

Solution of standard types of partial differential equations – Clauriat's form - Lagrange's Linear partial differential equations - Problems only.

Chapter: 26

UNIT IV: Laplace Transforms:

Laplace Transforms - Definitions -Standard formula – Elementary theorems - Problems.

Chapter: 27

UNIT V: Inverse Laplace Transforms

Inverse Laplace Transforms - standard formula - elementary theorems (without proof) - problems.

Chapter: 27

Text Book :

1. Dr. P.R .Vittal , Allied Mathematics, Margham publication, Chennai-17, Reprint 2012.

Reference Book:

1. S.G.Venkatachalapathi, Allied Mathematics, Margham publication, Chennai-17.

D. Additional web resources:

    1.en.wikipedia.org/wiki/   2.mathworld.wolfram.com   3.wiki.answers.com

E. Assignments:

    Problems can be given in the following topics:

1. Laplace and inverse Laplace Transforms.

2. Second order differential equations.

3. Partial differential equations.

F. Group Tasks

1. In control engineering and control theory the transfer function is derived using the Laplace transform. Get an example from control theory and make a presentation.

2. Describe the applications of ordinary differential equations.

SEMESTER – I & II

22USTP1	Core Practical - I: Descriptive Statistics and Probability Theory

OBJECTIVE

1. To understand the concepts of matrices and it's operations.
2. To recognize the methods of analyzing univariate and bivariate data.
3. To know the methods of quantifying the intensity of interrelationship between two variables.
4. To fit the straight line, Second degree parabola.
5. To know behind the reasons for curve fitting.

SYLLABUS

UNIT – I

Operations on matrix, inverse of the matrix, Rank of a matrix, Solution of simultaneous equations using Cramer's rule and matrix inverse method, characteristicroots and vectors of a matrix (order n, $n \leq 3$).

UNIT – II

Frequency distribution - Calculation of measures of central tendency, dispersion, skewness and kurtosis.

UNIT – III

Correlation: Karl Pearson's coefficient of correlation, rank correlation coefficient and regression of two variables (raw and grouped data).

UNIT – IV

Evaluation of probabilities - mathematical expectations and computing Measures of central tendency, dispersion, skewness and kurtosis.

Bivariate distribution - Marginal and Conditional distributions – conditional expectation, correlation and regression.

UNIT – V

Curve fitting: Fitting of straight line, second degree equation, power curve, exponential curves and logistic curve.

TEXT BOOKS

1. Hogg, R.V. and Allen T. Craig (1978), Introduction to Mathematical Statistics, Fourth edition. Macmillan Publishing Company, New York and Collier, Macmillan Publishers, London.

2. Kapur, J.N. and H.C. Saxena (1999), Mathematical Statistics, S. Chand and Company Ltd., New Delhi.

3. Mood, A.M, Franklin A. Graybill and Duane C. Boes (2005), Introduction to the Theory of Statistics, Third Reprint, Tata McGraw-Hill Publishing Company Ltd, New Delhi.

REFERENCE BOOKS

1. Croxton, F.E, Dudley J.Cowden and Sidneyklein (1979), Applied General Statistics, Prentice Hall of India Private Ltd, New Delhi.

2. Goon, A.M, M.K. Gupta and B. Dasgupta (1977), An outline of Statistical Theory, The World Press Private Ltd, Calcutta.

3. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

4. Gupta, S.P. (2004), Statistical Methods, Sultan Chand & Sons, New Delhi.

5. Murray R. Spiegel (1972), Schaum's outline series theory and problems, McGraw-Hill Book Company, New York

WEB RESOURCES

1. www.wikipedia.org / measures of central tendency.html

2. www.wikipedia.org / Correlation and regression.html

3. www.wikipedia.org / Curve fitting

4. www.wikipedia.org / probability.html

5. www.wikipedia.org/ Random variables.html

6. www.wikipedia.org / Mathematical expectation.html

COURSE OUTCOMES

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

S.No	Course Outcome	Blooms Verb
CO1	Frame the questionnaire and collect primary data and select a proper source of secondary data.	Understand, Remember & Apply
CO2	Interpret the problems based on measures of central tendency and measures of dispersion.	Analyze & Evaluate
CO3	Estimate the value of a dependent variable using regression analysis.	Analyze & Evaluate
CO4	Fit linear and non-linear curves using method of least squares.	Understand, Analyze & Evaluate
CO5	Derive regression lines using bivariate probability distribution.	Create & Analyze

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	M	M	S	M	M	S	S
CO2	M	S	M	L	M	M	S	S	S	S
CO3	M	L	S	M	M	L	L	L	S	L
CO4	S	S	S	S	S	L	S	M	L	S
CO5	L	M	M	M	M	S	M	L	L	S

*S-Strong; M-Medium; L-Low

Semester - II

Allied – I - Practical : Mathematics - I   **Course Code: 22AMTP1**

A. Objective:

Many of the general laws of nature in Physics, Chemistry, Biology and Astronomy can be expressed in the language of differential Equations which involve derivatives and hence the theory of derivatives is the most important part of Mathematics for understanding Physical Sciences. Hence on completion of the course the students are expected to have knowledge about ordinary and partial derivatives and vector differentiation, vector integration and its applications.

B. Learning Outcomes:

After the completion of the chapters the students are expected to

a. Have studied how to do successive differentiation by applying Leibnitz formula.

b. Have learnt about homogeneous function in partial differentiation and the Euler's theorem.

c. Have studied the basics of vector calculus comprising of gradient, divergence and curl which is mostly used in the study of Solenoidal and Irrotational fields in physics.

d. Have learnt the application of line integrals which represent the work done in mechanics. Also surface and volume integrals and the classical theorems involving line, surface and volume integrals which would be encountered by them in higher semesters.

e. Have sufficient exposure to get the solution of certain linear differential equation using Laplace Transform and inverse Laplace Transform.

C. Syllabus

UNIT-I

Successive differentiation – Standard nth derivatives – Leibnitz formula (without proof) for nth derivative – Problems.

Chapter: 8

UNIT-II

Partial derivatives – Euler's theorem on homogeneous function (without proof) – Problems to verify Euler's theorem – Problems.

Chapter: 9

UNIT-III

Scalar point functions – Gradient of scalar point functions – Vector point functions –Divergence of vector point functions – Curl of vector point functions – Solenoidal of vector – Irrotational of vector – Problems only.

Chapter: 28

UNIT-IV

Line integrals – Surface integrals & volume integrals- Gauss Divergence Theorem – Stoke's theorem- Green's theorem (Statements only) – Problems.

Chapter: 29

UNIT-V

  Applications of Laplace transforms -Solution to second order differential equations with constant co-efficient.

Chapter: 27

Text Book:

   1.P.R. Vittal, Allied Mathematics, Margham publications Chennai(2002).

Reference Books:

   1. T.K.Manickavasagampillai, Allied Mathematics, S.Viswanathan and Co.,Chennai(1992).
   2. A.Singaravelu- Allied Mathematics , Meenakshi Traders, Chennai(2002)

   3. P.Duraipandian - Udayabaskaran, Allied Mathematics volume I and II, Muhil Publishers, Chennai- 28, Year of Publications1997.

D.   Additional web resources:

   1.en.wikipedia.org/wiki/   2.mathworld.wolfram.com   3.wiki.answers.com

E. Assignments:

   Problems can be given in the following topics:

      1. Finding successive differentiation using Leibnitz formula.
      2. Vector differentiation.
      3. Vector Integration.

F. Group Tasks:

   1. Try to use a software package to successive derivatives for standard functions and give a presentation.

   2. What is the role of vector differentiation in Physics?

Semester - II
Course Code : 22AECC2
Ability Enhancement Compulsory Course –II: Environmental Studies

Course Objectives:

1. To understand the structure of the Ecosystem.
2. To teach various kinds of natural resources.
3. To create awareness on pollution and control measures.

Learning Outcomes:

1. Realize the importance of conservation of natural resources.
2. Develop interest in safe guarding the environment.
3. Become aware of environmental issues and identify appropriate ways of addressing them.

Unit – I :
Natural resources - Definition, scope, importance and public awareness on environment. Forest resources - Deforestation, mining, dams and their effects on forest. Water resources - Utilization of surface and ground water, floods, benefit and problems. Mineral resources - Environmental effects of extracting and using mineral resources.

Unit – II :
Ecosystems - Concept, structure and functions of ecosystem. Components of ecosystem - Producers, Consumers and Decomposers. Energy flow in ecosystem. Ecological succession, Food chain, Food webs and Ecological pyramids. Ecosystems – Grassland ecosystem and Pond ecosystem.

Unit – III :
Biodiversity and Pollution - Threats to biodiversity - Habitat loss, Poaching of wildlife, Man-Wild life conflicts. Endangered and endemic species of India. Environmental pollution - Causes, effects and control measures. Role of an individual in the prevention of pollution - Air, Water and Soil. Solid waste management - Causes, effects and control measures of urban and industrial wastes. Disaster management - Floods, earthquake, cyclone and landslides.

Unit – IV :
Social issues and Legislation - An outline of Environmental Pollution Act.
Environmental Ethics - Issues and problem – solutions. Climate change, Global warming, Acid rain and Ozone layer depletion.

Unit – V :
Population Explosion and Environment - Population explosion and problems - HIV/AIDS , Women and Children welfare, Role of Information and Technology in Environmental protection and Human welfare.

Text Books:
1. Editorial Board, Periyar EVR college professors, Environmental studies, Trichy – 23. (Both in English and Tamil).

Reference Books:

1. Miller T.G., Jr. Environmental Science, Wadsworth Publishing Co, (TB).
2. Arul,P., A Text book of Environmental studies - Environmental Agency Chennai - 42
3. Sharma,P.D., Environmental Science
4. Arunachalam, N. *et al* (2000). Environmental Science and Engineering, Charulatha Publications, Chennai
5. Kumaraswamy, K. *et al* (2000). Environmental studies, Bharathidasan University, Trichy – 24.

SEMESTER - III

22UST03	Core Course - III: Distribution Theory

OBJECTIVE

The main objectives of this course are:

1. To understand the standard Univariate theoretical distributions.
2. To understand the sampling distribution.
3. To apply the concept of sampling distributions to real time problems.
4. To understand the concept of order statistics.
5. To understand the concept of truncated distributions.

SYLLABUS

UNIT – I

Univariate discrete distributions and their properties: Bernoulli, Binomial, Poisson and Geometric Distributions – Hyper Geometric and Negative binomial distributions, Poisson distribution as an approximation of Binomial distribution.

UNIT – II

Continuous Univariate distributions: Uniform, Normal, Exponential, Cauchy, Gamma and Beta distributions.

UNIT – III

Sampling distributions - Standard Error – Student's t, Chi-square and F distributions - properties and uses, Relationship between t, F and chi-square distributions.

UNIT – IV

Order Statistics: Distribution function of maximum and minimum order statistics - Distribution function of the rth order statistics and sample median - joint distribution of $(r, s)^{th}$ order statistics, uses of order statistics.

UNIT – V

Random variable - Truncated Random variables - Truncated distributions: Truncated Binomial and Poisson distributions.

TEXT BOOKS

1. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Rohatgi, V.K. (1988), An introduction to Probability theory and Mathematical Statistics, Wiley Eastern limited, Chennai.

REFERENCE BOOKS

1. Goon, A.M, M.K. Gupta and B. Dasgupta (1986), Fundamental of Statistics, Vol II World Press, Calcutta.
2. Hogg, R.V. and A.T. Craig (1972), An introduction to Mathematical Statistics, Third Edition, Amerind, New York, London.

WEB RESOURCES

1. https://www.youtube.com/watch?v=M-Y_PAcJH5k
2. https://www.youtube.com/watch?v=BFRwDG67UoA
3. https://www.youtube.com/watch?v=VKTMn5P7-7Q
4. https://www.youtube.com/watch?v=wO9n24mExjQ&list=PL9aVpS8B8Cg6Ui2dDQGhoWDtKFPxp-nI4
5. https://www.youtube.com/watch?v=HOebvVLpPlM&list=PL9aVpS8B8Cg5ZWTiWMWnpohJXbaEH0eq2

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Derive the characteristics of discrete Univariate distributions.	Remember and Understand
CO2	Derive the characteristics of continuous Univariate distributions.	Remember and Understand
CO3	Derive Sampling distributions	Apply
CO4	Know how to apply the concept of order statistics	Analyze
CO5	Understand the need for truncated distributions.	Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	L	L	L	L	L	S	S
CO2	S	S	M	L	L	L	L	L	S	S
CO3	S	S	S	L	L	L	M	L	S	S
CO4	S	S	S	L	M	L	L	L	S	S
CO5	S	S	M	L	L	L	L	L	S	S

*S- Strong; M-Medium; L-Low

SEMESTER –III

22ASTS1	Allied – II- Course I: Linear Programming and its Applications

OBJECTIVE

The main objectives of this course are to:

1. Know the methods of solution of linear programming

2. Understand the concept and solution of Transportation problems

3. Know the problem of Game and network analysis.

SYLLABUS

UNIT – I

Introduction – Origin – Nature of Operations Research (O.R.) – Scope and Characteristics of O.R. – O.R. in Decision making – Models in O.R. – Phases of O.R. – Uses and Limitations of O.R. – Linear Programming Problem (LPP)– Mathematical formulation of LPP – Graphical method.

UNIT - II

LPP: Standard and canonical form of LPP – Maximization – Minimization – Simplex method –Artificial variable technique. Big - M Method – Two-phase method. Duality in LPP – Formulation of Dual LPP – Primal – Dual relationship – Solving LPP using dual concepts.

UNIT - III

Transportation Problem (T.P.): Balanced, unbalanced T.P. – Initial Basic feasible solution – North-West Corner Rule (NWCR) – Least Cost Method (LCM) – Vogel's Approximation Method (VAM) – Optimum solution: MODI method(Without Looping).
Assignment Problem (A.P.): Introduction – Balanced – Unbalanced – Maximization –Minimization – Hungarian method.

UNIT - IV

Game theory : Introduction – Two person zero sum game – Solution of a Game - Maximin –Minimax principle – Games with saddle points – Games without saddle points – Dominance property – Graphical solution of 2xn and mx2 games.
UNIT - V

Network analysis: Introduction - Basic concepts - construction of network - Critical Path Method (CPM). Float of an activity - Program Evaluation Review Technique (PERT).

TEXT BOOKS:

1. KantiSwarup, P.K. Gupta. and Manmohan (1980), Operations Research, Sultan Chand & Sons, NewDelhi.

BOOKS FOR REFERENCE:

1. Goel, B.S. and S.K. Mittal, Operations Research – Pragathi Prakasam Publishers, NewDelhi.

2. Sharma, J.K. (1997), Operations Research and Application, Mc.Millan and company, NewDelhi.

ADDITIONAL WEB RESOURCES:

1. www.wikipedia.org/operations research.html
2.
3. https://www.geeksforgeeks.org/transportation-problem-set-1-introduction
4.
5. https://en.wikipedia.org/wiki/Network_analysis_%28electrical_circuits%29

COURSE OUTCOMES:

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

S.No.	Course Outcome	Blooms Verb
CO1	Understand methods of solving linear programming problem	Remember, Understand
CO2	Know the concept and solution of Transportation problems	Understand, Apply, Evaluate
CO3	Understand the concept and solving assignment	Understand, Apply, Evaluate
CO4	Understand the concept and solving the problem of game theory	Understand, Apply, Evaluate
CO5	Understand the network analysis	Understand, Apply, Evaluate

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	M	S	S
CO2	S	S	M	S	S	M	M	M	S	S
CO3	S	S	M	M	S	M	S	M	S	S
CO4	S	S	S	M	S	M	M	M	S	S
CO5	S	S	S	M	M	S	M	S	M	M

* S-Strong;   M-Medium;   L-Low

SEMESTER – III

22USTS1	Skill Enhancement Course – I : Basics for Statistics

OBJECTIVE

1. To apply the concepts of permutation and combination in real life situations.
2. To understand the concept of set theory, sequences and limits.
3. To execute the real life data with Arithmetic and Geometric Progression.
4. To realize the limits and continuity.
5. To understand the concept of differentiability.

SYLLABUS

UNIT-I

Concept of Factorial, Permutation, Combinations – Standard results and problems.

UNIT-II

Set theory, Relations, Functions, Domain and Range of a function, various types of functions.

UNIT-III

Sequences and Subsequences (Concept only). Series: Definition, Arithmetic Progression, Geometric Progression – Standard results and problems.

UNIT-IV

Concept of Limits – Standard results and problems. Continuity – Definition and problems. Kinds of discontinuities.

UNIT-V

Differentiability of a function in [a, b], Rolle's Theorem, Lagrange's Mean Value theorem.

TEXT BOOKS

1. Pa. Navnitham (2008), Business Mathematics and Statistics, Jai Publishers, Trichy.
2. Sharma and Vasishtha (2003), Real analysis, Krishna Prakashan Media (P) Ltd, Meerut (U.P).

REFERENCE BOOKS

1. Gupta, S.P, P.K. Gupta and Manmohan (1980), Business Statistics and Operations Research, Sultan Chand & Sons, New Delhi.
2. Robert G Bartle, Donald R. Sherbert (2005), Introduction to Real analysis, 3rd Edition, John Wiley's sons.

WEB RESOURCES

1. http://www.mathbasics
2. https://plato.stanford.edu
3. https://origin.geeksforgeeks.org

COURSE OUTCOMES

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

S.No	Course Outcome	Blooms Verb
CO1	Solve the problems using permutation and combination	Evaluate
CO2	Find the domain and range of a function	Apply & Understand
CO3	Solve the problems based on arithmetic and geometric progression	Remember & Evaluate
CO4	Identify the convergent and divergent sequences	Remember & Analyze
CO5	Execute whether a function is differentiable in an interval	Create, Apply & Evaluate

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	S	L	S	M	M	M	M
CO2	M	M	S	L	M	S	L	S	M	S
CO3	S	S	L	M	S	S	M	M	M	S
CO4	M	S	S	L	L	M	M	S	S	M
CO5	S	L	L	M	S	L	S	S	S	S

*S-Strong; M-Medium; L-Low

SEMESTER – III

22USTN1	Non-Major Elective Course - I – Statistics for Business Analysis - I

OBJECTIVE

1. To understand the method of planning a survey.

2. To recognize the methods of analyzing univariate and bivariate data.

3. To organize the data in diagrams and graphs.

4. To know the methods of quantifying the intensity of interrelationship between two variables.

5. To compute the measures of central tendency and dispersion.

SYLLABUS

UNIT-I

Definition of statistics, functions of statistics, scope of statistics and limitations of statistics.

UNIT-II

Statistical survey, planning the survey, executing the survey. Collection of data: Primary data – collections, methods. Sources of secondary data.

UNIT-III

Classification: Definition, objects, types. Formation of frequency distribution. Tabulation: Definition, parts of a table and rules of tabulation. Types of tables – Problems.

UNIT-IV

Significance of diagrams and graphs. One dimensional diagrams, two dimensional diagrams. Graphs: Histograms, frequency polygon, frequency curve and Ogive curves. Graphical location of median, quartiles and mode.

UNIT-V

Measures of central tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean, properties of an ideal average. Measure of dispersion: Absolute and relative measures, Range, Quartile Deviation, Mean Deviation and Standard Deviation.

TEXT BOOKS

1. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.

2. Gupta, S.P. (2004), Statistical Methods, Sultan Chand and Sons, New Delhi.

3. Pillai, R.S.N. and V. Bagavathi (2001), Statistics, Sultan Chand and Sons, New Delhi.

4. Navnitham, PA. (2004), Business Mathematics and Statistics, Jai publishers, Trichy-22.

5. Kapur, J.N. and H.C. Saxena (1999), Mathematical Statistics, S. Chand and Company Ltd., New Delhi.

REFERENCE BOOKS

1. Goon, A.M, M.K. Gupta and B. Dasgupta (1977), An outline of Statistical Theory, The World Press Private Ltd, Calcutta.

2. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

3. Gupta, S.P. (2004), Statistical Methods, Sultan Chand & Sons, New Delhi.

4. Murray R. Spiegel (1972), Schaum's outline series theory and problems, McGraw-Hill Book Company, New York

WEB RESOURCES

1. www.wikipedia.org/data collection.html
2. www.wikipedia.org/measures of central tendency.html
3. www.wikipedia.org/Correlation and regression.html

COURSE OUTCOMES

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

S.No	Course Outcome	Blooms Verb
CO1	Plan and execute a statistical survey	Understand & Remember
CO2	Frame the questionnaire and collect primary data and select a proper source of secondary data.	Understand, Remember & Apply
CO3	Evaluate the statistical constants with diagrams and graphs.	Understand, Analyze & Evaluate
CO4	Identify the appropriate measure of central tendency and dispersion for a particular situation.	Understand, Analyze & Evaluate
CO5	Interpret the problems based on measures of central tendency and measures of dispersion.	Analyze & Evaluate

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	S	S	S	M	L	M	M
CO2	S	S	M	L	S	M	S	L	M	S
CO3	M	S	L	M	L	L	M	M	S	L
CO4	S	S	S	S	S	M	S	M	L	L
CO5	L	M	M	S	M	S	M	L	L	M

*S-Strong; M-Medium; L-Low

SEMESTER - IV

22UST04	Core Course - IV: Sampling Techniques

OBJECTIVE

The main objectives of this course are to

1. To understand the principles and methods of sample survey.

2. To understand the types of sampling and different methods of sampling techniques.

3. To equip students with sampling techniques and enable them to conduct sample survey.

SYLLABUS

UNIT – I

Concept of sampling and population: 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 – Limitations of sampling - NSSO, CSO and its functions.

UNIT – II

Simple random sampling with and without replacement – Unbiased estimate of mean and variance – Finite population correction – Estimation of standard error from a sample – Confidence limits- Determinations of sample size – Simple random sampling for attributes.

UNIT – III

Stratified random sampling: Principles of stratification-Estimation of population mean and variance –Allocation techniques (Equal allocation, Proportional and optimum allocation) - Gain due to Stratification- Relative precision of stratified random sampling with simple random sampling.

UNIT – IV

Systematic sampling: Estimation of the mean and variance of the estimated mean – Comparison of simple random sampling and stratified random sampling with systematic sampling.

UNIT – V

Cluster Sampling with equal sized clusters- Estimation of population mean and variance- Concepts of Convenience, Judgement, Quota and Snowball Sampling-Applications.

TEXT BOOKS

1. Cochran, W.G. (1977), Sampling Techniques, Wiley Eastern Limited, Singapore, Canada.

2. Goon, A.M, M.K. Gupta and B. Dasgupta (1986), Fundamental of Statistics,
   Vol I, II, World Press, Calcutta.

3. Gupta, S.C. and V.K. Kapoor (1978), Fundamentals of Applied Statistics, Sultan Chand &
   Sons, New Delhi.

4. Murthy, M.N. (1977), Sampling Theory and Methods, Statistical Publishing Society,
   Calcutta.

REFERENCE BOOKS

1. Parimal Muthopedhyay (2012), Theory and methods of survey sampling, 4th Edition
   (EEE), PHI Learning Private Ltd, New Delhi.

2. Sampath S(2001), Sampling Theory and Methods, Narosa Publishing House, New Delhi.

3. Rajan K. Son, Practical Sampling Techniques, (Second Edition), CRC Publications,
   New York.

WEB RESOURCES

1. https://youtu.be/vTyrthS7t5g
2. https://youtu.be/9PaR1svnJs
3. https://youtu.be/be9e-Q-jC-0
4. http://www.statpac.com/surveys/sampling.htm
5. www.apparison.com

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Identify the plan and design a sample survey	Remember to Apply
CO2	Construct the principal steps in Sample survey and Preparation of questionnaire and schedule	Remember to Evaluate
CO3	Understand the principles of census and sample surveys and to become competent for conductingsample surveys.	Analyze, Evaluate
CO4	Estimate the population characteristics using the methods of simple random sampling, stratified random sampling and systematic sampling.	Understand to Evaluate
CO5	Analyze various sampling techniques and make interpretations for further studies.	Analyze, Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	S	S	M	S
CO2	S	S	L	S	S	S	S	S	M	S
CO3	S	S	L	S	S	S	S	S	M	S
CO4	S	S	M	S	S	S	S	S	M	S
CO5	S	S	M	S	S	S	S	S	M	S

*S- Strong; M- Medium; L- Low

SEMESTER –IV

22ASTS2	Allied – II- Course II: Decision Theory and its Applications

OBJECTIVES:

The main objectives of this course are to:

1. Understand the decision making environments and methods.

2. Understand the methods of inventory control.

3. Solve the replacement problems, sequencing problems and queueing problems.

SYLLABUS:

UNIT – I
Decision theory : Introduction – Types of decision making – Environment – Decision making under uncertainty – Maximin criterion- Maximax criterion – Minimax criterion – Laplace criterion – Hurwitz criterion – Decision making under risk – Expected Monetary Value – Expected Opportunity Loss – Expected Value of Perfect Information. Decision tree analysis (Concepts only).

UNIT - II
Inventory control - Inventory decisions - costs associated with inventories – factors affecting inventory control – Economic Order Quantity (EOQ) - Fundamental problem of EOQ. Deterministic inventory problem with no shortages - EOQ with uniform demand and with several production runs of unequal length.

UNIT - III
Queuing theory - queuing system - characteristics - classification of queues – Poisson queues (M/M/1) :($\Box$/ FIFO) queuing system - Finite queue length model (M/M/1):(N/FIFO).

UNIT - IV
Replacement problem – Replacement of items that deteriorates gradually - Replacement of items whose maintenance cost increases with time and money value does not change - Replacement of items when the value of money changes with time – selection of best machine amongst two.

UNIT - V
Sequencing problem – Problems with n jobs on two machines – Problems with n jobs on three machines – Problems with n jobs on m machines - Problems with 2 jobs on m machines (graphical method).

TEXT BOOKS:

1. KantiSwarup, P.K. Gupta. and Manmohan (1980), Operations Research, Sultan Chand & Sons, NewDelhi.

BOOKS FOR REFERENCE:

1. Goel, B.S. and S.K. Mittal, Operations Research – Pragathi Prakasam Publishers,NewDelhi.
2. Kapoor,V. K. (1999), Operations Research, Problems and Solutions, Sultan Chand & Sons, New Delhi.
3. Sharma, J.K. (1997), Operations Research, Theory and Application, Mc.Millan India Ltd. New Delhi.

ADDITIONAL WEB RESOURCES:

1. www.wikipedia.org/operations research.html
2. www.bookza.org
3. www.bookfinder.org
4. www.Shodhganga.inflipnet.ac.in

COURSE OUTCOMES:

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

S.No.	Course Outcome	Blooms Verb
CO1	Take appropriate decisions using EMV, EOL and EVPI.	Understand, Apply, Evaluate
CO2	Find EOQ in various situations.	Apply, Evaluate
CO3	Quantify the characteristics of a queueing system.	Understand, Apply, Evaluate
CO4	Find the optimum replacement time of machines and optimum sequence of jobs.	Apply, Evaluate
CO5	Derive the relationship between the finite and infinite queue length models.	Apply, Analyze, Evaluate

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	M	M	S	S
CO2	S	S	M	S	M	M	M	M	S	S
CO3	S	M	M	M	M	M	S	M	S	S
CO4	S	S	S	M	M	M	M	M	S	S
CO5	S	S	S	M	M	M	M	S	M	M

* S-Strong; M-Medium; L-Low

SEMESTER - IV

22USTS2	Skill Enhancement Course - II: Computational Statistics – I

OBJECTIVE

The main objectives of this course are to

1. To know the methods of fitting Binomial, Poisson and Normal distributions.
2. To derive probabilities of a normal distribution.
3. To know the methods of finding the distributions of order statistics.

.

SYLLABUS

UNIT-I

Discrete distribution: Bernoulli – Binomial and Poisson distributions. Fitting of Binomial distribution and Poisson distribution.

UNIT-II

Continuous distribution: Geometric distribution – Hyper geometric distribution, Rectangular (uniform) distribution - Gamma - Beta distributions.

UNIT-III

Exponential distribution - Standard Laplace distribution - Cauchy distributions.

UNIT-IV

Normal distribution: Simple problems based on normal distribution - Fitting of Normal distribution (Area and Ordinate methods), (simple problems).

UNIT-V

Order statistics - Cumulative distribution function of a single order - pdf of single order - Joint pdf of Kthorder - Joint pdf of all nth order statistics based on simple problems.

Note: For Section B and C Numerical Problems Only (Scientific calculator must be permitted).

TEXT BOOK:
1. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

REFERENCE BOOK:
1. Mood, A.M, Franklin A. Graybill and Duane C. Boes (2005), Introduction to the Theory of Statistics, Third Reprint, Tata McGraw-Hill Publishing Company Ltd, New Delhi.

ADDITIONAL WEB RESOURCES:

www.wikipedia.org/operations research.html
www.bookza.org
www.bookfinder.org
www.Shodhganga.inflipnet.ac.in

COURSE OUTCOMES:

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

S.No.	Course Outcome	Blooms Verb
CO1	Bernoulli ,Binomial and Poisson distributions. Fitting of Binomial distribution and Poisson distribution	Understand, Apply, Evaluate
CO2	Geometric distribution – Hyper geometric distribution, Rectangular (uniform) distribution - Gamma - Beta distributions	Apply, Evaluate
CO3	Exponential distribution - Standard Laplace distribution - Cauchy distributions.	Understand, Apply, Evaluate
CO4	Normal distribution, Simple problems based on normal distribution - Fitting of Normal distribution	Apply, Evaluate
CO5	Order statistics - Cumulative distribution function of a single order - pdf of single order - Joint pdf of Kth order - Joint pdf of all nth order statistics based on simple problems.	Apply, Analyze, Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	L	L	L	L	S	S
CO2	S	S	S	S	L	L	L	L	S	S
CO3	S	S	S	S	L	L	L	L	S	S
CO4	S	S	S	S	L	L	L	L	S	S
CO5	S	S	M	L	S	M	S	M	S	S

*S- Strong; M-Medium; L-Low

SEMESTER - IV

22USTN2	Non-Major Elective Course - II : Statistics for Business Analysis - II

OBJECTIVE

1. To construct the index numbers.

2. To analyse the time series.

3. To understand the uses of vital statistics.

SYLLABUS

UNIT-I

Analysis of time series: Definition, components of time series, measurement of trend, measurement of seasonal variations.

UNIT-II

Index numbers: Definition, basic problems in the construction of index numbers, simple aggregate method, weighted aggregate method, average of price relatives.

UNIT-III

Fixed base and chain base index numbers, criteria of a good index number: unit test, time reversal test, factor reversal test and circular test. Cost of living index numbers.

UNIT-IV

Demand analysis: Laws of demand and supply, price elasticity of demand and price elasticity of supply. Partial and cross elasticity of demand.

UNIT-V

Vital statistics: Definition, uses, methods of obtaining vital statistics, rates and ratios of vital events. Measurement of Mortality: CDR and SDR. Measurement of Fertility: CBR, GFR and SFR.

TEXT BOOKS

1. Gupta, S.C., and Kappor, V. K. (2019). Fundamentals of Applied Statistics, Fourth Edition, Sultan Chand & Sons (Publisher), New Delhi, India
2. Parimal, M. (1999), Applied Statistics, 2nd Edition, Books & Applied Ltd., Kolkata, India
3. Goon, A.M., Gupta, M. K., Dasgupta, B. (2016): Fundamentals of Statistics, Vol. II, World Press, Kolkata, India

REFERENCE BOOKS

1. Agarwal, B. L. (2006). Basic Statistics, New Age International Private Limited, New Delhi, India.
2. Navnitham, PA. (2004), Business Mathematics and Statistics, Jai publishers, Trichy-22.
3. Pillai, R.S.N. and V. Bagavathi (2001), Statistics, Sultan Chand and Sons, New Delhi.

WEB RESOURCES

1. https://www.stat.berkeley.edu/~bartlett/courses/153-fall2010/lectures/1.pdf

2. http://www.gdcboysang.ac.in/About/droid/uploads/EconomicsPart4.pdf

3. https://www.ctanujit.org/uploads/2/5/3/9/25393293/20_vital_statistics.pdf

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Identify the components of time series and the method of measuring trend.	Remember, Understand
CO2	Construct, evaluate and interpret the index numbers.	Understand, Apply, Analyze
CO3	Evaluate the cost of living index and interpret.	Understand, Apply, Evaluate
CO4	Understand the demand analysis.	Understand, Apply
CO5	Understand the vital statistics and its importance in the civic society.	Remember, Understand, Apply

MAPPING WITH PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	S	M	S
CO3	S	S	M	S	S	M	M	S	S	S
CO3	S	S	M	M	S	M	S	S	M	S
CO4	S	S	S	M	S	M	M	S	M	S
CO5	S	S	S	M	M	S	M	M	M	S

S- Strong; M-Medium; L-Low

SEMESTER III & IV

22USTP2	Core Practical II: Distribution Theory and Sampling Techniques

OBJECTIVE

The main objectives of this course are to:

1. To understand the methods of analyzing Binomial and Poisson distributions.
2. To understand the methods of estimating the population mean and variance for Simple, Stratified and Systematic random sampling.

SYLLABUS

UNIT – I

Binomial Distribution: Determination of first four moments about origin, determination of central moments, Moments of Binomial and Poisson distribution.

UNIT – II

Fitting of Binomial, Poisson distribution and normal distribution (Area method and Ordinate method).

UNIT – III

Simple Random sampling – Drawing sample from the population with and without Replacement – Estimation of population mean, total , variance and its standard error.

UNIT – IV

Stratified random sampling: Allocation, Estimation of mean and variance of the population mean and variance of the estimator of mean under proportional and optimum allocations.

UNIT – V

Systematic sampling: Estimation of mean and its variance – Ratio and Regression methods of estimation based on simple random sampling.

TEXT BOOKS

1. Goon, A.M, M.K. Gupta and B. Dasgupta (1986), Fundamental of Statistics, Vol II World Press, Calcutta

2. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

3. Cochran, W.G. (1977), Sampling Techniques, Wiley Eastern Limited, Singapore, Canada.

4. Murthy, M.N. (1977), Sampling Theory and Methods, Statistical Publishing Society, Calcutta.

REFERENCE BOOKS

1. Rohatgi, V.K. (1988), An introduction to Probability theory and Mathematical Statistics, Wiley Eastern limited, Chennai.

2. Sampath S (2001), Sampling Theory and Methods, Narosa Publishing House, New Delhi.

3. Rajan K.Son, Practical Sampling Techniques, (Second Edition), CRC Publications, New York.

WEB RESOURCES

1.https://youtu.be/vTyrthS7t5g

2.https://youtu.be/9PaR1svnJs

3.http://www.statpac.com/surveys/sampling.htm

4.www.apparison.com/

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Compute the statistical constants of Binomial and Poisson distribution	Remember to Apply
CO2	Understand the concept of fitting of distribution and solving problems for Binomial, Poisson and Normal distribution	Remember to Evaluate
CO3	Compute the estimates of parameters using simple random sampling, stratified random sampling and systematic sampling	Analyze, Evaluate
CO4	Analyze and solve the problems in Sampling techniques	Analyze , Evaluate
CO5	Use systematic sampling to estimate the ratio and regression estimator.	Understand, Evaluate

MAPPING WITH PROGRAM OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	S	S	S	S	S	M	S
CO2	S	S	L	S	S	S	S	S	M	S
CO3	S	S	L	S	S	S	S	S	M	S
CO4	S	S	M	S	S	S	S	S	M	S
CO5	S	S	M	S	S	S	S	S	M	S

*S- Strong; M-Medium; L-Low

SEMESTER III & IV

22ASTSP	Allied – II - Practical : Operations Research

The main objectives of this course are to:

      1. To know the methods of solving a LPP.

      2. To understand the methods of solving a game.

      3. To know the methods of decision making.

      4. To understand the methods of analyzing a replacement problems.

SYLLABUS

UNIT – I

      Linear Programming Problem (LPP) – Graphical method – Simplex method – Big M-method, Two-phase method (Not more than three constraints).

UNIT – II

      Transportation Problem (T.P.) – Basic feasible solutions – North-West Corner Rule – Least Cost Method – Vogel's Approximation Method (VAM) – Optimum solution by MODI method (without loop)– Unbalanced T.P. Assignment Problem (A.P.) – Balanced – Unbalanced Hungarian method.

UNIT – III

      Game theory – Pure and Mixed Strategy with and without saddle point – Dominance rule – graphical method for 2 x n and m x 2 Game. Network analysis – Critical Path Method (CPM) and Programme Evaluation Review Technique (PERT).

UNIT – IV

      Decision theory – Decision making under uncertainty and under risk – Expected Monetary Value – Decision Tree Analysis. Queuing theory – Poisson model $[(M/M/1):(\infty/FIFO)]$ – Finite Queue length model $[(M/M/1):(N/FIFO)]$.

UNIT – V

Replacement problem – Items that deteriorate gradually money value constant with time – money value changing with time. Sequencing problem - problems with n jobs on two machines and n jobs on three machines.

TEXT BOOKS

1. Sharma, J.K. (2013) Operations Research: Problems and Solutions,5/e, Macmillan India, New Delhi.
2. Gupta, P.K. and Man Mohan. (1979) Operations Research: Linear Programming and Theory of Games,3/e, Sultan Chand &Sons, New Delhi.

REFERENCE BOOKS

1. Sharma, S.D. (2010) Operations Research, KedarnathRamnath, Meerut.

2. Swarup, K. Mohan, M. and Gupta, P.K. (2001) Operations Research, Sultan Chand & Sons, New Delhi.

WEB RESOURCES

1. https://youtu.be/rDDmPvSAll
2. https://youtu.be/vUMGvpsb8dc
3. https://youtu.be/y7rEGCsymzs

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Explain optimum solution for a LPP, transportation problem and assignment problem.	Remember to Apply
CO2	Understand the appropriate decisions for problems of games.	Remember to Evaluate
CO3	Analyze the optimum replacement time of machines and optimum sequence of jobs.	Analyze, Evaluate
CO4	Analyze and solve the decision theory and queuing theory problems.	Analyze to Create
CO5	Create Operation Research Models for their further studies.	Understand, Create

MAPPING WITH PROGRAM OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	S	S	S	S	S	M	S
CO2	S	S	L	S	S	S	S	S	M	S
CO3	S	S	L	S	S	S	S	S	M	S
CO4	S	S	M	S	S	S	S	S	M	S
CO5	S	S	M	S	S	S	S	S	M	S

*S- Strong; M-Medium; L-Low

Semester -IV

Course Code : 22AEEC1

Ability Enhancement Elective Course-I : Gandhian Thoughts

Syllabus:

UNIT- I

Biography of Gandhiji- Gandhiji's Concept on Truth and Non Violence.

UNIT- II

Gandhian Principles of Directive Principles of State Policy-Gandhiji's Views on

Reservation.

UNIT -III

Education Philosophy of Gandhiji: Basic Education- Education for all- Key to

Health: Naturopathy.

UNIT- IV

Economic Ideas of Gandhiji: Trusteeship-Public Sector- Private Enterprise.

UNIT- V

Political Philosophy: Gandhiji's Idea of Good Government – Democracy- Qualities

of Good leader.

Reference Books:

1. Bandhyopathyaya J: Social and Political Thought of Gandhiji:Allied

   Publishers Private Limited.

2. Gandhi M.K: Basic Education: L.Navajivan Publication House: Ahamedabad.
3. Gandhi M.K: Hindu Dharma: L.Navajivan Publication House: Ahamedabad.
4. Gandhi M.K: Key to Health : L.Navajivan Publication House: Ahamedabad.
5. Appadurai.A:Political Thought 20th Century: South Asia Publishers,New Delhi.

Course Code : 22AEEC2
Ability Enhancement Elective Course-II : Human Rights

UNIT – I

INTRODUCTION

Introduction: Meaning, Nature and Importance of the study of Human Rights -

Concept of Human Rights.

UNIT – II

FUNDAMENTAL RIGHTS

Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom

of Religion - Right to Education and Culture - Right to Constitutional Remedies.

UNIT – III

HUMAN RIGHTS IN INDIA

Protection of Human Rights Act 1993 - National Human Rights Commission - State

Human Rights Commission - Right to Information Act.

UNIT – IV

HUMAN RIGHTS ORGANIZATION

UN and Human Rights- United Nations Human Rights Commission – Universal

Declaration of Human Rights.

UNIT – V

ISSUES IN HUMAN RIGHTS

Areas of Human Rights Violation and Conflicts: Violence against Women and

Children- Bonded Labour – Child Labour.

Reference Books:

1. Ibohal Singh. H: Human Rights in India, New Delhi: Vibhar Law Publication, (2001)

2. Subramaniyam.S : Human Rights Inter National Challenges (Two Volumes Select Paper), 1997.

3. Tiwari D, K. : Laws of Protection of Human Rights, New Delhi – Asia Law Agency, (2000)

4. Krishna Iyer V.R. : Human Rights and Human Wrongs, New Delhi B,R,. Publications Commission, 2011

Semester - IV

Course Code : 22AEEC3

Ability Enhancement Elective Course - III : Business Start-Up Fundamentals

Course Objectives:

1. To make students understand the nature of Entrepreneurship and its

   importance to Business.

2. To impart Basic entrepreneurial Skills and understanding to run a

   business effectively and efficiently

Learning Outcomes:

After completion of this course, the students will be able to:

1. Explain the various features of business.
2. List out the various forms of business organization.
3. Know various types of entrepreneurs.
4. Understand MSME policy.
5. Prepare project formulation.

Syllabus:

UNIT – I

Business – Meaning – Definition – Features - Objectives – Difference between Business, Employment and Profession.

UNIT – II

Forms of Business Organizations – Sole Trader – Meaning, Merits and Demerits - Partnership – Meaning, Definition, Feature and Types - Joint Stock Company – Meaning, Characteristics - Multi National Company (MNC) – Meaning, Nature and

Objectives.

UNIT – III

Entrepreneur – Meaning – Types – Characteristics – New Venture – Industrial Park / Industrial Estate – Meaning, Features and Objectives.

UNIT – IV

Special Economic Zone - Meaning, Nature, Incentives and Subsidies – Meaning, Types – District Industries Centre (DIC) – Meaning, Features and Objectives.

UNIT V

Business Plan – Business Plan Preparation – Feasibility Analysis of Project (Market, Technical and Financial Viability) - Business Opportunities in the Context of Tamil

Nadu and Industrial Policy of the State – Business Incubation Centres – Start up Policy Framework and Incentives.

Text Book:

1. Vasanth Desai, Entrepreneurial Development, Himalaya Publishing House, New Delhi

Reference Books:

1. Srinivasan N.P, Gupta C.B, Entrepreneurial Development, Sultan Chand Publications, NewDelhi.

2. Khanka. S.S, Entrepreneurial Development, S. Chand Publications, New Delhi.

3. Dr. P. T. VijayaShree and M. Alagammal, Entrepreneurial Development and Small Business Development, Margham Publications, Chennai.

Online Resources:

1. https://msme.gov.in
2. https://www.nsic.co.in
3. https://smallindustryindia.com
4. https://www.kvic.org.in

Semester- IV

Course Code : 22AEEC4

Ability Enhancement Elective Course-IV : Professional Ethics & Cyber Netiquette

Course Objectives:

1. To inculcate ethical and moral behavior in their profession
2. To impart the knowledge on etiquette on various online platforms

Learning outcomes:

1. Identify and describe relevant theoretical concepts related to professional ethics
2. Understand the basic perception of profession, professional ethics, various moral issues

3. Aware the code of conduct over online platforms

Unit-1

Definitions of Ethics, Personal ethics and Business ethics, Morality and law, How are moral standards formed? Religion and Morality

Unit-II

Principles of personal Ethics, Principles of Professional ethics, Distinction Between Values and Ethics, Roots of unethical Behaviour, Ethical Decision Making.

Unit-III

Cyber Security- Meaning and importance of awareness. Cyber Crime- Meaning.

Basics of Types of Cyber crimes – Identity Theft-Psychological Tricks – Social media

related attacks-Digital banking frauds – Attacks through mobile applications-Virus

attacks on personal attacks.

Unit-IV

Etiquette – Meaning – Importance. Netiquette – Meaning – Necessity-Internet based communication methods – E-mail- meaning and purpose, E-mail-Etiquette Instant Messaging- meaning and benefits, Etiquette on Instant Messaging

Unit-V

Social Media- Etiquette on Social Media. Online Meet-Challenges in online meetings– Challenges for Host-Challenges for Participants- Technical Challenges. Netiquette for internet based meetings.

Reference Materials:

1. Human Values and Professional Ethics – Dr. Sambasiva Rao, Dr. Madhukar behara,

   Prof. Abdul Noor Basha, Himalaya Publications

2. Human Values and Professional Ethics – Jayshree Suresh, B.S.Raghavan, S.Chand Publications

3. Cyber Security - Awareness for Citizens, Volume-1 , Office of Special Inspector General of Police

4. Maharashtra Cyber, Home Department, Government of Maharashtra

www.ethicssage.com

SEMESTER - V

22UST05	Core Course - V: Theory of Estimation

OBJECTIVE

The main objectives of this course are to:

1. know the types of inference.

2. understand the two broad categories of estimation.

3. know the various methods of finding an estimator.

4. identify the best estimator for a parameter.

5. accomplish the knowledge about the inferential statistics in building statistical models which is required for applications in real time problems.

SYLLABUS

UNIT - I

Statistical inference – Types of inference: Inductive, deductive inference. Population, sample, parameter, parameter space, sample space, statistic, estimator, estimate. Point estimation – Characteristic of point estimation – Unbiasedness – Consistency.

UNIT - II

Concept of efficiency, sufficiency and their inter relationship – Simple application – Cramer Rao inequality – Simple problems – Minimum Variance Unbiased Estimator (MVUE) – Uniqueness property of MVUE, Minimum Variance Bound Estimator (MVBE).

UNIT - III

Asymptotic efficiency – Sufficient statistic and optimal properties – Statement of Neyman factorization theorem – Concept of complete sufficient statistics – Simple illustrations – Rao-Blackwell theorem.

UNIT - IV

Methods of Estimation – Maximum Likelihood Estimator (MLE) and their properties, Likelihood function – Simple problems – Method of moments – Simple illustrations – Method of minimum variance, Method of minimum chi-square, Method of least squares.

UNIT - V

Interval Estimation – Distinction between point estimation and interval estimation - Confidence interval and Confidence limits - Construction of confidence intervals for parameters of Binomial, Poisson, Normal and Exponential distributions.

TEXT BOOKS

1. Gupta, S.C. and V.K. Kapoor (2020), Fundamental of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

2. Rao, C.R. (1973), Linear Statistical Inference and it Applications, Revised Edition, Wiley Eastern Ltd, New Delhi.

3. Rohatgi, V.K. (1988), An introduction to Probability theory and Mathematical Statistics, Wiley Eastern limited, Chennai.

REFERENCE BOOKS

1. Hoel, P.G. (1971), Introduction to Mathematical Statistics, Wiley, New York.

2. Hogg, R.V. and A.T. Craig (1972), An introduction to mathematical statistics, Third Edition, Collier Macmillan Publishers, New York, London.

3. Lehmann, E.L. (1986), Theory of Point Estimation (Student edition), John Wiley and Sons, New York.

4. Mood, A.M, Franklin A. Graybill and Duane C. Boes (2005), Introduction to the Theory of Statistics, Third Reprint, Tata McGraw-Hill Publishing Company Ltd, New Delhi.

WEB RESOURCES

1. www.wikipedia./theory of estimation.html
2. https://youtu.be/4v41z3HwLaM
3. https://youtu.be/IqpqhQqQa4g
4. https://nptel.ac.in/courses/111/102/111102212/
5. https://www.digimat.in/nptel/courses/video/111105124/L01.html

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understand the concept of Statistical Inference, types of inference, Characteristics of point estimation	Remember, Understand
CO2	Know the concept of efficiency, sufficiency, CR inequality and its applications	Understand, Apply
CO3	Know the concept of sufficient statistic, Neyman Factorization theorem, RB theorem and its applications	Understand, Apply
CO4	Know the different methods of estimation	Understand, Apply, Analyze
CO5	Know the concept of interval estimation, Confidence intervals for parameters of some distributions	Understand, Apply, Analyze

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	S	M	M	M
CO2	S	S	M	M	S	M	S	S	M	S
CO3	S	S	M	M	S	M	M	M	S	M
CO4	S	S	S	S	M	M	M	S	M	S
CO5	S	S	M	M	S	S	S	M	M	M

*S- Strong; M-Medium; L-Low

SEMESTER -V

22UST06	**Core Course - VI : Demography**

1. To measure the growth of population, birth and death rates and to estimate Life expectancy.
2. To know the principle of migration, measurement of scales and methods of estimating.

SYLLABUS

UNIT-I

Demographic Data: Demography – definition-sources of demographic data - population census -demographic surveys - Registration method: vital registration - population register and other administrative records, registration of population in India.

UNIT-II

Rates and Ratios –Fertility - Factors affecting fertility, Fertility measures – General and Specific Fertility Rates –Total Fertility Rates – Growth Rates – Gross – Reproduction Rates – Net Reproduction Rates.

UNIT-III

Mortality: Mortality measurements: crude death rate- specific death rate-standardized death rate-infant mortality rate – maternal mortality rate –case fertility rate-comparative mortality index –force of mortality –graduation mortality rates-Makeham's law.

UNIT-IV

Life table – Structure –Construction – relationship between the functions of life table – Abridged life table – Methods: Reed – Merrell method – Greville's method .

UNIT-V

Migration – Types of Migration – Migration rates – Hamilton's rates – Net migration rates – Methods of estimating Net migration rates.

TEXT BOOKS

1. 1. Gupta, S.C. and V.K. Kapoor (1978), Fundamentals of Applied Statistics,

   Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS

1. Bhaskar, D. Misra (1980), An introduction to the study of population, South Asian Publishers Private Ltd, New Delhi.

2. Goon, A.M, M.K. Gupta and B. Dasgupta (1986), Fundamentals of Statistics, Vol II, World Press, Calcutta.

3. Ramkumar, R. (1986), Technical Demography, Wiley Eastern Ltd, New Delhi.

4. Sinha, V.C. and E. Zacharia (2000), Elements of Demography, Allied Publisher's Ltd,

   New Delhi.

WEB RESOURCES

1. www.wikipedia.org/demographic data.html

2. www.censusindia.gov.in

3. www.data.un.org

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Execute methods of obtaining vital statistics, measurement of Population.	Remember
CO2	Educate the application of vital statistics.	Understand
CO3	Compute various fertility measures	Apply
CO4	Extract the measures of mortality using life tables and construction of abridged life table.	Apply
CO5	Know the types of migration and apply methods of estimating net migration rates.	Apply

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	M	L	M	S	S	S
CO2	L	S	S	M	M	L	M	S	S	S
CO3	M	S	L	M	M	L	S	M	S	S
CO4	S	S	M	L	M	L	L	M	S	S
CO5	S	S	S	M	M	L	S	S	S	S

*S- Strong; M-Medium; L-Low

SEMESTER-V

22UST07	Core Course-VII : Statistical Quality Control

OBJECTIVE

1. To know the principle of Quality, Specifications of Quality and concepts of SQC.
2. To understand the process control techniques.
3. To understand the principles of control charts for attributes.
4. To know the principle of Acceptance Sampling, Single, double and Sequential Sampling plan.
5. To know the concepts of Reliability.

SYLLABUS

UNIT-I

Basic concepts of quality - meaning of quality - quality of design - quality of conformance - specifications of quality - Concepts of Statistical Quality Control (SQC) - causes of variation.

UNIT-II

Process control - control charts - Basis of control charts - Rational subgroups - Control charts for variables ($\overline{X}$, R and S-charts) - Uses of control charts.

UNIT-III

Control charts for Attributes (p, np, c for fixed and varying sample sizes) - Comparison of control charts for variables and attributes.

UNIT-IV

Product control - Acceptance sampling - Sampling Inspection by attributes - Producer's and Consumer's risk. AQL, LTPD, IQL. Single, Double and Sequential sampling plan procedures - OC, ASN, AOQ, AOQL, and ATI Curves, concept of multiple sampling plan - comparison of single, double and multiple sampling.

UNIT-V

Reliability Definition – Design – Measurement – Maintainability and availability. Failure rate and Hazard function. Distribution – Exponential – Weibul – Normal.

TEXT BOOKS

1. Duncan, A.J. (1974), Quality Control and Industrial Statistics, Irwin Inc. Homework.

2. Grant, E.L. and R.S. Leavenworth (1991), Statistical Quality Control, McGraw-Hill, New York.

3. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.

4. Mahajan, M. (2001), Statistical Quality Control, Dhanpat Raj & Co (p) Ltd, Delhi.

REFERENCE BOOKS

1. Montgomery, D.C. (1991), Introduction to Statistical Quality Control, John Wiley & Sons.

2. Suddhendu Biswas, Statistics of Quality Control-Sampling Inspection and Reliability, New Central Book Agency (P) Ltd.

3. Veerarajan, T. Probability, Statistics and Random Processes, Tata McGraw-Hill, New Delhi.

WEB RESOURCES

1. www.wikipedia.org /SQC.html
2. www.wikipedia.org /Reliability.html
3. www.wikipedia.org / Sequential sampling plan.html

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Understand the concept of quality, specification limits and tolerance limits	Remember, Understand
CO2	Construct and draw control charts for variables ,attributes and interpret them.	Understand , Apply
CO3	Apply various sampling plans for product control.	Apply, Analyze
CO4	Analyze the nature of data and interpret the quality of product	Apply, Analyze
CO5	Apply reliability and other related measures based on standard distributions	Analyze , Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	S	S	S	M	S
CO2	S	S	S	S	S	S	M	S	M	S
CO3	S	S	M	S	S	S	S	M	S	M
CO4	S	S	S	S	S	M	M	S	S	M
CO5	S	S	S	M	M	S	S	M	S	S

*S- Strong; M-Medium; L-Low

SEMESTER-V

22USTM1	**Major Based Elective - I: Stochastic Processes**

OBJECTIVE

The main objectives of this course are to:

1. To understand the classification of Stochastic processes based on time and space.
2. To analyse a real time situation using Markovian concept.
3. To understand the time series models for stationary process.
4. To understand the applications and analysis of Birth-Death process and Poisson process.
5. To solve queueing problems using stochastic process.

SYLLABUS

UNIT – I

Definition of stochastic processes – Classification of stochastic processes according to time parameter space and state space – Examples of Stochastic Processes

UNIT – II

Markov Chains – Definitions and examples – Higher transition probabilities – Chapman – Kolmogorov equation – Classification of states – limiting behaviour (concept and applications only).

UNIT – III

Stationary processes and time series – Strict and wide Sense stationary models of time series – Concept of Renewal process and Martingales.

UNIT – IV

Continuous time Markov chains: Poisson processes - Poisson process and related distributions – Birth and Death processes – Simple examples.

UNIT – V

Derivations of the constants for the Queueing models (M/M/1, M/M/S queueing system) – Steady state solutions – Simple problems.

TEXT BOOKS

1. Medhi. J. (1982), Stochastic processes, Wiley Eastern.

REFERENCE BOOKS

1. Karlin.S. and Taylor, H.M (1966), First Course in Stochastic Processes, Academic Press.
2. Prabhu, N.U (1965), Stochastic processes, MacMillan, New York.

WEB RESOURCES

1. https://www.youtube.com/watch?v=uvYTGEZQTEs
2. https://www.youtube.com/watch?v=7HMq-10aDQ4
3. https://www.youtube.com/watch?v=JBRFAMBgrWc

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Understand the classification of Stochastic processes	Remember and Understand
CO2	Solve problems using Markovian concepts.	Apply
CO3	Test the stationarity of a stochastic proces	Analyze
CO4	To model a problem using continuous time Markov models.	Evaluate
CO5	Solve queueing problems using standard queueing models.	Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	M	L	L	L	L	S	S
CO2	S	S	M	L	L	L	L	L	S	S
CO3	S	S	M	L	L	M	L	L	S	S
CO4	S	S	M	L	L	L	L	L	S	S
CO5	S	S	M	L	L	M	L	L	S	S

*S- Strong; M-Medium; L-Low

SEMESTER-V

22USTM2	Major Based Elective – II: Official Statistics

OBJECTIVE

1. To understand the statistical systems.

2. To understand the official statistical system.

3. Understand the functioning of government and policies.

4. Promote human resource development in the official statistics and encourage research and development in theoretical and applied statistics.

5. Execute the data handling tasks in various government records

SYLLABUS

Unit - I

Official Statistics: Definition – Growth of Indian Statistics – Statistical organizations of India: Central Statistical Organisation (CSO) – Divisions of Central Statistical Organisation – Functions – Publications.

Unit - II

National Sample Survey Organisation (NSSO) – Divisions of NSSO – Functions of NSSO – Procedure for collection of information – Agriculture Statistics, Yield Statistics – Official series: Traditional method, Random Sampling Method – NSS Series – Forest Statistics, Fisheries Statistics – Defects in agricultural Statistics.

Unit - III

National income: Definition – Methods of estimating national income: The Income method, the Output method and the Expenditure method – Uses of National income estimates – Difficulties of estimation.

Unit - IV

Social accounting – Population statistics – Sources – Different methods of collecting population census – Methods of enumeration – Merits and demerits of De Facto method, Merits and demerits of the De Jure system.

Unit - V

Price Statistics: Wholesale prices, Retail prices, Uses and limitations of price statistics. Industrial Statistics: Main Sources of industrial Statistics – Limitations.

TEXT BOOKS

1. Allen R. G. D. (1975). Index Numbers in Theory and Practice, Macmillan.
2. Mukhopadhyay, P. (2011). Applied Statistics, Second Edition, Books & Allied Ltd, India.
3. Basic Statistics Relating to the Indian Economy (CSO),1990.
4. Family Welfare Yearbook.Annual Publication of D/o Family Welfare.
5. Guide to Official Statistics (CSO), 1999.
6. Monthly Statistics of Foreign Trade in India, DGCIS, Calcutta and other Govt. Publications.
7. Principles and accommodation of National Population Censuses, UNESCO.
8. Statistical System in India (CSO) 1995.

REFERENCE BOOKS

1. Bhaduri, A. (1990). Macroeconomics: The Dynamics of Commodity Production, Macmillan India Limited, New Delhi.
2. Branson, W. H. (1992). Macroeconomic Theory and Policy, Third Edition, Harper Collins Publishers India (P) Ltd., New Delhi.
3. Goon A. M., Gupta M. K., and Dasgupta. B. (2001), Fundamentals of Statistics, Vol. 2, World Press, India.
4. Panse, V. G. (1964). Estimation of Crop Yields (FAO), Food and Agriculture Organization of the United Nations.

WEB RESOURCES

1. https://www.classcentral.com/course/swayam-macro-economics-19942
2. https://www.classcentral.com/course/swayam-economics-of-health-and-health-care-14023
3. www.mospi.nic.in and censusindia.gov.in

COURSE OUTCOMES

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

S.No	Course Outcome	Blooms Verb
CO1	Understand the fundamentals of measurement in official statistics	Remember
CO2	understand National Sample Survey Organisation ,Procedure for collection of information ,Forest Statistics	Understand, Evaluate
CO3	Methods of estimating national income	Apply & Evaluate
CO4	Evaluate Social accounting	Evaluate
CO5	Wholesale prices, Retail prices, industrial Statistics	Understand, Evaluate

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	L	L	S	S	S	L	S	S
CO2	S	S	S	S	S	M	S	S	L	S
CO3	M	S	S	S	S	S	S	S	L	L
CO4	M	M	L	S	S	S	S	L	S	S
CO5	S	S	S	L	S	M	S	L	S	L

*S-Strong; M-Medium; L-Low

SEMESTER-V

22USTM3	Major Based Elective III : Econometrics

OBJECTIVE

1. Know the Scope and objectives of Econometrics
2. Understand models of Econometrics and estimation of parameters of econometric models.
3. Understand the multi collenearity and auto correlation

SYLLABUS

UNIT-I

Introduction: Definition, scope, economic and econometric models-Aim and methodology of econometrics. Linear models - Endogenous and Exogenous variables – assumptions-structural forms and reduced forms. Ordinary Least Square Estimators (OLS) and its properties

UNIT-II

Assumptions of Classical Linear Regression Model (CLRM). Heteroskadasticity: Meaning, detection, consequences. Solutions to the Heteroskadasticity problem. Testing the linear versus Log linear functional form – Concept of Box- Cox test.

UNIT-III

Autocorrelation: Meaning, sources and consequences- Test for autocorrelation-Durbin – Watson test, Estimation in levels verses first differences. Correlelogram: Correlelogram of moving averages-correlelogram of auto-regressive series.

UNIT-IV

Multicollinearity: Meaning, assumptions and consequences, Measures of Multicollinearity, Problems with measuring Multicollinearity, solutions to multocolinearity problem: Ridge Regression. Concept of principal component regression and dropping variables.

UNIT-V

Simultaneous Equation models: Identification through Reduced form, Necessary and sufficient condition for identification. Methods of estimation: The instrumental variable method, Two stage least square method.

TEXT BOOKS

1. Damadar N. Gujarati and Sangeetha, Basic Econometrics.
2. Maddala, G.S., Introduction to Econometrics, Third edition, John Wiley's and Sons Ltd.

REFERENCE BOOKS

1. Madnani, G.M.K. (2008). Introduction to Econometrics: Principles and Applications. Oxford and IBH Publishing.
2. Johnston, J., and J. DiNardo,.(1997). Econometric Methods, McGraw-Hill.

WEB RESOURCES

1. http://bseu.by/russian/faculty5/stat/docs/4/Creel,Graduate%20Econometrics.pdf
2. https://www.youtube.com/watch?v=_94uwySaKlU
3. https://www.youtube.com/watch?v=YclJm2zymsg
4. https://www.dynamictutorialsandservices.org/2014/05/business-economics-meaning-nature-scope.html

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Know the scope and objectives of Econometrics	Remember, Understand
CO2	Know the models of econometrics	Understand, Apply, Analyze
CO3	Estimate the parameters of models of Econometrics	Understand, Apply, Analyze
CO4	Know multicollinearity	Understand, Apply
CO5	Understand Auto correlation	Remember, Understand, Apply

MAPPING WITH PROGRAM OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	S	M	S
CO2	S	S	M	S	S	M	M	S	S	S
CO3	S	S	M	M	S	M	S	S	M	S
CO4	S	S	S	M	S	M	M	S	M	S
CO5	S	S	S	M	M	S	M	M	M	S

*S- Strong; M-Medium; L-Low

SEMESTER-V

22USTM4	Major Based Elective - IV: Actuarial Statistics

OBJECTIV*E*

The main objectives of this course are to:

1. To understand the methodologies of computing the present value and accumulated values of an annuity.
2. To understand the methods of loan redemption.
3. To understand the methods of computing assurance benefits and premiums for various insurance plans
4. Compute the present value and accumulated values of various types of annuities.
5. Compute assurance benefits and annual premiums for various plans.

SYLLABUS

UNIT - I

Present value and accumulated value at fixed rate and varying rates of interest – effective rate of interest corresponding to a nominal rate of interest and vice – versa– simple problems – Annuity – classification of Annuity – Derivation of the formula for Present Values of immediate annuity *n a* and annuity due *n a* , accumulated values of immediate annuity *n S* and annuity due *n S* .

UNIT - II

Derivation of the formula for Present Value of immediate annuity payable p times a year, Present Value of annuity due payable p times a year, accumulated value of immediate annuity payable p times a year, accumulated value of annuity due payable p times a year - redemption of loan by uniform early payment – definitions of sinking fund –Redemption of loan by a sinking fund (uniform early payment) – simple problems.

UNIT - III

Mortality Table: Definitions – Uses – Types and construction of a mortality table – complete and incomplete mortality table – Computing the Probability of survival and death using LIC (1970-1973) mortality table – definition: expectation of life, curate expectation of life and central death rate and simple problems.

UNIT - IV

Principles of insurance – Assurance – Types of assurance – Pure endowment assurance, endowment assurance, term assurance, whole life assurance, double endowment assurance, increasing temporary and whole life assurance – commutation functions Dx , Cx, Mx and Rx Expression for present values of assurance benefits and simple problems.

UNIT - V

Definitions of Premium, natural premium level - Annual, Net, office Premiums. Expressions for level annual premium under temporary assurance plans – simple problem involving the calculations of level annual premium, office premium (four types of plans only).

TEXT BOOKS

1. Alistair – Neill, (1977), 'Life contingencies, Great Britain.

REFERENCE BOOKS

1. Dixit, S.P., C.S. Modi and R.V. Joshi, (2005), Mathematical basis of Life Assurance, Institute of India.

WEB RESOURCES

1. www.wikipedia.org/actuarial statistics**.**html
2. www.wikipedia.org/mortality table.html

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Present value, accumulated value, Annuity, immediate annuity	Remember, Understand
CO2	Present Value of immediate annuity payable p times a year, Redemption of loan by a sinking	Remember, Understand, Evaluate
CO3	Complete and incomplete mortality table, expectation of life,.	Understand, Evaluate
CO4	Assurances, Pure endowment assurance, endowment assurance, term assurance, whole life assurance, double endowment assurance, increasing temporary and whole life assurance.	Remember, Understand, Evaluate
CO5	Premium, natural premium level, Annual, Net, office Premiums. Expressions for level annual premium under temporary assurance plans	Remember,Understand, Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	M	S	S	M	S	M
CO2	S	M	S	S	S	S	S	S	S	S
CO3	M	M	S	S	M	S	S	M	S	M
CO4	M	M	S	S	M	M	M	S	M	S
CO5	S	M	M	M	S	S	S	M	M	M

*S- Strong; M-Medium; L-Low

SEMESTER - V

22USTS3	Skill Enhancement Course - III : Regression Analysis

OBJECTIVE

The main objectives of this course are to:

1. To understand the types of models.

2. To fit a straight line by the method of least squares and testing the quality of fit.

3. To impart knowledge about fitting of power curve and exponential curve and related practical applications.

4. To fit Regression using matrices.

5. To fit Multiple Regression models.

SYLLABUS

UNIT-I

Linear models: Definition and classification. Functionally related models, Mean related models, Regression models, Experimental design models, Components of Variance models (concepts only).

UNIT-II

Fitting a straight line by the method of Least Squares: The need for Statistical analysis, Properties of Regression model.

UNIT-III

Curve fitting-Conversion of data into Linear form-fitting of Power Curve and Exponential curve.

UNIT-IV

Regression in Matrix terms: Fitting a Straight line in Matrix terms, Singular matrices. Regression when $X'X$ is singular. Variance and Covariance of b_0 and b_1 from matrix calculation.

UNIT-V

Multiple Regression models: Methods of fitting Multiple Regression models (Only for three variables), Stepwise Regression and Backward elimination methods.

TEXT BOOKS

1. Norman R. Draper and Harry Smith, Applied Regression analysis.
2. Douglas C. Montgomery, Elizabeth A. Peck and G. Geoffrey Vining, Introduction to Linear Regression.
3. Damadar N. Gujarati and Sangeetha, Basic Econometrics

REFERENCE BOOKS

1. Plackeff R,L.(1960), Principles of Regression Analysis, Oxford at the Clavendon press.

2. Huang,D.S.(1970),Regression and Econometric Methods, John Wiley and sons.

3.Brook R.J and Arnold G.C (1985), Applied Regression Analysis and Experimental Design, Marcel Dekker, Inc,

WEB RESOURCES

1. https://youtu.be/wscb2XfWl1Q
2. https://youtu.be/owl7zxCqNY0
3. www.wikipedia.org/least square method.html
4. www.wikipedia.org/ regression analysis.html
5. www.econpapers

NOTE: FOR SECTION B AND C NUMERICAL PROBLEMS ONLY

(Scientific calculator must be permitted).

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Explain Linear Models	Remember to Apply
CO2	Understand the Least square methods and Properties of Regression Models.	Remember to Evaluate
CO3	Analyse the Curve fitting and Conversion of data into Linear form.	Analyze,Evaluate
CO4	Analyze and solve the Regression in Matrix terms.	Analyze to Create
CO5	Construct Multiple Regression models for given circumstances.	Understand,Create

MAPPING WITH PROGRAM OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	S	S	S	S	S	M	S
CO2	S	S	L	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	S	S	M	S
CO4	S	S	M	S	S	S	S	S	M	S
CO5	S	S	M	S	S	S	S	S	M	S

*S- Strong; M-Medium; L-Low

SEMESTER - VI

22UST08	Core Course - VIII: Testing of Hypothesis

OBJECTIVE

The main objectives of this course are to:

1. understand the concepts of parametric and non-parametric tests.

2. understand the methods of framing and testing the hypothesis based on large samples and small samples.

3. understand the non-parametric methods for hypothesis testing.

4. understand the core part required to work as statistical analyst and advisor in other disciplinary projects.

5. understand the sequential analysis procedure.

SYLLABUS

UNIT - I

Statistical Hypothesis – Simple and composite hypothesis – Null and Alternative hypothesis - Critical region - Types of error- Level of significance- Size and power of the test –One and two sided tests - Most Powerful (MP) test – Neyman Pearson lemma – UMP test – Simple problems.

UNIT - II

Likelihood Ratio (LR) Test – Applications - Properties and uses of LR test – Test for the mean and variance of the normal population - Tests for the equality of means and variances of two normal populations – Test for the equality of means of several normal populations.

UNIT - III

Testing of Significance - Large sample and small sample tests - Tests based on Normal with respect to mean, proportion and coefficient of correlation - Tests based on t, F and Chi-square – Test for independence of attributes.

UNIT - IV

Elementary ideas on distribution free test - Non-parametric test -Advantages and limitations of Non-parametric test over parametric test - Run, Median and Mann-Whitney –Wilcoxon U - test for two sample problems.

UNIT - V

Sequential Analysis - Need for sequential rules - Wald's Sequential Probability Ratio Test (SPRT) - Operating Characteristic (OC) functions and Average Sample Number (ASN) - Simple problems.

TEXT BOOKS

1. Gupta, S.C. and V.K. Kapoor (2020), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

2. Rao, C.R. (1973), Linear Statistical Inference and its Applications, Revised Edition, Wiley Eastern Limited, New Delhi.

REFERENCE BOOKS

1. Hogg, R.V. and A.T. Craig (1972), An Introduction to Mathematical Statistics, Fourth Edition, Colliar Mac Millian Publishers.

2. Lehmann, F.L. (1986), Testing of Statistical Hypothesis (Student edition), John Wiley and Sons, New York.

3. Mood, A.M, Franklin A. Graybill and Duane C. Boes (2005), Introduction to the Theory of Statistics, Third Reprint, Tata McGraw-Hill Publishing Company Ltd, New Delhi.

4. Rohatgi, V.K. (1988), An Introduction to Probability theory and Mathematical Statistics, Wiley Eastern Limited, New Delhi.

5. Hoel, P. G. (1971), Introduction to Mathematical Statistics, Wiley, New York.

WEB RESOURCES

1. www.bookza.org

2. www.bookfinder.org

3. www.Shodhganga.inflipnet.ac.in

4. https://online.stat.psu.edu/stat502

5. https://statisticssolutions.com/hypothesis-testing

6. https://youtu.be/VK-mA3-41c

7. https://youtu.be/0XXT3bIY_pw

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Understand testing of statistical hypothesis	Remember, Understand
CO2	Understand Likelihood Ratio test, applications and properties	Understand, Apply
CO3	Understand test of significance, tests based on normal, t, F and Chi-square distributions	Understand, Apply
CO4	Understand the concept of distribution free test, non-parametric tests	Apply, Analyze, Evaluate
CO5	Understand the concept of Sequential Analysis, OC and ASN functions	Apply, Analyze, Evaluate,

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	L	S	M	S	M	S	M
CO2	M	S	M	M	S	M	M	S	M	S
CO3	S	S	M	L	M	M	S	M	S	M
CO4	S	S	M	M	S	S	M	S	M	S
CO5	S	S	M	L	S	M	S	M	S	M

*S- Strong; M-Medium; L-Low

SEMESTER – VI

22UST09	Core Course – IX: Design of Experiments

OBJECTIVE

The main objectives of this course are to:

1. To enrich the basic for principle of design of experiments.
2. To understand multiple comparison test.
3. To enrich the layout and statistical model of experiment design.
4. To enrich the analysis of factorial experiment with main and indication effects.

SYLLABUS

Unit-I

Principle of experimental Design: Replication, Randomization and Local control. Various concepts, definition in experimental designs. Multiple comparison test: Meaning and needs; Detailed description of CD, Students Newman Keul's (SNK)test, Duncan's Multiple Range (DMR) test and Tukey's test.

Unit -II

Analysis of variance: concept - layout and Statistical Model and detailed analysis of one-way and two-way classification without interactions.

Unit -III

Basic Experimental Designs- Completely Randomized Design (CRD), Randomized Block Design (RBD) and Latin Square Design (LSD): Layout and their Statistical analysis-Efficiencies of LSD over RBD and CRD (Simple problems).

Unit- IV

Missing plot Techniques: Analysis of RBD and LSD with one observation and two observations per cell.

Unit-V

Factorial experiment: Need and advantages – definition of symmetric factorial. Experiment – meaning of main and interaction effects-statistical analysis in 2^2, 2^3 and 3^2 designs. Need and meaning of confounding: Total and partial confounding.

TEXT BOOKS

1. Cochran, W.G. and G.M. Cox (1977), Experimental Design, Asia Pub. Company, New Delhi.
2. Das, M.N. and N.C. Giri, (1979), Design and Analysis of Experiments, Wiley Eastern Ltd, New Delhi.

REFERENCE BOOKS

1. Giri, N.C. (1986), Analysis of Variance, South Asian Publishers, New York.
2. Goon, A.M, M.K. Gupta and B. Das Gupta (1986), Fundamentals of Statistics, Vol-II, World Press, Calcutta.

3. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.

WEB RESOURCES

1. www.booksc.org   2.www.khanacademy.org

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Experimental Design Replication, Randomization and Local control. Students Newman Keul's (SNK)test, Duncan's Multiple Range (DMR) test and Tukey's test	Remember, Understand
CO2	one-way and two-way classification without interactions	Understand, Apply
CO3	CRD, RBD and LSD Layout and their Statistical analysis- Efficiencies of LSD over RBD and CRD	Apply, Analyze, Evaluate
CO4	Analysis of RBD and LSD with one observation and two observations per cell	Apply, Analyze, Evaluate
CO5	Factorial Experiment: main and interaction effects and statistical analysis in 2^2, 2^3 and 3^2 designs.	Apply, Analyze, Evaluate,

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	S	L	S	S	S	L	S	S
CO2	M	S	M	M	S	M	S	S	S	S
CO3	S	M	M	L	M	S	S	M	S	M
CO4	M	S	L	M	S	L	M	S	M	S

CO5	S	S	M	L	S	M	S	M	S	L

*S- Strong; M-Medium; L-Low

SEMESTER VI

22UST10	Core Course - X: Applied Statistics

OBJECTIVE

1. Be acquainted with the knowledge of time series analysis.
2. Understand the significance of index numbers and its types.
3. To verify optimality and evaluation of cost of living index numbers.

SYLLABUS

UNIT-I

Concept of time series – Source of time series data – Component of time series – Additive and Multiplicative models. Trend –Methods of measuring trend – Semi average method – Method of moving average –Method of least squares and its simple problems.

UNIT-II

Seasonal variation – Seasonal index – Methods of measuring seasonal index –Simple average method – Ratio to moving average - Ratio to trend method – Link relatives method and its simple problem– De-seasonalisation of data. Cyclical variation – Measurement of cyclical variation: Residual method –Auto regression series of first order and second order.

UNIT-III

Basis of Index Numbers – Definition – Problems in the construction – Different types of Index Numbers – Simple Index Numbers – Weighted Index Numbers –Laspeyre's Index Numbers – Paasche's Index Numbers – Fisher's Index Numbers –Marshall & Edge worth Index Numbers – Dorbish & Bowley's Index Numbers and simple problem

UNIT-IV

Optimum tests of Index Numbers – Time reversal test – Factor Reversal Test –Circular Test – Chain base Index Number – Conversion of FBI into CBI and Vice versa –Uses of Index Numbers - Wholesale price Index Numbers (Concept only)

UNIT-V

Cost of living index numbers – Problems in the construction – Methods of construction – Aggregate method – Family budget method – Index numbers of industrial production – Splicing and deflating – Base Shifting – Uses of cost of living index numbers.

TEXT BOOKS

1. Gupta, S.C., and Kappor, V. K. (2019). Fundamentals of Applied Statistics, Fourth Edition, Sultan Chand & Sons (Publisher), New Delhi, India
2. Parimal, M. (1999), Applied Statistics, 2nd Edition, Books & Applied Ltd., Kolkata, India
3. Goon, A.M., Gupta, M. K., Dasgupta, B. (2016): Fundamentals of Statistics, Vol. II, World Press, Kolkata, India

REFERENCE BOOKS

1. Agarwal, B. L. (2006). Basic Statistics, New Age International Private Limited, New Delhi, India.

WEB RESOURCES

1. https://www.stat.berkeley.edu/~bartlett/courses/153-fall2010/lectures/1.pdf

2. http://www.gdcboysang.ac.in/About/droid/uploads/EconomicsPart4.pdf

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Identify the components of time series and the method of measuring trend.	Remember, Understand, Apply
CO2	Apply the different measures of variations to forecast the data.	Apply, Analyze, Evaluate
CO3	Construct, evaluate and interpret the index numbers.	Understand, Apply, Evaluate
CO4	Know the criteria for good index numbers	Apply, Analyze
CO5	Evaluate the cost of living index and interpret.	Understand, Apply, Evaluate

MAPPING WITH PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	S	M	S
CO3	S	S	M	S	S	M	M	S	S	S
CO3	S	S	M	M	S	M	S	S	M	S
CO4	S	S	S	M	S	M	M	S	M	S
CO5	S	S	S	M	M	S	M	M	M	S

*S- Strong; M-Medium; L-Low

SEMESTER - VI

22USTM5	Major Based Elective - V : MS - Excel

OBJECTIVE

1. Design and format effective spreadsheets.
2. Create and revise formulas, using functions.
3. Know the significance of data in the form of tables and diagrams using spreadsheets.
4. Learn computational aspects of basic statistical measures/methods.

SYLLABUS

UNIT-I

Worksheet Design: Building worksheets, Formatting worksheets and Enhancing a Worksheet. Moving Data within and between Workbooks, Usage of different views in Workbooks. Importing, Exporting, and Distributing Data. Summarizing and Consolidating Data.

UNIT-II

Sorting, filtering, freeze panes of data. Allignments and formatting cell data. Use of pivot tables with categorical and numerical data.
Financial functions: ACCRINT, DB, DISC, EFFECT and NPV.
Logical Functions: IF, AND, OR, TRUE and FALSE.

UNIT-III

Charting techniques in Excel: Line, bar and pie charts, Scatter plots and Histogram, Labeling the charts.

UNIT-IV

Statistical functions: Count, Min, Max and Rank. Measures of central tendency: Arithmetic mean, Median, Mode, Harmonic mean and Geometric mean. Measures of dispersion: Quartiles, Standard Deviation and Coefficeint of variation.

UNIT-V

Finding bivariate statistical measures: Correlation and regression. Testing of significance using statistical functions Z-test, Student 't'-test, Chi-square test and F-test.

TEXT BOOKS

1. Curtis D. Frye, Microsoft step by step – Excel 2013, Practice files plus book.
2. Stewart Nordell (2019). 'Microsoft Excel 365 Complete: In Practice', McGraw Hill Ltd.

REFERENCE BOOKS

1. Benchmark Series: Microsoft Excel 2016 Levels 1 and 2 with SNAP and eBook.
2. Curtis D. Frye, Microsoft step by step – Excel 2016, Microsoft press.

WEB RESOURCES

1. https://www.microsoft.com/en-us/microsoft-365/excel
2. https://docs.microsoft.com/en-us/office365/servicedescriptions/office-online-service-description/excel-online

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Define terminology related to spreadsheet applications.	Remember, Understand
CO2	Find and replace cell data and formats.	Understand , Apply
CO3	Use appropriate plots, Charts and diagrams for all kinds of statistical data.	Understand , Apply, Analyze
CO4	Create and revise formulas, using functions.	Understand , Apply, Analyze
CO5	Analyze the data and interpret the results for statistical methods.	Understand , Apply, Analyze

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	M	M	S	S
CO2	M	S	M	S	S	S	S	S	M	M
CO3	S	S	M	M	S	S	S	M	M	S
CO4	S	M	S	M	S	M	M	S	S	S
CO5	S	S	S	S	M	S	M	M	S	S

*S- Strong; M-Medium; L-Low

SEMESTER - VI

22USTM6	**Major Based Elective - VI : Numerical Analysis and C - Programming**

OBJECTIVE

1. To understand the algebraic and transcendental equations.
2. To understand the methods of solving problems using numerical methods.
3. To use C – programming for statistical problems.

SYLLABUS

UNIT - I

Floating point Representation – Error - Solution of Algebraic and transcendental equations – Method of bisection – Method of RegulaFalsi – Newton Raphson iterative method.

UNIT - II

Interpolation – Newton's Gregory forward interpolation and Newton's Gregory Backward interpolation – Lagrange interpolation formula.

Numerical integration: General Quadrature for equidistant ordinate – Trapezoidalrule – Simpson's (1/3)rd and (3/8)th rules.

UNIT - III

Overview of C: Introduction and importance of C. Structure of C program – Executing a C Program – Character set – C Tokens – Keywords and Identifiers – Constants – Variables – Data types – Declaration of variables – Assigning values to variables – Symbolic constants – Operators and Expression – Library function.

UNIT - IV

Managing Input and Output Statements: getchar(), putchar(), scanf(), printf(), gets() and puts() functions.

Decision making with Simple If, IF – else, Nested If – else, Switch, break and continue statements.

UNIT - V

Looping using While, Do – while, For statements – simple examples.

Arrays: One dimensional arrays and Two dimensional arrays – Declaration and Initialisation – simple programs to find mean, median, standard deviation and correlation coefficients.

TEXT BOOKS

1. QuaziShoels Ahmad, Zubair Khan and Shadab Ahmad Khan, Numerical and Statistical Techniques, Ane Books Private Ltd, New Delhi.
2. Seymour Lipschutz and Marc Lipson (2003), Discrete Mathematics, Thirteenth reprint, Schaum's outline Tata McGraw Hill Edition, New York.
3. Shanker Rao, G. Numerical Analysis, New Age International (P) Limited, New Delhi.

REFERENCE BOOKS

1. Shastry, S.S. (1994), Numerical Analysis, Prentice Hall of India Private Ltd, New Delhi.
2. Balagurusamy, E (2008), Programming in ANSI C, Fourth edition, Tata McGraw-Hill, New Delhi.

WEB RESOURCES

1. www.numerical analysis.com
2. www.programsforstatistics.com
3. www.statsoft.com

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Solve equations using numerical methods.	Remember, Understand
CO2	Interpolate the value using techniques of numerical methods.	Understand , Apply
CO3	Perform numerical integration using Trapezoidal and Simpson's rule.	Remember, Apply
CO4	Write C programs for solving problems.	Understand , Apply
CO5	Make and revise programs using statistical measures.	Create, Understand , Apply

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	M	S	S	S
CO2	M	M	M	S	S	M	S	S	M	M
CO3	S	S	M	S	M	S	S	M	S	S
CO4	M	M	M	S	S	M	S	S	S	M
CO5	S	S	S	S	M	S	S	M	S	S

*S- Strong; M-Medium; L-Low

SEMESTER - VI

22USTM7	**Major Based Elective - VII: Psychological Statistics**

OBJECTIV*E*

The main objectives of this course are to:

1. To impart the knowledge of statistical methods in psychological studies.
2. understand the Reliability of test scores.
3. understand the Validity of test scores.
4. identify curvilinear or non- linear relationship.
5. accomplish the knowledge about the inferential statistics in building statistical models

which is required for applications in real time problems.

SYLLABUS

UNIT-I

Introduction-scaling procedures- Z or σ 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 there liability 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 (Φ) 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, 4th thoroughly revised edition, New Delhi, Reprint 2015.

REFERENCE BOOKS

1. Henry.E.Garrett - Statistics in Psychology and Education, Surjeet Publications, Fourth Indian Reprint 2014.

WEB RESOURCES

1. www.wikipedia./Psychological Statitistics.html.   2. www.booksc.org

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Z or σ scores-standard scores-Normalized scores- T-scores-Percentile score-Scaling of rankings and ratings in terms of Normal Probability curve.	Remember, Understand, Apply
CO2	Reliability of test scores, Parallel tests- Methods for determining test reliability, effect of different ranges on the reliability of the test.	Understand, Apply
CO3	Validity of test scores ,types of validity	Understand, Apply
CO4	Biserial correlation, comparison of Phi and Tetrachoric r. The contingency coefficient (c)-curvilinear or non- linear relationship.	Understand, Apply, Analyze
CO5	Correlation ratio ,multiple correlation, partial and multiple correlation.	Understand, Apply, Analyze

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10

CO1	S	S	S	M	S	S	M	S	S	M
CO2	L	M	M	S	M	M	S	M	S	S
CO3	S	M	S	M	S	S	M	M	S	S
CO4	M	S	S	S	M	S	S	S	M	S
CO5	S	M	M	S	M	S	S	M	S	S

*S- Strong; M-Medium; L-Low

SEMESTER - VI

22USTS4	**Skill Enhancement Course - IV: Computational Statistics - II**

OBJECTIVE ives of this course are to:

1. To understand the tests of significance for small and large samples.
2. To understand the Analysis of variance for simple designs.
3. To understand the methods of Numerical integration.
4. Perform the Analysis of Variance for CRD, RBD and LSD.
5. Apply Trapezoidal rule and Simpson's rule for numerical integration.

SYLLABUS

UNIT-I
Point estimation: Properties of estimators – Unbiasedness, consistency, sufficiency and efficiency – M.L.E. – Definitions and simple problems.

UNIT-II
Testing of significance-Large sample test with regards to proportion and mean, difference between proportions and means.

UNIT-III
Testing of significance-Exact sample tests based on 't' and F distributions with regard to mean, variance and correlation co-efficient-Test based on chi-square distribution. Analysis of Variance - One way classification - Two way classifications.

UNIT-IV
Design of Experiments- Analysis of CRD-Analysis of RBD- Analysis of variance for one missing value (RBD, LSD).

UNIT-V
Numerical Integration: General Quadrature for equidistant ordinate - Trapezoidal Rule-Simpson's 1/3rdand 3/8th rules.

TEXT BOOKS

1. Gupta, S.C. and V.K. Kapoor (1978), Fundamentals of Applied Statistics, Sultan Chand& Sons, New Delhi.
2. ShankerRao, G. Numerical Analysis, New Age International (P) Limited, New Delhi.

REFERENCE BOOKS

1. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

WEB RESOURCES

1. http://www.stat.colostate.edu/computationalstatistics/
2. http://www.stat.ucdavis.edu/undergrad/computational-statistics

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Unbiasedness, consistency, sufficiency and efficiency and M.L.E.	Remember, Understand, Apply
CO2	Testing of significance-Large sample test	Understand, Apply
CO3	Testing of significance-Exact sample tests based on 't' and F , One way classification - Two way classifications.	Understand, Apply, Analyze
CO4	Analysis of CRD-Analysis of RBD for one missing value	Understand, Apply, Analyze
CO5	Know the concept of interval estimation, Confidence intervals for parameters of some distributions	Understand, Apply, Analyze

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	L	S	M	S	M	S	S
CO2	L	M	M	M	S	L	S	S	M	S
CO3	M	L	L	L	S	L	S	S	S	M
CO4	S	M	S	S	M	S	M	S	S	S
CO5	L	S	S	M	S	S	S	M	M	M

*S- Strong; M-Medium; L-Low

SEMESTER - V and VI

22USTP3	Core Practical - III: Applied Statistics

OBJECTIVE

The main objectives of this course are to:

1. To measure the growth of population, birth and death rates and to estimate life expectancy.
2. To know various control charts for variables and attributes, apply the methods to real life situations.
3. To know how to analyse time series data.

SYLLABUS

UNIT-I

Fertility rates – TFR, GRR and NRR – Mortality rates – Crude Birth and Death Rates – ASDR, Infant Mortality Rate and Standardized Death Rate- Construction of complete life table.

UNIT-II

Construction of control charts for Mean and Range, Mean and Standard Deviation, Fraction defectives, Number of defectives and the number of defects per unit.

UNIT-III

Control chart for fraction defectives(varying Sample Size)-Control Chart for Number of Defectives(Varying Sample size)-Single Sampling Plan and Sequential Sampling Plan for attributes.

UNIT-IV

Construction of Price and Quantity index numbers (Laspeyre's , Paasche's, Marshall, Bowley's and Fisher), Optimum tests of index numbers – Time Reversal Test and Factor Reversal Test - Construction of cost of living index number

UNIT-V

Determination of trend by method of moving averages, least squares method – Computation of seasonal indices by Method of Simple averages, Ratio to Moving Average method, Ratio to trend method and the Method of Link Relatives.

TEXT BOOKS

1. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Gupta, S.C. and V.K. Kapoor (1978), Fundamentals of Applied Statistics, Sultan Chand& Sons, New Delhi.

REFERENCE BOOKS

1. Gupta, C.B. and Vijay Gupta (1998), An Introduction to Statistical Methods, Sultan Chand& Sons, New Delhi.

2. Gupta, S.P. (2004), Statistical Methods, Sultan Chand & Sons, New Delhi.

WEB RESOURCES

1. https://www.youtube.com/watch?v=GuV1ptJqmjA&t=63s

2. https://www.youtube.com/watch?v=OH8ZDIwjlJ4&list=PL9aVpS8B8Cg4waA31_f 0Y0fKBRitxMUMQ

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS VERB
CO1	Compute various demographic Measures	Evaluate
CO2	Construct Process control charts for mean , Range and Standard deviation.	Evaluate
CO3	Construct Process control charts for attributes and Construct OC, ASN, AOQ and ATI curves for sampling plans	Evaluate and Create
CO4	Compute various types of Index numbers.	Evaluate
CO5	Compute the trend values and seasonal indices for a time series.	Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	L	M	S	L	S	S

CO2	S	S	S	S	L	M	S	L	S	S
CO3	S	S	S	S	L	M	S	L	S	S
CO4	S	S	S	S	L	M	S	L	S	S
CO5	S	S	S	S	L	M	S	L	S	S

S- Strong; M-Medium; L-Low

SEMESTER - V and VI

22USTP4	**Core Practical - IV: Inference and Design of Experiments**

OBJECTIVE

The main objectives of this course are to:

1. To understand the procedures for testing the parameters based on Large samples and Small samples.
2. To understand the Non Parametric methods.
3. To understand the various designs and the method of analyzing them.

SYLLABUS

UNIT-I

Method of Moments: Problems based on Binomial, Multinomial, Poisson and Exponential distributions. Maximum likelihood Estimation: Problems based on Uniform, Normal, Exponential distributions.

UNIT-II

Tests for Goodness of fit: Binomial, Poisson and Normal Distributions. Chi square test for independence of Attributes.

UNIT-III

Testing of significance: Large sample – proportion and difference of proportions, mean and difference of means

UNIT-IV

Small sample tests: Test for single mean, difference of means based on independent and dependent Samples, test for single variance and two variances, test for correlation coefficient.

UNIT-V

Analysis of CRD, RBD, LSD design , Missing plot technique for RBD and LSD (one missing value) – Factorial experiments: 2^2 design and 2^3 Design.

TEXT BOOKS

1. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Gupta, C.B. and Vijay Gupta (1998), An Introduction to Statistical Methods, Sultan Chand& Sons, New Delhi.

REFERENCE BOOKS

.

1. Gupta, S.P. (2004), Statistical Methods, Sultan Chand & Sons, New Delhi.

WEB RESOURCES

1. https://www.youtube.com/watch?v=aWhIlCOImXg
2. https://www.youtube.com/watch?v=Q1yu6TQZ79w

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Estimate the parameters by MLE and method of moments	Apply
CO2	Fit the standard distributions and test the goodness of fit.	Evaluate
CO3	Test the hypothesis for proportion, mean and standard deviation based on large samples.	Evaluate
CO4	Test the hypothesis for mean and variance based on small samples.	Evaluate
CO5	Perform the analysis of various for various designs	Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	L	M	S	L	S	S
CO2	S	S	S	S	L	M	S	L	S	S
CO3	S	S	S	S	L	M	S	L	S	S
CO4	S	S	S	S	L	M	S	L	S	S
CO5	S	S	S	S	L	M	S	L	S	S

*S- Strong; M-Medium; L-Low

ALLIED COURSES

(Common to B.Sc. Maths, B.Sc. Computer Science and BCA)

SEMESTER - III

22ASTM1	**Allied – II - Course - I: Mathematical Statistics-I**

OBJECTIVE

The main objectives of this course are to:

1. To know the meaning of random variable and its probability distribution.
2. To understand the statistical constants and the methods of deriving them.
3. To derive the moments of a distribution.
4. To understand the relation between t, F & Chi-square
5. To understand the methods of curve fitting.

SYLLABUS

UNIT – I

     Random Variable – Discrete and Continuous Random Variables – Distribution Functions – Marginal and Conditional distributions. Mathematical Expectation, Moment generating function - Chebychev's inequality.

UNIT – II

Standard Discrete distributions: Binomial and Poisson distribution; Derivation of moments, moment Generating Function, Additive property and Recurrence relation for the central moments. Problems based on Binomial and Poisson distributions.

UNIT – III

Standard Continuous Distributions: Uniform Distribution: Derivation of Mean and Variance. Normal distribution: Derivation of Mean, Median and Mode, Odd order and even order central moments, Moment Generating Function and Additive property, Properties of Normal distribution. Problems.

  Exact sampling distributions: Mean and Variance of chi-square distribution, student's 't' distribution, F distribution – Relationship between t, F and Chi-square.

UNIT – IV

B.Sc. (Statistics)   *2022 – 2023 onwards*

Correlation and Regression: Correlation coefficient, Rank correlation coefficient and their properties, Regression Lines. Regression coefficient and properties – Partial and multiple correlation coefficients (for 3 variables only).

UNIT –V

Curve Fitting: Fitting of a straight line – Fitting of a second degree parabola – Fitting of power curve – exponential curve.

TEXT BOOKS

1. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS

1. Gupta, C.B. and Vijay Gupta (1998), An Introduction to Statistical Methods, Sultan Chand & Sons, New Delhi.
2. Gupta, S.P. (2004), Statistical Methods, Sultan Chand & Sons, New Delhi.
3. Sancheti, D.C. and V.K. Kapoor (2005), Statistics, 7th Edition, Sultan Chand & Sons, NewDelhi

WEB RESOURCES

1. https://www.youtube.com/watch?v=5k6RFJw1t8s&t=36s
2. https://www.youtube.com/watch?v=BGvxNHFRLCM&t=4s
3. https://www.youtube.com/watch?v=mrCxwEZ_22o
4. https://www.youtube.com/watch?v=uqlO5y6CJc8
5. https://www.youtube.com/watch?v=08aaJU_UhJY

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Find the characteristics of a random variable from its probability distribution	Remember and Understand
CO2	Apply the results of standard distributions to real life problems.	Apply
CO3	Compute the intensity of relationship between any two variables.	Apply
CO4	Estimate the value of one variable when the value of a related variable is known	Evaluate
CO5	Fit statistical models for real time data	Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	L	L	L	L	S	S
CO2	S	S	S	S	L	L	L	L	S	S
CO3	S	S	S	S	L	L	L	L	S	S
CO4	S	S	S	S	L	L	L	L	S	S
CO5	S	S	M	L	S	M	S	M	S	S

*S- Strong; M-Medium; L-Low

(Common to B.Sc. Maths, B.Sc. Computer Science and BCA)

SEMESTER - IV

22ASTM2	**Allied – II - Course - II: Mathematical Statistics - II**

OBJECTIVE ives of this course are :

1. To know the basic concepts of sample, population, statistic and parameter.
2. To know the concepts of point and interval estimation.
3. To know the characteristics of a good estimator.
4. To know the method that gives the best estimators.
5. To test the deviation between the observed sample statistic and the hypothetical value.

SYLLABUS

UNIT – I

Concept of Population, Sample, Statistic, Parameter. Estimation: Point estimation- Concept of point estimation, Criteria for good Estimators - Consistency, unbiasedness, efficiency (Cramer-Rao Inequality) and sufficiency (Rao- Blackwell theorem)**.[Problems based on Binomial, Poisson, and Normal distributions only]**

UNIT – II

Methods of Estimation: Maximum Likelihood and method of Moments**.[Problems based on Binomial, Poisson and Normal distributions only]**, properties of these estimators- Interval Estimation: Concept - Confidence intervals for proportion and mean, Difference between proportions and means.

UNIT – III

Testing of hypothesis: Concepts of statistical hypothesis, Simple and Composite hypothesis –Errors – Critical Region – Power of a test – Neyman-Pearson Lemma – Simple Problems.

UNIT – IV

Testing of significance – Standard Error – Large Sample test with regard to proportion, mean, difference between proportions and means.

UNIT – V

Testing of Significance – Exact sample tests based on 't' and F distributions with regard to mean, variance and correlation coefficient –Chi-square test for single variance – Independence of Attributes – Goodness of fit.

TEXT BOOKS

1 Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS

1. Gupta, C.B. and Vijay Gupta (1998), An Introduction to Statistical Methods, Sultan Chand& Sons, New Delhi.
2. Gupta, S.P. (2004), Statistical Methods, Sultan Chand & Sons, New Delhi.

WEB RESOURCES

1. https://www.youtube.com/watch?v=VK-rnA3-41c
2. https://www.youtube.com/watch?v=XepXtl9YKwc

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Verify the properties of an estimator	Understand
CO2	Apply various methods of estimation	Understand and Apply
CO3	Understand the terminologies of the testing the hypothesis.	Analyze
CO4	Test the parameters based on large samples.	Evaluate
CO5	Test the parameters based on small samples.	Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	L	L	L	L	S	S
CO2	S	M	M	L	L	S	L	L	S	S
CO3	S	S	S	S	L	L	L	L	S	S
CO4	S	S	S	S	L	L	L	L	S	S
CO5	S	S	S	S	L	L	L	L	S	S

*S- Strong; M-Medium; L-Low

(Common to B.Sc. Maths, B.Sc. Computer Science and BCA)

SEMSESTER - III & IV

22ASTMP	Allied – II - Practical : Mathematical Statistics

B.Sc. (Statistics)   *2022 – 2023 onwards*

1. To understand the methods of computing the Measures of central tendency,

    Dispersion, Correlation and Regression coefficients.

2. To know the methods of fitting probability distributions.

3. To know the tests of significance based on small and large samples.

SYLLABUS

UNIT – I

Computation of Measures of Central Tendency, Dispersion (Absolute and Relative) -

Measures of Skewness and Kurtosis.

UNIT – II

Fitting of Binomial, Poisson and Normal distributions and Test the goodness of fit.

UNIT – III

Curve Fitting: Fitting of a straight line, Second degree equation, $Y = ae^{bx}$, $Y = ab^x$ and $Y = ax^b$.

UNIT – IV

Computation of correlation co-efficient– Rank correlation co-efficient – Regression lines

(raw data).

UNIT – V

Asymptotic test with regard to proportion, difference of proportions and mean, difference
of means. Exact sample tests with regard to mean, variance, Paired t- test and
co-efficient of correlation – Test for Independence of Attributes.

TEXT BOOKS

1. Gupta, S.C. and V.K. Kapoor (2007), Fundamentals of Mathematical Statistics, Sultan Chand
   & Sons, New Delhi.

REFERENCE BOOKS

1 Gupta, C.B. and Vijay Gupta (1998), An Introduction to Statistical Methods, Sultan Chand &
Sons, New Delhi.

2. Gupta, S.P. (2004), Statistical Methods, Sultan Chand & Sons, New Delhi.

3. Sancheti, D.C. and V.K. Kapoor (2005), Statistics, 7th Edition, Sultan Chand & Sons,
   New Delhi

WEB RESOURCES

1. https://www.youtube.com/watch?v=5k6RFJw1t8s&t=36s

2. https://www.youtube.com/watch?v=BGvxNHFRLCM&t=4s

3. https://www.youtube.com/watch?v=mrCxwEZ_22o

4. https://www.youtube.com/watch?v=uqlO5y6CJc8

5. https://www.youtube.com/watch?v=08aaJU_UhJY

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Determine the measure of location for real life problem in various fields.	Apply
CO2	Fit the discrete and continuous distribution	Apply, Analyze
CO3	Compute the relationship between any two variables.	Apply, Analyze
CO4	Test the significance of proportion, Mean and Variance	Analyze, Evaluate
CO5	Test the independence of attributes	Analyze, Evaluate

MAPPING WITH PROGRAM

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	M	L	M	S	S
CO2	S	S	S	S	M	M	M	L	S	S
CO3	S	S	S	S	L	M	M	M	S	S
CO4	S	S	S	S	M	L	M	L	S	S
CO5	S	S	M	L	S	M	S	M	S	S

*S- Strong; M-Medium; L-Low

B.Sc. GEOGRAPHY

SEMESTER - I

22ASTG1	Allied – I - Course - I: Applied statistics - I

OBJECTIVE ...erstand the nature, Classification, presentation and analysis of statistical data.

2. To understand the methods of fitting a model relating two variables.

3. To understand the method of fitting a curve relating two variables.

SYLLABUS

UNIT – I

Nature and Scope of Statistical Methods – Limitations – Sources of data – Classification and Tabulation of data.

UNIT – II

Presentation of data: Diagrammatic representation – Bar diagram, Pie diagram, Histogram, Frequency Polygon and Frequency Curve, Ogive Curve.

UNIT – III

Formation of Frequency distributions – Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean – Measures of Dispersion: Absolute and Relative Measures- Range, Quartile Deviation, Mean Deviation, Standard Deviation and Co- efficient of Variation.

UNIT – IV

Concept of Correlation - Karl Pearson's Correlation Co-efficient, Spearman's Rank Correlation Co-efficient – Simple Problems – Concept of Regression – Regression equations – Simple Problems.

UNIT – V

Curve Fitting – Method of Least Squares - Principle of least squares – Fitting of Straight Line-Fitting of Second degree equation.

TEXT BOOKS

1. Gupta, S.C., and Kappor, V. K. (2019). Fundamentals of Applied Statistics, Fourth Edition, Sultan Chand & Sons (Publisher), New Delhi, India
2. Parimal, M. (1999), Applied Statistics, 2nd Edition, Books & Applied Ltd., Kolkata, India

3. Goon, A.M., Gupta, M. K., Dasgupta, B. (2016): Fundamentals of Statistics, Vol. II, World Press, Kolkata, India

REFERENCE BOOKS

1. Gupta. S.C & V.K Kapoor.(2002), Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.

2. Gupta. S.P (2004), Statistical Methods, Sultan Chand and Sons, New Delhi.

3. Goon, A.M., M.K. Gupta, B. Dasgupta (1977), An outline of Statistical Theory, The world Press Private Ltd, Calcutta.

4. Navnitham . PA (2004), Business Mathematics and Statistics, Jai Publishers, Trichy -22. Pillai R.S.N, V. Bagavathi (2001), Statistics, S. Chand and Company Ltd, New Delhi.

WEB RESOURCES

1. www.wikipedia.org/measures of central tendency.html

2. www.statsoft.com

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Collect the data using proper tools.	Remember, Understand, Apply
CO2	Classify, tabulate and present the data in diagrams and graphs.	Apply, Analyze, Evaluate
CO3	Locate the statistical measures using graphs.	Understand, Apply, Evaluate
CO4	Describe the characteristics of data in terms of statistical constants.	Apply, Analyze
CO5	Fit a straight line and a second degree parabola.	Understand, Apply, Evaluate

MAPPING WITH PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	S	M	S
CO3	S	S	M	S	S	M	M	S	S	S
CO3	S	S	M	M	S	M	S	S	M	S
CO4	S	S	S	M	S	M	M	S	M	S
CO5	S	S	S	M	M	S	M	M	M	S

*S- Strong; M-Medium; L-Low

B.Sc. GEOGRAPHY

SEMESTER - II

22ASTG2	Allied – I - Course - II: Applied statistics - II

OBJECTIVE

1. Be acquainted with the knowledge of time series analysis.

2. Understand the significance of index numbers and its types.

3. To verify optimality and evaluation of cost of living index numbers.

SYLLABUS

UNIT – I

Experiment: Random Experiment, Sample Space and Events - Addition and Multiplication theorems on Probability (Not more than 3 events) - Independence of events - Conditional Probability.

UNIT – II

Random Variables – Discrete and Continuous Random Variables – Probability Mass Function and Probability Density Function – Distribution Function – Mathematical Expectation and its Properties – Mean and variance, concepts of Binomial, Poisson and Normal Distributions (Derivations not required) – Simple Problems.

UNIT – III

Concept of Sampling Distributions – Standard Error – Testing of Significance – Large sample tests for mean, difference of means, Proportion and difference of proportions.

UNIT – IV

Small sample tests based on 't', chi-square and 'F' Statistics – Analysis of Variance – Concept and Assumptions – One way and Two way classifications.

UNIT – V

Sampling from finite population – Simple, Stratified and Systematic Sampling procedures – Estimation of mean and population total and their standard error – concept of sampling and non-sampling errors.

TEXT BOOKS

1. Gupta, S.C., and Kappor, V. K. (2019). Fundamentals of Applied Statistics, Fourth edition,

Sultan Chand & Sons (Publisher), New Delhi, India
2. Parimal, M. (1999), Applied Statistics, 2nd Edition, Books & Applied Ltd., Kolkata, India
3. Goon, A.M., Gupta, M. K., Dasgupta, B. (2016): Fundamentals of Statistics, Vol.II, World Press, Kolkata, India

REFERENCE BOOKS

1. Agarwal, B. L. (2006). Basic Statistics, New Age International Private Limited, New Delhi, India.

WEB RESOURCES

1. https://www.stat.berkeley.edu/~bartlett/courses/153-fall2010/lectures/1.pdf

2. http://www.gdcboysang.ac.in/About/droid/uploads/EconomicsPart4.pdf

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Identify the components of time series and the method of measuring trend.	Remember, Understand, Apply
CO2	Apply the different measures of variations to forecast the data.	Apply, Analyze, Evaluate
CO3	Construct, evaluate and interpret the index numbers.	Understand, Apply, Evaluate
CO4	Know the criteria for good index numbers	Apply, Analyze
CO5	Evaluate the cost of living index and interpret.	Understand, Apply, Evaluate

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	S	M	S
CO3	S	S	M	S	S	M	M	S	S	S
CO3	S	S	M	M	S	M	S	S	M	S
CO4	S	S	S	M	S	M	M	S	M	S
CO5	S	S	S	M	M	S	M	M	M	S

*S- Strong; M-Medium; L-Low

B.Sc. GEOGRAPHY

SEMESTER - I & II

22ASTGP	**Allied – I - Practical : Applied Statistics**

OBJECTIVE

1. Be acquainted with the knowledge of time series analysis.

2. Understand the significance of index numbers and its types.

3. To verify optimality and evaluation of cost of living index numbers.

SYLLABUS

UNIT – I

Construction of Univariate Frequency Distributions – Diagrammatic and Graphical Representation of Statistical data – Cumulative Frequency Curve.

UNIT – II

Computation of Measures of Central Tendency - Computation of Measures of Dispersion – Co-efficient of Variation.

UNIT – III

Computation of Correlation Co-efficient (Raw data) and Rank correlation Co- efficient – Regression Equations –Fitting of $Y = a + bx$, $Y = a + bx + cx^2$ by the Method of Least Squares.

UNIT – IV

Testing of Goodness of Fit – Large Sample Tests for Proportion, Mean, difference between Means and difference of Proportions – Small Sample Tests for Mean and difference of Means -Test for variance.

UNIT – V

Sampling: Estimation of mean and population total. Analysis of Variance: One Way and Two Way Classifications.

TEXT BOOKS

1. Gupta, S.C., and Kappor, V. K. (2019). Fundamentals of Applied Statistics, Fourth Edition,   Sultan Chand & Sons (Publisher), New Delhi, India
2. Parimal, M. (1999), Applied Statistics, 2nd Edition, Books & Applied Ltd., Kolkata, India
3. Goon, A.M., Gupta, M. K., Dasgupta, B. (2016): Fundamentals of Statistics, Vol. II, World Press, Kolkata, India

REFERENCE BOOKS

1. Agarwal, B. L. (2006). Basic Statistics, New Age International Private Limited, New Delhi, India.

WEB RESOURCES

1. https://www.stat.berkeley.edu/~bartlett/courses/153-fall2010/lectures/1.pdf

2. http://www.gdcboysang.ac.in/About/droid/uploads/EconomicsPart4.pdf

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Identify the components of time series and the method of measuring trend.	Remember, Understand, Apply
CO2	Apply the different measures of variations to forecast the data.	Apply, Analyze, Evaluate
CO3	Construct, evaluate and interpret the index numbers.	Understand, Apply, Evaluate
CO4	Know the criteria for good index numbers	Apply, Analyze
CO5	Evaluate the cost of living index and interpret.	Understand, Apply, Evaluate

MAPPING WITH PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	S	M	S
CO3	S	S	M	S	S	M	M	S	S	S
CO3	S	S	M	M	S	M	S	S	M	S
CO4	S	S	S	M	S	M	M	S	M	S
CO5	S	S	S	M	M	S	M	M	M	S

*S- Strong; M-Medium; L-Low

(Common to B.B.A. / B.Com. / B.Com. (CA) / B.Com. Co-operation)

SEMESTER - III

22ASTC1	Allied – II - Course - I: Business Statistics - I

The main objectives of this course are to:

1. To understand the methods of data collection and presentation of data.
2. To understand the methods of studying the statistical properties of data.
3. To understand the method of Averages, dispersion and skewness.
4. To understand the meaning of Operations Research and methods of solving LPP.

SYLLABUS

UNIT-I

Statistics: Meaning and definition of statistics - Scope and Limitations - Primary and Secondary data - Collection of data - Sources of data collection - classification and Tabulation. Variables in commerce and management.

UNIT-II

Diagrams - Bar diagram - Pie diagram - Graphs - Histogram, Frequency polygon and Frequency curve. Frequency Distribution - Univariate and Bivariate Distribution.

UNIT-III

Measures of central tendency - Mean, Median, Mode, Geometric Mean and Harmonic Mean. Merits and Demerits.

UNIT-IV

Measures of dispersion - Absolute and relative measures – Co-efficient of Variations - Measures of skewness -Karl-Pearson's and Bowley's coefficient of skewness. Applications in commerce and management.

UNIT-V

Introduction of Operations Research (O.R.) - Scope of O.R. - Definition - Concept of Linear Programming Problem (LPP) – Mathematical formulation of LPP (2 variables only).Graphical method for maximization and minimization (simple problems only).

TEXT BOOKS

1. Gupta, S.P, P.K. Gupta and Manmohan (1980), Business Statistics and Operations Research, Sultan Chand & Sons, New Delhi.
2. Navnitham, PA. (2004), Business Statistics, Jai Publishers, Trichy -22.

3. Pillai, R.S.N. and V. Bagavathi (2001), Statistics, Sultan Chand and Company Ltd, New Delhi.

REFERENCE BOOKS

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

2. Sharma J,K.BusinessStatistics, Vikas Publishing House, Chennai.

WEB RESOURCES

1. https://youtu.be/Aydqi-mPdf4
2. https://youtu.be/dLJp6DrPArk
3. https://youtu.be/NDO9SzxR3Vg
4. www.wikipedia.org/data collection.html
5. www.wikipedia.org/measures of central tendency.html

COURSE OUTCOMES

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

S. No.	Course Outcome	Blooms Verb
CO1	Explain scope, limitations and data collections.	Remember to Apply
CO2	Understand the data in table and represent the data in diagrams and graphs.	Remember to Evaluate
CO3	Analyse the measures of central tendency and dispersion.	Analyze, Evaluate
CO4	Analyze and solve the LPP using graphical method.	Analyze to Create
CO5	Construct LPP Models for given circumstances.	Understand, Create

MAPPING WITH PROGRAM OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	S	S	S	S	S	M	S
CO2	S	S	L	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	S	S	M	S
CO4	S	S	M	S	S	S	S	S	M	S
CO5	S	S	M	S	S	S	S	S	M	S

*S- Strong; M-Medium; L-Low

(Common to B.B.A. / B.Com. / B.Com. (CA) / B.Com. Co-operation)

SEMESTER - IV

22ASTC2	Allied – II - Course - II: Business Statistics - II

OBJECTIVE

The main objectives of this course are to:

1**.** To understand the methods of studying the relationship between variables.

2. To understand the methods of constructing index numbers.

3. To understand the method of analyzing the time series.

4. To understand the methods of solving transportation and assignment problems.

SYLLABUS

UNIT-I

Simple correlation: Types of correlation - Scatter diagram - Karl Pearson's coefficient of correlation - Rank correlation coefficient - Linear regression lines - Applications in commerce and management.

UNIT-II

Time series analysis: Components of time series - Methods of Measures of trend: Free hand curve method - Semi average method and moving average method - Method of Least squares - Measures of seasonal variation - Simple average method - Applications in commerce and management.

UNIT-III

Index numbers : Definition - Construction of Index numbers - Weighted and unweighted methods: Paasche's, Laspeyre's, Bowley's, Marshall Edgeworth and Fisher's - Fixed and chain base index numbers - Test for index numbers - cost of living index number- Business problems.

UNIT-IV

Transportation Problem: Initial basic feasible solutions - Methods – North-West Corner Rule - Least Cost Method - Vogel's Approximation Method - Optimum solutions (MODI Method: Simple problems only- without loop).Assignment Problem: Hungarian Method - Balanced and Unbalanced.

UNIT-V

Matrices: Fundamental ideas - Matrices and their operations. Addition, Subtraction, Multiplication and scalar division - Inverse of square matrix (not more than order 3*3) - Solving simultaneous linear equations: Cramer's rule - Matrix inversion method (simple problems only).

TEXT BOOKS

1. Gupta, S.P, P.K. Gupta and Manmohan (1980), Business Statistics and Operations Research, Sultan Chand & Sons, New Delhi.

2. Navnitham , PA. (2004), Business Statistics, Jai Publishers, Trichy -22.

3. Pillai, R.S.N. and V. Bagavathi (2001), Statistics, Sultan Chand and Company

   Ltd, New Delhi**.**

REFERENCE BOOKS

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

2. Sharma J,K.Business Statistics, Vikas Publishing House, Chennai

WEB RESOURCES

1. https://youtu.be/8dPkvu4gAvc
2. https://youtu.be/3P62Odhegs
3. https://youtu.be/FPM6it4v8MY
4. www. gfumbanotes.files.worldpress.com
5. www.wikipedia.org/operations research.html
6. www.statpage.org

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

S. No.	Course Outcome	Blooms Verb
CO1	Understand the methods of studying trends and tendencies in data.	Remember to Apply
CO2	Measure the trend and identify its type and construct seasonal indices	Remember to Evaluate
CO3	Understand the methods of analyzing Time series	Analyze, Evaluate
CO4	Construct weighted and unweighted index numbers	Analyze, Evaluate
CO5	Analyze the optimum schedule and assignment schedule	Apply to Evaluate

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	L	S	S	S	S	S	M	S
CO2	S	S	L	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	S	S	M	S
CO4	S	S	M	S	S	S	S	S	M	S
CO5	S	S	M	S	S	S	S	S	M	S

*S- Strong; M-Medium; L-Low