DEPARTMENT OF STATISTICS

COURSE STRUCTURE AND SYLLABUS

FOR

BACHELOR OF ARTS

(UNDER CHOICE BASED CREDIT SYSTEM)

🟨	Skill Development
🟦	Employability
🟥	Entrepreneurship
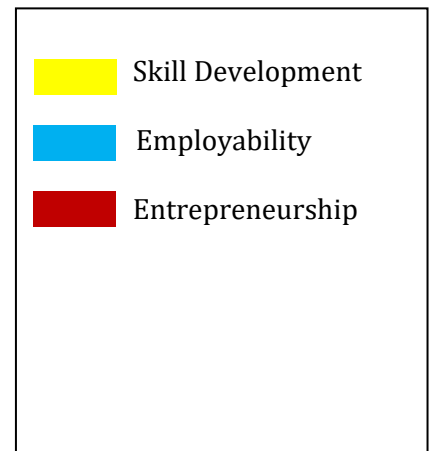
Department of Statistics
Rama Devi Women's University
Vidya Vihar, Bhubaneswar-751022

Sl. No.	Semester	Paper Code	Title of the course	Full Mark	End-Term Marks	Mid-Term Mark	Practical Marks	Credit Point
1	1st	AECC-I	Environmental Science	100	80	20	-	6
		CC I	Descriptive Statistics	100	60	15	25	6
2		CC II	Algebra	100	60	15	25	6
3		G.E-I	Statistical Methods	100	60	15	25	6
	Total			400				24
5	2nd	AECC-II	Alternative English/MIL/Hindi	100	80	20	-	6
		CC III	Probability and Probability Distributions	100	60	15	25	6
6		CC IV	Calculus	100	60	15	25	6
7		G. E-II	Introductory Probability	100	60	15	25	6
	Total			400				24
9	3rd	CC V	Sampling Distributions	100	60	15	25	6
10		CC VI	Survey Sampling & Indian Official Statistics	100	60	15	25	6
11		CC VII	Mathematical Analysis	100	60	15	25	6
		SEC-I	Communicative English	100	80	20	-	6
	Total			400				24
13	4th	CC VIII	Statistical Inference	100	60	15	25	6
14		CC IX	Linear Model	100	60	15	25	6
15		CC X	Statistical Quality Control	100	60	15	25	6
		SEC-II	Quantitative Aptitude & LogicalThinking	100	80	20	-	6
	Total			400				24
16	5th	CC XI	Stochastic Process & Queuing Theory	100	60	15	25	6
17		CC XII	Statistical Computing Using C & R Programming	100	60	15	25	6
18		DSE I	Operations Research	100	60	15	25	6

19		DSE II	Time Series Analysis	100	60	15	25	6
	Total			**400**				**24**
20	6th	CC XIII	Design Of Experiments	100	60	15	25	6
21		CC XIV	Multivariate Analysis And Non Parametric Methods	100	60	15	25	6
22		DSE III	Demography And Vital Statistics	100	60	15	25	6
23		DSE IV	Econometrics	100	60	15	25	6
		DSE IV	PROJECT		60	40	-	
	Total			**400**				**24**
			ETHICS & VALUE IN EACHSEMESTER					6
	Grand Total							**150**

Programme Outcomes

PO1: Enhanced Critical Thinking: This course aims to cultivate students' critical thinking abilities by providing them with a logical and methodical approach to analysing fundamental statistical issues. Through computational and analytical exercises, students will strengthen their reasoning skills.

PO2: Improved Analytical Reasoning: Students will develop the capacity to identify logical flaws and inconsistencies in the arguments put forth by statisticians. They will learn to analyse and synthesize data from diverse sources, enabling them to draw well-founded conclusions.

PO3: Enhanced Mathematical Thinking: This course aims to enhance students' mathematical abilities, enabling them to make more logical and informed decisions. By strengthening their computational and analytical skills, students will develop a solid foundation for applying mathematics in various contexts.

PO4: Comprehensive Statistical Knowledge: The curriculum will provide students with a comprehensive understanding of statistics, covering a wide range of topics. As a result, students will not only grasp important statistical techniques but also be able to apply them to different fields.

PO5: Research Proficiency: Students will develop original thinking skills, enabling them to formulate new problems and provide innovative solutions. This ability to think critically will benefit both their own field of study and those practicing statistics.

PO6: Effective Problem Solving: Students will learn to examine various hypotheses systematically and seek relevant resources to find rational answers. This problem-solving approach will enable them to tackle complex statistical challenges with confidence.

PO7: Proficient Data Handling: Students will gain the ability to analyse, interpret, and draw meaningful conclusions from quantitative and qualitative data. They will critically evaluate ideas, evidence, and experiences using an unbiased and consistent approach.

PO8: Polished Presentation Skills: The course will develop students' presentation skills, enabling them to effectively communicate statistical results through clear and visually appealing graphs, figures, histograms, and mathematical models. These skills will prove valuable in their future careers.

PO9: Mathematical and Programming Proficiency: The course will enhance students' mathematical problem- solving abilities and equip them with diverse programming skills. They will learn to mathematically formulate problems and utilize programming techniques to solve them effectively.

PO10: Effective Communication: Upon completion of the course, students will develop strong and confident communication skills. They will be able to articulate statistical concepts and findings clearly and effectively, fostering effective communication in both academic and professional settings.

Programme Specific Outcomes

PSO1: A student will have an idea about the basics of Statistics.

PSO2: Students get equipped with statistical model developing ability, problem solving capability along with developmentof creative talent and communication skill that is essential for
Employment.

PSO3: Students will be able to apply their skill and knowledge in various fields like
Education,Research, Business Analytics and Data Science.

PSO4: Students get adequate exposure to global and local concerns that explore many aspects of mathematical sciences.

PSO5: The students are enabled to develop a positive attitude towards statistics as an interesting and valuable subject ofstudy.

AECC-1 ENVIRONMENTAL SCIENCE & DISASTER MANAGEMENT

Course Outcomes:

After reading this paper, students will be able to

I. Understand about problems of environmental pollution and Impact of pollution on human and ecosystem and control measures.
II. Learn about increase in population growth and understand the issues of use of resources in proper manner leading to sustainable development.
III. Learn about causes and impacts of Disasters and Case studies of National and Global disasters and risk reduction approaches of Disasters with safety issues in mitigating Industrial disasters.
IV. Acquire basic idea about the mode of transmission and course of some communicable and non-communicable diseases and knowledge on the Importance and methods of prevention of epidemics and pandemics.

Unit-I (Environment)

The Environment: The Atmosphere, Lithosphere, Hydrosphere, Biosphere (01 period) Ecosystem: Energy flow in the ecosystem (01 period) Biogeochemical Cycle: Water Cycle, Carbon Cycle, Nitrogen Cycle (02 periods) Pollution: Water Pollution, Air Pollution, Soil Pollution, Radiation Pollution, Industrial Pollution, Light Pollution, Sound Pollution (05 periods) Environmental Laws (Water Act 1974, Air Act 1981, The Wildlife Protection Act 1972, The Environment Protection Act 1986), The Forest Conservation Act1980 (04 periods).

Unit-Il (Climate Change & Sustainable Development)

Population Ecology: Individuals, Species, Population, Community (01 period) Human Population Growth, Population Control Methods (01 period) Urbanization and its effect on society (01 period).

Climate Change: Causes, effect, Global Warming, Carbon footprint and environmental protection (05 periods).

Steps taken towards sustainable development: Ban of single-use plastics, Automobile Scrapping Policy, Promotion of Electrical Vehicles (03 periods) Brief idea on Sustainable Development Goals (SDGs), Agenda 21 of Rio Earth Summit (02 periods).

Unit-Ill (Disaster Management)

Disaster Management: Types of disasters (Natural and Man-made) and their causes and effect) (02 periods)

Vulnerability Assessment and Risk Analysis: Vulnerability to various disasters (Flood, Cyclone, Earthquake, Heat waves and Lightning) (02 periods)

Institutional Framework: Institutional arrangements for disaster management

(National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), District Disaster Management Authority (DDMA), National Disaster Response Force (NDRF) and Odisha Disaster Rapid Action Force (ODRAF) (02 periods)

Preparedness Measures: Disaster Management Cycle, Early Warning System, Pre-Disaster and PostDisaster Preparedness, Strengthening of SDMA and DDMA, Community Preparedness, Stakeholder participation, Corporate Social Responsibility (CSR) (05 periods) Survival Skills: Survival skills adopted during and after disaster (Flood).

Unit-IV (Public Health Management)

Brief idea on Epidemics and Pandemics (01 period)

Non-communicable diseases with special reference to cardiovascular diseases, Cancer, Diabetes, Hypertension and Obesity and their prevention (02 periods)

Communicable diseases with special reference to Covid-19, Flu, Hepatitis, AIDS and Tuberculosis and their transmission (02 periods)

Dynamics of Disease Transmission: Mode of transmission (Direct/indirect), Events after infection: Immunity (Active vs. Passive, Innate vs. Acquired, Herd Immunity), Incubation Period (02 periods)

Prevention of Epidemics/Pandemics Diseases: Preventing Measures (Quarantine, Sanitization, Personal Protective measures such as Hand washing and use of protective devices, Vaccination); Control Measures (Surveillance, Isolation, Contact Tracing) (03 Periods)

Life Style management (Diet, Physical Exercise, Yoga and sleeping habit) (02 periods)

Role of Different Sectors in Managing Health Disaster: Role of Government (Centre and State), Community, Civil Society, Student mass, NGOs (01 period)

Books Recommended:
1. Asthana DK and Asthana M: A Text Book of Environmental Studies, S. Chand, New Delhi
2. Bharucha E: A Text Book of Environmental Studies, New Delhi:UGC
3. Dash MC and Mishra PC: Man and Environment, McMillan,London
4. Disaster Management and Mitigation Plan,2013 of Dept. of Health & Family Welfare, Govt. of Odisha*
5. Mishra DD: Fundamental Concepts in Environmental Studies, S. Chand, New Delhi
6. National Policy on Disaster Management,2009*
7. National Disaster Management Plan,2019*
8. Odum EP: Fundamentals of Ecology, Natraj Publications
9. State Disaster Management Plan, 2019 of Government of Odisha* Standard

Operating Procedure (SOP) issued by Govt. of India and Govt. Of Odisha on Public Health Managements in the websites: www.mohfw.gov.in and health.odisha.gov.in*

10. The Disaster Management Act, 2005 of Government of India* [Note: Star (*) marked

References, published by the State as well as Central Government are available in the open sources]

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	2	2	2	4	4	4	4	4	2
CO2	1	2	4	2	2	2	2	4	2	2
CO3	1	2	5	2	2	2	2	4	2	2
CO4	1	1	2	1	2	5	2	2	1	1

CC I: Descriptive Statistics

Course Outcomes:

CO1: Understand the fundamental concepts of statistics, including population, sample, and thescope of statistics.

CO2: Differentiate between quantitative and qualitative data, and grasp the scales ofmeasurement.

CO3: Learn effective methods for presenting data using tables and graphs, and analyse dataconsistency and independence.

CO4: Acquire knowledge and skills in measures of central tendency and dispersion, includingrange, standard deviation, skewness, and kurtosis.

CO5: Develop proficiency in analysing bivariate data through scatter diagrams, correlation analysis, and simple linear regression.

Syllabus:

Unit-I:	**Statistical Methods:** Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement nominal, ordinal, interval and ratio. Presentation: tabular and graphical, including histogram and Ogives, consistency and independence of data with special reference to attributes.
Unit-II:	**Measures of Central Tendency:** mathematical and positional. Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation,

Coefficient of Variation, Moments, Absolute Moments, Factorial Moments, Skewness and Kurtosis, Sheppard's Corrections.

Unit-III: **Bivariate data:** Definition, Scatter Diagram, Simple, Partial And Multiple Correlation (3 variables only), Rank Correlation. Simple linear regression, Principle of least squares and fitting of polynomials and exponential curves.

Unit-IV: **Index Numbers:** Definition, construction of index numbers and problems there of for weighted and unweighted index numbers including Laspeyre's, Paasche's, Edgeworth- Marshall and Fisher's Ideal Index numbers. Errors in Index numbers. Chain index numbers, conversion of fixed based to chain based index numbers and vice-versa. Consumer price index numbers. Uses and limitations of index numbers.

LIST OF PRACTICALS:

1. Graphical representation of data.
2. Problems based on Measures of Central Tendency.
3. Problems based on Measures of Dispersion.
4. Problems based on Moments, Skewness And Kurtosis.
5. Karl Pearson and rank correlation coefficient.
6. Lines of regression, angle between lines and estimated values of variables.
7. Calculate price and quantity index numbers using simple and weighted average of price relatives.

Prescribed Books:
1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. TheWorld Press, Kolkata.
2. Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals Of Mathematical Statistics, 4 thEdition(Reprint), Sultan Chand &Sons

Reference books:
(1) Miller, Irwin and Miller, Marylees(2006): John E.Freund's Mathematical Statistics with Applications,(7th Edn.), Pearson Education, Asia.
(2) Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Page Statistics, 3rdEdn., (Reprint), Tata McGraw-Hill Pub. Co.Ltd.
(3) Mukhopadhyay, P. (1999): Applied Statistics, New Central Book Agency,

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	4	4	5	5	4	5	4	4	5
CO2	4	5	4	5	5	5	5	5	4	5

CO3	5	4	4	5	5	4	5	4	4	2
CO4	4	4	4	5	5	4	5	4	5	2
CO5	4	5	4	5	5	5	5	4	4	2

CC II: Algebra

Course Outcomes:

CO1: Develop a solid understanding of the theory of equations, including the fundamental theorem of Algebra and its implications. Explore the relationship between the roots and coefficients of polynomial equations. Gain proficiency in vector spaces, subspaces, and related concepts such as the sum of subspaces, span of a set, linear dependence and independence, dimension, and basis.

CO2: Review and apply the algebra of matrices, including theorems related to triangular, symmetric, and skew-symmetric matrices. Explore properties of idempotent, Hermitian, skew Hermitian, orthogonal, singular, and non-singular matrices. Understand concepts like trace of a matrix, unitary matrices, involutory matrices, and nilpotent matrices.

CO3: Gain a comprehensive understanding of determinants of matrices, including their definition, properties, and applications for 3rd and higher orders. Learn techniques for evaluating determinants of order 3 and above using transformations. Explore the concepts of the adjoint and inverse of a matrix and their properties. Apply determinants in solving systems of linear equations, row reduction, echelon forms, and matrix equations of the form AX = B. Understand solution sets of linear equations and their applications.

CO4: Study the concept of rank in matrices, including row-rank and column-rank. Explore standard theorems on ranks, as well as the rank of the sum and product of two matrices. Understand characteristic roots and characteristic vectors, their properties, and the Cayley-Hamilton theorem. Gain knowledge of quadratic forms and their properties.

CO5: Apply the learned concepts to various practical applications, emphasizing the importance of linear equations and matrices in real-world scenarios such as engineering, physics, and computer science. Develop the ability to analyse and solve problems using matrix techniques and understand the significance of characteristic roots and vectors in practical situations.

Syllabus:

Unit-I: Theory of equations, statement of the fundamental theorem of Algebra and its consequences. Relation between roots and coefficients of any polynomial equations. Vector spaces, Subspaces, sum of subspaces, Span of a set, Linear

Unit-II: Algebra of matrices - A review, theorems related to triangular, symmetric and skew symmetric matrices, idempotent matrices, Hermitian and skew Hermitian matrices, orthogonal matrices, singular and non-singular matrices and their properties. Trace of a matrix, unitary, involutory and nilpotent matrices.

Unit-III: Determinants of Matrices: Definition, properties and applications of determinants for 3rd and higher orders, evaluation of determinants of order 3 and more using transformations. Adjoint and inverse of a matrix and related properties. Use of determinants in solution to the system of linear equations, row reduction and echelon forms, the matrix equations AX=B, solution sets of linear equations. Applications of linear equations.

Unit- IV: Rank of a matrix, row-rank, column-rank, standard theorems on ranks, rank of the sum and the product of two matrices. Characteristic roots and Characteristic vector, Properties of characteristic roots, Cayley Hamilton theorem and Quadratic forms.

List of Practicals:

1. Finding roots of an algebraic equations
2. Solution of linear equations by matrix method.
3. Rank and Inverse of a matrix
4. Characteristics roots and characteristics vector of a matrix.
5. Applications of matrices.

Prescribed Book:

1. Krishnamurthy V., Mainra V.P. and Arora J.L.: An Introduction to Linear Algebra (II, III, IV, V).

Reference Book:

1. Biswas, S. (1997): A Textbook of Matrix Algebra, New Age International,1997.
2. Gupta S.C.: An Introduction to Matrices (Reprint). Sultan Chand & Sons,2008.
3. Datta K.B.: Matrix and Linear Algebra. Prentice Hall of India Pvt. Ltd.,2002.
4. Hadley G.: Linear Algrbra. Narosa Publishing House (Reprint),2002.

5. Searle S.R.: Matrix Algebra Useful for Statistics. John Wiley &Sons.,1982.

6. Schaum'sOutlines : Linear Algebra, Tata McGraw-Hill Edition, 3rdEdition,2006.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	5	4	5	2	4	4	5	4	4	2
CO2	5	5	5	4	5	5	4	5	4	2
CO3	5	4	5	2	4	4	5	4	4	2
CO4	5	5	5	4	5	5	5	4	5	2
CO5	5	5	5	2	4	5	4	4	4	2

GE I: STATISTICAL METHODS

Course Outcomes:

CO1: The students are Introduced to different Statistical methods.

CO2: Data types and different methods of presenting data.

CO3: The students learn to measure the central tendencies of data. **CO4:** The students learn about Bivariate data and its characteristics.**CO5:** The students are taught about theory of attributes.

Syllabus:

Unit-I:	Introduction: Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio.Presentation: tabular and graphic, including histogram and ogives.
Unit- II:	Measures of Central Tendency: mathematical and positional. Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient Of Variation, Moments,Skewness

Unit-Ill:	Bivariate data: Definition, scatter diagram, simple and rank correlation. Simple linear regression, principle of least squares and fitting of polynomials, Applications.
Unit-IV:	Theory of attributes, consistency of data, independence and association of attributes, measures of association and contingency.

List of Practicals:

1. Graphical representation of data
2. Problems based on measures of central tendency
3. Problems based on measures of dispersion
4. Problems based on moments, skewness and kurtosis
5. Fitting of polynomials, exponential curves
6. Karl Pearson correlation coefficient
7. Spearman rank correlation with and without ties.
8. Correlation coefficient for a bivariate frequency distribution
9. Lines of regression, and estimated values of variables.
10. Checking consistency of data and finding association among attributes.

Prescribed Books:

1. Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals Of Mathematical Statistics, 4 thEdition(Reprint), Sultan Chand &Sons

2. Goon, A.M., Gupta M.K. & Das Gupta, Fundamentals of statistics, Vol.-I & II (2005).MAPPINGCOURSE OUTCOMES WITH PROGRAMME OUTCOMES

Reference Books:

1. Miller, Irwin and Miller, Marylees(2006):John E. Freund's Mathematical Statistics withApplications, (7th Edn.), Pearson Education, Asia.

2. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rdEdn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	4	5	5	4	4	5	4	4	4
CO2	4	5	2	4	5	5	4	5	4	4
CO3	5	4	5	5	2	4	5	4	4	4
CO4	4	2	5	4	5	4	5	4	5	4
CO5	4	5	4	5	4	5	4	4	4	4

- Note related: 1
- From What Related: 2
- Neutral: 3
- Moderately Related: 4
- Highly Related: 5

ETHICS AND VALUES

(UNIT 1)

Course Outcome:

After reading this paper the students will be able to

I. Have changes in their perceptions and practices towards women and eve lop proper
attitude towards women and value their work and contribution.

II. Come forward to challenge the unethical treatments against women.

III. End gender-based hierarchy and hegemony, remove the feeling that women are counter to men and bring about a complementarity among the hitherto existing gender binary.

IV. Pioneer in creating a gender equal society where the well-being, happiness and security of the women will be well protected & contributing towards a better and happier society

Unit-1

Title: - Issues Relating to Women

Total no. of Periods-15   **Full mark-25**   **Credit point -1**

1.0 Aims of the Unit:

- *The module aims to generate a sensitivity among the students towards women*
- *Enable them to value the contributions of women, from family to the larger society*
- *To generate among them a distinct urge to respect women*
- *To appreciate that women should have equal status and equal entitlements as member of the society*

Learning Objectives:

After going through the contents of the module and the classroom transactions on the contents, the students are expected to

- Have changes in their perceptions and practices towards women
- Develop proper attitude towards women and value their work and contribution
- Come forward to challenge unethical treatments against women
- End gender based hierarchy and hegemony, remove the feeling that women are counter to men and bring about a complementarity among the hitherto existing gender binary
- Allow women to realize their self worth and contribute their best for betterment of the society
- Pioneer in creating a gender equal society where the well being, happiness and security of the women will be well protected ; contributing towards a better and happier society

Teaching Hours

1.1 Introduction: General introduction on Ethics and Values, Gender equality as an essential precursor to social progress, the present scenario, Desirable gender related values.	1-2-3
1.2 Women and Family Pre-natal sex selection, Gendered practices in the family, Gender based division of labour in the family, Marriage and women, Marriage and women's consent, Child marriage, Practice of dowry, Women and family violence.	4-5-6-7
1.3 Women and Work Women's work: The Invisible hands, Exploitation of women at work, Gender Stereotyping at work, Glass ceiling, Women and pay gap, Sexual Harassment of women at work, Working women and role conflict.	8-9-10-11
1.4 Women, Community and Society Violence against women in public spaces, Gender sensitive language and communication, Gendered language, Sexist Language, Gender neutral language, Women and property Rights, Women's property Rights in Indian Laws, The functionality of Women's Property Rights	12-13-14-15

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	4	5	2	4	4	4	2	2	4
CO2	1	4	4	2	2	2	4	1	1	4
CO3	1	4	2	2	2	2	2	1	1	2
CO4	1	4	5	1	2	2	4	2	2	4

- Note related: 1
- From What Related: 2
- Neutral: 3
- Moderately Related: 4
- Highly Related: 5

SEMESTER-II

AECC-2 MIL

Course Outcomes:

After reading this paper the students will be able to

I. Students of other departments of the University can easily present their theoretical knowledge in Odia by studying Odia Grammar and Communication skills in the course AECC-II.

II. Students of Science, Commerce and Humanities can fluently discuss their research findings in their mother tongue (ODIA)

III. Though we receive higher education in various subjects and media of instruction, it is always more convenient to express oneself in one's Mother tongue. It is an enriching experience for both the knowledge giver and the receiver.

IV. Odia language is essential for Professionals like a doctor, scientist or educator to become intelligible as well as amiable for others.

ଯୋଗାଯୋଗମୂଳକ ମାତୃଭାଷା – ଓଡ଼ିଆ (AECC)

ପାଠ–୧ | **Course – 1** : ଯୋଗାଯୋଗ ଅନୁବିଧ୍ୟ, ରୀତି ଓ ମାଧମ

୧ମ ଏକକ : ଯୋଗାଯୋଗର ପରିଭାଷା, ଅନୁବିଧା, ପରିସର ଓ ପ୍ରକାରଭେଦ

୨ୟ ଏକକ : ସାକ୍ଷାତକାର, ଭାଷଣ କଳା

୩ୟ ଏକକ : ସମ୍ୱାଦର ପରିଭାଷା, ପରିସର ଓ ସମ୍ୱାଦ ପ୍ରସ୍ତୁତି

୪ର୍ଥ ଏକକ : ଓଡ଼ିଆ ଭାଷାର ବର୍ଣ୍ଣମାଳା, ବର୍ଣ୍ଣଶୁଦ୍ଧିର ନିରାକରଣ । (ବନାନ ତୃଟି - ସାଦୃଶ୍ୟଜନିତ ଅଶୁଦ୍ଧି, ଲିଙ୍ଗଗତ ଅଶୁଦ୍ଧି, ସନ୍ଧିଗତ ଅଶୁଦ୍ଧି, ସମାସଗତ ଅଶୁଦ୍ଧି, ବଚନ ଓ ବିଭକ୍ତିଗତ ଅଶୁଦ୍ଧି, ବାକ୍ୟ ବିଧ୍ୟଜନିତ ଅଶୁଦ୍ଧି, ସମାର୍ଥବୋଧକ ଶବ୍ଦାଶୁଦ୍ଧି, ପ୍ରତ୍ୟୟ ଜନିତ ଅଶୁଦ୍ଧି, ଶବ୍ଦ ସଂଯୋଗାମୂକ ଓ ସ୍ୱରସଙ୍ଗିତ ଅଶୁଦ୍ଧି

ସହାୟକ ଗ୍ରନ୍ଥସୂଚୀ (ପାଠ–୧ | Course – 1)

୧. ଯୋଗାଯୋଗ ମୂଳକ ମାତୃଭାଷା (ଓଡ଼ିଆ) ସାମଲ ବିରଞ୍ଜି ନାରାୟଣ, ସତ୍ୟନାରାୟଣ ବୁକ ଷ୍ଟୋର,କଟକ ।

୨. ସଂଯୋଗ ଅନୁବିଧ୍ୟ, ସନ୍ତୋଷ କୁମାର ତ୍ରିପାଠୀ, ନାଲନ୍ଦା, କଟକ

୩. ଭାଷଣ କଳା ଓ ଅନ୍ୟାନ୍ୟ ପ୍ରସଙ୍ଗ - କୃଷ୍ଟଚନ୍ଦ୍ର ପ୍ରଧାନ, ସତ୍ୟନାରାୟଣ ବୁକ ଷ୍ଟୋର,କଟକ

୪. ପ୍ରାୟୋଗିକ ଓଡ଼ିଆ ଭାଷା – ଓଡ଼ିଶା ରାଜ୍ୟପାଠ୍ୟ ପୁସ୍ତକ ପ୍ରଣୟନ ଓ ପ୍ରକାଶନ ସଂସ୍ଥା, ଭୁବନେଶ୍ୱର ସଂସ୍ଥା, ଭୁବନେଶ୍ୱର

୧. ନିର୍ଭୁଲ ଲେଖାର ମୂଳସୂତ୍ର, ନୀଳାମ୍ବିଭୂଷଣ ହରିଚନ୍ଦନ, ପି.ସି.ଆର ପବ୍ଲିକେସନ, ଭୁବନେଶ୍ୱର

୨. ସର୍ବସାର ବ୍ୟାକରଣ - ନାରାୟଣ ମହାପାତ୍ର ଓ ଶ୍ରୀଧର ଦାସ, ନିୟ ଷ୍ଟୁଡେଣ୍ଟସ୍ ଷ୍ଟୋର, କଟକ

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	1	2	1	1	1	2	1	2	1
CO2	1	2	2	1	1	1	2	2	2	1
CO3	1	1	2	1	1	1	2	1	1	1
CO4	1	2	1	1	1	1	2	1	1	2

MIL (ALTERNATIVE ENGLISH)

Course Outcomes:

After reading this paper the students will be able to

I. Demonstrate high-level proficiency in writing and speaking English and employ effectively the language of their discipline.
II. Develop skills in organizing and expressing ideas and viewpoints with clarity and coherence in writing and speech
III. Enumerate skills in narration, description, and argumentation, ascertain insight into different cultures and gain good knowledge that includes understanding recent developments in language and literature.
IV. Develop acumen for a better understanding of the diversity of human experiences and acquire openness to new ideas, perspectives, and ways of thinking.

Introduction:

The paper is focused upon developing one fundamental skills of Language learning; reading which needs a thorough rethink and revision. In order to build a strong base for acquisition of the communication skills, suitable reading content is selected from diverse areas in prose form. This would boost the learner's competence in expressive and comprehension skills. The well- researched language exercises in the form of usage, vocabulary and grammar is the other area that should attract the teacher and learner to work out for giving decent shape to the mastery of English language.

UNIT l: Short Story

i Jim Corbett-The Fight between Leopards ii Dash Benhur- The Bicycle
iii Dinanath Pathy- George V High School
iv Alexander Baron- The Man who knew too much v Will f Jenkins- Uneasy Homecoming

UNIT 2: Prose

i Mahatma Gandhi- The way to Equal Distribution
ii S Radhakrishnan- A Call to Youth
iii C V Raman-Water- The Elixir of Life
iv Harold Nicolson- An Educated Person
v Claire Needell Hollander- No Learning without Feeling

UNIT 3:

Comprehension of a passage and answering the questions

UNIT 4:

Language exercises-test of vocabulary, usage and grammar

Reference Books

1. The JJ'idening Arc: A Selection of Prose and Stories, Ed. A R Parhi, S Decpika, P
   Jani, Kitab Bhavan, Bhubaneswar.

2. A Communicative Grammar of English, Geoffrey Leech.

3. A University Grammar of English. Randolph Quirk and Sidney Greenbaum

4. Developing Reading Skills. F. Grellct. Cambridge: Cambridge University Press, 1981. UG Honours/Pass Syllabus in English

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	5	5	1	1	1	1	2	2	4
CO2	1	5	4	1	1	1	2	1	1	4
CO3	1	5	2	1	1	1	2	1	1	2
CO4	1	5	5	1	1	1	1	2	2	4

MIL – Hindi

Course Outcomes:

After reading this paper the students will be able to

I. Gain knowledge on Hindi poets and their poems and understand the variations in ancient, medieval and modern poetry.
II. Acquire knowledge on different perspectives of writers through their prose.
III. Gain understanding of basic structure of Hindi sentence and grammar.
IV. Develop a skill of essay writing.

1. - साखी - 1 से 10
2. तुलसी - वनियपत्रिका - पद 1 और 2
3. प्रसाद - मधुमय देश
4. निराला – भकिषुक
5. अज्ञेय - हरीशिमा

1. रामचन्द्र शुक्ल- उत्साह
2. हजारी प्रसाद द्वविदी- कुटन
3. (हरिशंकर परसाई -सदाचार का ताबीज

शब्द ज्ञान

1. शब्द शुद्धि
2. वाक्य शुद्धि
3. पर्यायवाची शब्द
4. विलोम शब्द

(Essay Writing)

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10

CO1	5	4	4	5	2	5	4	5	5	2
CO2	5	5	5	5	2	4	2	5	5	2
CO3	5	2	5	4	5	4	4	4	5	5
CO4	5	5	5	5	2	4	5	5	5	5

CC III: PROBABILITY AND PROBABILITY DISTRIBUTIONS

Course Outcomes:

CO1: This course introduces the students basic definitions and concepts of probability.

CO2: This course teaches the students how to deal with continuous and discrete random variables.

CO3: This course teaches students to calculate the essential statistics like expectation, pgf, CDF and conditional expectation.

CO4: This course introduces students to standard discrete distributions and it's application.

CO5: This course teaches how to calculate joint distribution, marginal distribution and independence of random variables.

Syllabus:

Unit-I: Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability – classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.

Unit-II: Random variables: discrete and continuous random variables, p.m.f., p.d.f. and c.d.f., illustrations and properties of random variables, univariate transformations with illustrations. Two dimensional random variables: discrete and continuous type, joint, marginal and conditional p.m.f, p.d.f., and c.d.f., independence of variables.

Unit-III: Mathematical Expectation and Generating Functions: Expectation of single and bivariate random variables and its properties. Moments and Cumulants, moment generating function, cumulant generating function and characteristic function. Uniqueness and inversion theorems (without proof) along with applications. Conditional expectations.

Unit-IV: Standard discrete probability distributions: Uniform, binomial, poisson, geometric, along with their properties and limiting/approximation cases. Standard continuous probability distributions: uniform, normal, exponential, beta and gamma along with their properties and limiting/approximation cases.

List of Practicals:

1. Fitting of Binomial distributions
2. Fitting of Poisson distributions
3. Fitting of Normal distributions
4. Application problems based on Binomial, Poisson and Normal distributions.

Prescribed Books:

(1) Hogg,R.V.,Tanis,E.A.andRaoJ.M.(2009):ProbabilityandStatisticalInfere nce, Seventh Ed, Pearson Education, NewDelhi.

(2) Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals Of Mathematical Statistics, 4thEdition (Reprint), Sultan Chand &Sons

Reference Books:

(1) Miller,Irwin and Miller, Marylees(2006): John E.Freund's Mathematical Statisticswith Applications, (7th Edn.), Pearson Education,Asia.

(2) Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory ofStatistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co.Ltd.

(3) Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I,8th Edn. The World Press,Kolkata.

(4) Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford& IBH Publishing, NewDelhi

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	5	4	5	5	5	4	5	4	4	5
CO2	4	5	2	5	5	5	4	5	4	4
CO3	5	4	5	5	5	4	5	4	4	2
CO4	4	2	5	5	5	4	5	4	5	2
CO5	4	5	4	5	5	5	4	4	4	2

CC IV: CALCULUS

Course Outcomes:
CO1: This course teaches students basic concepts of calculus like limit, continuity and properties ofcontinuous functions.

CO2: This course teaches students how to calculate Maxima and Minima in two variables. This hasnumerous applications.

CO3: This course teaches students how to do integration and differentiation. This is used to calculate area under any curve and maximum and minimum of the curve respectively.

CO4: This course introduces First order Differential equations and its real life application.

CO5: This course introduces Partial Differential Equations and its real life application.

Syllabus:

Unit-I:	Differential Calculus: Limits of function, continuous functions, properties of continuous functions, partial differentiation and total differentiation (two variables). Indeterminate forms: L-Hospital's rule, Leibnitz rule for successive differentiation. Euler's theorem on homogeneous functions. Maxima and minima of functions of one and two variables. Transformations and Jacobians.
Unit- II:	Integral Calculus: Review of integration and definite integral. Differentiation under integral sign, double integral. Beta and Gamma functions: properties and relationship between them.
Unit-Ill:	Differential Equations: Exact differential equations, Integrating factors, change of variables, Total differential equations, Differential equations of first order and first degree, Differential equations of first order but not of first degree, Equations of the first degree in x and y, Clairaut's equations. Higher Order Differential Equations. Homogeneous differential equations of order n with constant coefficients.
Unit-IV:	Formation and solution of a partial differential equations. Equations easily integrable. Linear partial differential equations of first order. Homogeneous linear partial differential equations with constant coefficients. Different cases for complimentary functions and particular integrals.

List of Practicals:

1. Determination of Maxima & Minima.
2. Using definite integral obtain the area under curve.
3. Applications of differential equations.
4. Applications Partial Differential Equations.
5. Applications of Beta and Gamma function.

Prescribed Book:

1. Gorakh Prasad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad.
2. Gorakh Prasad: Integral Calculus, Pothishala Pvt. Ltd., Allahabad.

Reference Book:

1. Zafar Ahsan: Differential Equations and their Applications, Prentice-Hall of India Pvt. Ltd., New Delhi (2nd Edition-2004).

2. Piskunov, N: Differential and Integral Calculus, Peace Publishers, Moscow.
3. Differential calculus by Das & Mukherjee, U.N Dhar Publication, Kolkatta, 2010.
4. Integral Calculus by Das & Mukherjee, U.N Dhar Publication, Kolkatta,2010.

5. Advanced Differential Equations by Md Raisinghania, S Chand & Company Pvt Ltd.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	5	5	5	5	4	4	5	4	4	2
CO2	5	5	5	4	5	5	4	5	4	4
CO3	5	5	5	5	2	4	5	4	4	2
CO4	5	5	5	4	5	4	5	4	5	2
CO5	5	5	5	5	4	5	4	4	4	2

GE II: INTRODUCTORY PROBABILITY

Course Outcomes:

CO1: The students are Introduced to the concepts of probability so that they can apply it in real life.

CO2: The students learn conditional probability and how to apply it.

CO3: The students learn the Bayes Theorem and it's application.

CO4: The students are introduced to the concept of Random Variables.

CO5: The students learn Standard Probability Distributions and how to apply them to real life.

Syllabus:

Unit-I: Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability – classical, statistical, and axiomatic. laws of addition and multiplication of probability.

Unit-II: Conditional Probability, independent events, theorem of total probability, Bayes' theorem and its applications.

Unit-III: Random Variables: Discrete and continuous random variables, p.m.f., p.d.f. ,c.d.f. Illustrations of random variables and its properties. Expectation, variance, moments and moment generating function.

Unit-IV: Standard probability distributions: Binomial, Poisson, geometric, uniform, normal, exponential, beta, gamma and their applications.

List of Practicals:

1. Fitting of binomial distributions for n and p = q = ½given
2. Fitting of binomial distributions for n and p given
3. Fitting of binomial distributions computing mean and variance
4. Fitting of Poisson distributions for given value of lambda
5. Fitting of Poisson distributions after computing mean
6. Application problems based on Binomial distribution
7. Application problems based on Poisson distribution
8. Problems based on area property of normal distribution
9. Application based problems using normal distribution

Prescribed Books:

1. Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals Of Mathematical Statistics, 4 thEdition (Reprint), Sultan Chand &Sons

2. Goon, A.M., Gupta M.K. & Das Gupta, Fundamentals of statistics, Vol.-I& II (2005).

Reference Books:

1. Hogg,R.V.,Tanis,E.A.andRaoJ.M.(2009):ProbabilityandStatisticalInference, Seventh Ed, PearsonEducation, NewDelhi.

2. Miller,IrwinandMiller,Marylees(2006):JohnE. Freund's Mathematical Statistics with Applications,(7th Edn.), Pearson Education, Asia.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	4	5	5	4	4	5	4	4	4
CO2	4	5	4	4	5	5	4	5	4	5
CO3	5	4	5	5	2	4	5	4	4	4

CO4	4	2	5	4	5	4	5	4	5	4
CO5	4	5	4	5	4	5	4	4	4	4

ETHICS AND VALUES

Course Outcomes:

After reading this paper the students will be able to

V. Have changes in their perceptions and practices towards women and eve lop proper
   attitude towards women and value their work and contribution.
VI. Come forward to challenge the unethical treatments against women.
VII. End gender-based hierarchy and hegemony, remove the feeling that women are counter to men and bring about a complementarity among the hitherto existing gender binary.
VIII. Pioneer in creating a gender equal society where the well-being, happiness and security of the women will be well protected & contributing towards a better and happier society

SEMESTER-II

Unit-2

Title: - Values and Good Citizenship

Total no. of Periods-15　　　　　　**Full mark-25**　　　　　　**Credit point -1**

2.0 Aim of the Unit:

- Introducing the Salient features of Indian Constitution to students and to inculcate the sense of patriotism in them
- Encouraging them to Volunteer for social work
- Instilling appropriate work ethics in them

Learning Objectives:

- Understanding Basic Values of Indian Constitution
- Inculcating Volunteerism for Social change
- Helping students to become good human being and citizen

Teaching Hours

2.1 Indian Constitution

Salient Values of Preamble: Sovereign, Socialist, Secular, Democratic, Republic, Justice, Liberty, Equality and Fraternity.　　　**1-2-3**

2.2 Patriotism

Patriotic Value and ingredients of nation building, Concept of Good citizenship, Emotional connection with the country, Duties of citizens and Qualities of good citizens　　　**4-5-6-7**

2.3 Volunteerism

Concept and facets of Volunteerism and Leadership, Building a better society through Volunteerism, Blood Donation, Social Work, Helping the Aged, Environmental Protection　　　**8-9-10-11**

2.4 Work Ethics

Punctuality, Cleanliness, Law abidingness, Rational Thinking and Scientific Temper　　　**12-13-14-15**

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	4	5	2	4	4	4	2	2	4
CO2	1	4	4	2	2	2	4	1	1	4
CO3	1	4	2	2	2	2	2	1	1	2
CO4	1	4	5	1	2	2	4	2	2	4

SEMESTER-III

CC V: SAMPLING DISTRIBUTIONS

Course Outcomes:

CO1: This course introduces students to concepts of Limit and convergence in probability.
CO2: This course introduces students to concepts like Chebyshev's inequality, WLLN and CLT. **CO3:** In this course students learn Hypothesis testing and its real life applications.
CO4: This course introduces students to Chi square distribution and it's properties.

CO5: This course teaches students how to perform statistical tests like t-test, chi-square, F test, their applications and relationships.

Syllabus:

Unit-I: Limitlaws: convergence in probability, almost sure convergence, convergence in mean square and convergence in distribution and their interrelations, Chebyshev's inequality, W.L.L.N., S.L.L.N. and their applications, De-Moivre Laplace theorem, Central Limit Theorem (C.L.T.) for i.i.d. variates, applications of C.L.T.

Unit-II: Definitions of random sample, parameter and statistics, sampling distribution of a statistics, sampling distribution of sample mean, standard errors of sample mean, sample variance and sample proportion. Null and alternative hypotheses, level of significance, Type I and Type II errors, their probabilities and critical region. Large sample tests for testing single proportion, difference of two proportions, single mean, difference of two means, standard deviation and difference of standard deviations by classical and p-value approaches.

Unit-III: Exact sampling distribution: Definition and derivation of p.d.f. of χ^2 with n degrees of freedom (d.f.) using m.g.f., nature of p.d.f. curve for

different degrees of freedom, mean, variance, m.g.f., cumulant generating function, mode, additive property and limiting form of χ^2 distribution. Tests of significance and confidence intervals based on χ^2 distribution.

Unit-IV: Exact sampling distributions: Student's and Fisherst-distribution, Derivation of its p.d.f., nature of probability curve with different degrees of freedom, mean, variance, moments and limiting form of distribution. Snedecore's F-distribution: derivation of p.d.f., nature of p.d.f. curve with different degrees of freedom, mean, variance and mode. Relationship between t, F and χ^2 distributions. Test of significance and confidence Intervals based on t and F distributions.

List of Practicals:

1. Testing of significance and confidence intervals for single proportion and difference of two proportions

2. Testing of significance and confidence intervals for single mean and difference of two means and paired tests.

3. Testing of significance and confidence intervals for difference of two standard deviations.

4. Exact Sample Tests based on Chi-Square Distribution.

5. Testing if the population variance has a specific value and its confidence intervals.

6. Testing of goodness off it.

7. Testing of independence of attributes.

8. Testing based on 2 X 2 contingency table without and with Yates' corrections.

9. Testing and confidence intervals of equality of two population variances.

Prescribed Book:

(1) Goon, A.M., Gupta, M.K. and Dasgupta, B. (2003): An Outline of Statistical Theory, Vol. I, 4thEdn. World Press, Kolkata.

Reference Books:

(1) Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probabilityand Statistics.2ndEdn. (Reprint) John Wiley andSons.
(2) Hogg, R.V. and Tanis, E.A. (2009): A Brief Course in Mathematical Statistics. PearsonEducation.
(3) Johnson, R.A. and Bhattacharya, G.K. (2001): Statistics-Principles and Methods, 4 thEdn. JohnWiley andSons.
(4) Mood, A.M., Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rdEdn. (Reprint).Tata McGraw-Hill Pub. Co.Ltd.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	5	4	5	5	5	4	5	4	4	2
CO2	4	5	4	5	5	5	4	5	4	4
CO3	5	4	5	5	5	5	5	4	4	2
CO4	5	4	5	5	5	5	5	4	5	2
CO5	5	5	4	5	5	5	4	4	4	2

CC VI: SURVEY SAMPLING & INDIAN OFFICIAL STATISTICS

Course Outcomes:

CO1: This course introduces basic concepts of survey sampling.

CO2: The students in this course are taught principles of survey sampling and main steps involved in selecting a sample.

CO3: The students learn different types of sampling techniques and its application.

CO4: The students are taught the Ratio and Regression method of estimation.

CO5: This course introduces the student to the Indian Official Statistical System.

Syllabus:

Unit-I: Concept of population and sample, complete enumeration versus sampling, sampling and nonsampling errors. Types of sampling: non- probability and probability sampling, basic principle of sample survey, simple random sampling with and without replacement, definition and procedure of selecting a sample, estimates of: population mean, total and proportion, variances of these estimates, estimates of their variances and sample size determination.

Unit-II: Stratified random sampling: Technique, estimates of population mean and total, variances of these estimates, proportional and optimum allocations and their comparison with SRS. Practical difficulties in allocation, estimation of gain in precision. Systematic Sampling: Technique, estimates of population mean and total, variances of these estimates (N=nxk). Comparison of systematic sampling with SRS and stratified sampling in the presence of linear trend and corrections.

Unit-III: Introduction to Ratio and regression methods of estimation, first approximation to

the population mean and total (for SRS of large size), variances of these estimates and estimates of these variances, comparison with SRSWOR. Cluster sampling (equal clusters only) estimation of population mean and its variance.

Unit-IV: Present official statistical system in India, methods of collection of official statistics, their reliability and limitations. Role of Ministry of Statistics & Program Implementation (MoSPI), Central Statistical Office (CSO), National Sample Survey Office (NSSO), and National Statistical Commission. Government of India's Principal publications containing data on the topics such as population, industry and finance.

List of Practical:

1. To select a SRS with and without replacement.
2. For a population of size 5, estimate population mean, population mean square and population variance. Enumerate all possible samples of size 2 by WR and WOR and establish all properties relative to SRS.
3. For SRSWOR, estimate mean, standard error, the sample size
4. Stratified Sampling: allocation of sample to strata by proportional and Neyman's methods. Compare the efficiencies of above two methods relative to SRS.
5. Estimation of gain in precision in stratified sampling.
6. Comparison of systematic sampling with stratified sampling and SRS in the presence of a linear trend.
7. Ratio and Regression estimation: Calculate the population mean or total of the population. Calculate mean squares. Compare the efficiencies of ratio and regression estimators relative to SRS.
8. Cluster sampling: estimation of mean or total, variance of the estimate, estimate of intra-class correlation coefficient, efficiency as compared to SRS.

Prescribed Book:

1. Sukhatme,P.V., Sukhatme,B.V. Sukhatme,S. Asok,C.(1984). Sampling Theories of Survey With Application, IOWA State University Press and Indian Society of Agricultural Statistics

2. Guide to current Indian Official Statistics, Central Statistical Office, GOI, New Delhi.

Reference Books:
1. Cochran W.G. (1984):Sampling Techniques(3rd Ed.), Wiley Eastern.
2. Murthy M.N. (1977): Sampling Theory & Statistical Methods, Statistical Pub. Society,Calcutta.
3. Des Raj and Chandhok P. (1998): Sample Survey Theory, Narosa Publishing House.

4. Goon A.M., Gupta M.K. and Das gupta B. (2001): Fundamentals of Statistics (Vol.2), WorldPress.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	4	5	5	5	4	5	4	4	2
CO2	4	5	2	5	5	5	5	5	4	4
CO3	5	4	5	5	5	4	5	4	4	2
CO4	4	2	5	5	5	4	5	4	5	2
CO5	4	5	4	5	5	5	5	4	4	2

CC VII: MATHEMATICAL ANALYSIS

Course Outcomes:

CO1: This course introduces students to basic concepts of Real Analysis.

CO2: This course introduces students to proofs of important theorems of Calculus.

CO3: The students are taught Numerical Analysis and different methods of interpolation.

CO4: The students are taught Numerical integration using different methods.

CO5: This course introduces students to Stirling's approximation to factorial n and solution of differential equation of first order.

Syllabus:

Unit-I: Real Analysis: Representation of real numbers as points on the line and the set of real numbers as complete ordered field. Bounded and unbounded sets, neighbourhoods and limit points, Supremum and infimum, open and closed sets, sequences and their convergence. Infinite series, positive termed series and their convergence, Comparison test, D'Alembert's ratio test, Cauchy's nth root test, Raabe's test. Gauss test, Cauchy's condensation test and integral test (Statements and Examples only).

Unit-II: Review of limit, continuity and differentiability, uniform Continuity and boundedness of a function. Rolle's and Lagrange's Mean Value theorems. Taylor's theorem with Lagrange's and Cauchy's form of remainder (without proof). Taylor's and Maclaurin's series expansions.

Unit-III: Numerical Analysis: Factorial, finite differences and interpolation. Operators, E and divided difference. Newton's forward, backward and divided differences

interpolation formulae. Lagrange's interpolation formulae. Central differences, Gauss and Stirling interpolation formulae.

Unit-IV: Numerical integration. Trapezoidal rule, Simpson's one-third rule, three-eights rule, Weddle's rule with error terms. Stirling's approximation to factorial n. Solution of differencial equations of first order.

List of Practicals:

1. Interpolation with equal and unequal intervals.
2. Problems on Lagrange's interpolation
3. Numerical Integration (Trapezoidal, Simpson's and Weddle's method)
4. Stirling's approximation

Prescribed Books: -

1. Malik S.C. and Savita Arora: Mathematical Analysis, Second Edition, Wiley Eastern Limited,New Age International Limited, New Delhi,1994.
2. Goel B. S. and Mittal S. K. : Numerical Analysis, Pragati Prakashan, ND,2008Books for

Reference: -

1. Somasundram D. and Chaudhary B.: A First Course in Mathematical Analysis, NarosaPublishing House, New Delhi,1987.
2. Shanti Narayan: A course of Mathematical Analysis, 12th revised Edition, S. Chand &Co. (Pvt.) Ltd., New Delhi,1987.
3. Singal M.K. and Singal A.R.: A First Course in Real Analysis, 24th Edition, R. Chand &Co., New Delhi,2003.
4. Bartle,R.G.andSherbert,D.R.(2002):Introduction to Real Analysis(3rdEdition), JohnWiley and Sons (Asia) Pte. Ltd.,Singapore.
5. Jain,M. K., Iyengar, S. R. K. and Jain, R. K. (2003): Numerical methods for scientific andengineering computation, New age International Publisher, India.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	2	2	3	2	2	1
CO2	3	3	3	2	3	3	2	3	2	2
CO3	3	2	3	3	2	2	3	2	2	1
CO4	3	3	3	2	3	2	3	2	3	1
CO5	3	3	3	3	2	3	2	2	2	1

Skill Enhancement Courses (SEC Option-I)
ENGLISH COMMUNICATION

Course Outcomes:

After studying this paper, the students can

i.   Enhance their ability to build and enrich their communication skills and build up the four primary skills in students in the academic as well as in the wider domains of use like public offices.

ii.   acquire analytical and comprehension reading skills, identify basic principles of communication, build speaking and listening skills

iii.   learn beyond the conventional syllabus and be prepared to meet challenges while seeking a job and synthesize knowledge and use it creatively to better understand and Improvise themselves

iv.   communicate effectively through written reports, presentations and Discussions and develop a neutral accent and improve general standard of pronunciation

Introduction:

This paper intends t.o build up the four primary skills in students in the academic as well as in the wider domains of use like public offices. The books recommended only provide guidelines for what to teach, and the list is in no way exhaustive. Teachers must be free and resourceful enough to collect teaching materials on their own, and even use newspaper clippings as teaching materials.

This is an activity-based, goal-oriented, functional course in English Communication, which aims to make the students able and efficient communicators by helping them to be self-reflexive about English. This course has a pre-defined context of being supportive and complementary to the core courses in various disciplines. Therefore, unlike most other courses in English Communication on offer, it does not seek to build facile fluency that passes off as communicative competence. Rather, it intends to equip the

students with the relevant skills of presentation and expression needed in the academic as well as in the professional domains of communicative use. While reading skills exercises are meant to promote the acquisition of analytical and comprehension skills, writing skills exercises are centered on sentence construction, paragraph development and précis writing. Teachers must be free and flexible enough in relation to teaching materials, using newspaper clippings, non-conventional and multimedia resources in the classroom. There is ample scope to build the speaking and listening skills of students in the way the course is planned with an emphasis on interactive learning and articulation.

UNIT 1:

Introduction 1. What is communication? 2. Types of communication (Horizontal, Vertical, Interpersonal, Grapevine), (iii) Uses of Communication, Inter-cultural communication, Communication today (iv) Distinct features of Indianisation, alternative texts of language learning, global English and English in the print and electronic media in India.

UNIT 2:

The Four Skills and Prospect of new material in language learning 1. Listening-Passive and active, Speaking effective and intelligibility and clarity
2. Methods and techniques of reading such as skinnming, scanning and searching for Information, Reading to understand the literal, metaphorical and suggested meaning of a (Ill) ldentifyng the tone (adlniring, accusatory, Ironical, sympathetic, evasive, indecisive. ambiguous, neutral etc.) of the writer and view-points. (iv)Cohesive and Coherent writing

UNIT 3:

Grammatical and Composition Skills (l) Doing exercises like filling in the blanks, correcting errors, choosing correct forms out of alternative choices, joining clauses, rewriting sentences as directed, and replacing indicated sections with single words / opposites / synonyms, choosing to use correct punctuation marks, getting to understand and use formal and informal styles, learning to understand the usages of officialese, sexism, racism, jargon. (ii) Learning to understand information structure of the sentence such as topic- focus relationship; strategies of thematization, postponement, emphasis, structural compression (deletion of redundant parts, nominalization, cleft and pseudo-cleft sentences, elliptical structures etc.), Logical Connectors between sentences, Methods of developing a paragraph, structure of an essay and methods of developing an essay

UNIT 4:

Exercises in Written Communication (i) Précis writing (ii) Note-taking skills

(iii) Writing reports (iv) Guidelines and essentials of official correspondence for making enquiries, complaints and replies (v) Making representations; writing letters of application for jobs; writing CV, writing letters to the editor and social appeals in the form of letters/pamphlets.

Reference Books:

1. Ways of Reading: Advanced reading Skills for Students of English Literature. Martin Montgomery et al. London: Routledge, 2007.

2. Applying (communication Theory)' /0r Professional Life: A Practical Introduction. Dainton and Zelley, http://tsime.uz.ac.zw/claroline/backends/download.php?url—

3. Literature and the art of Communication, Cambridge University Press.

and VI.s•ions. Orient Black Swan (writing and granunar exercises at the end of lessons are

recommended) From Remapping An AnthologyU0r Degree Classes. C Writing

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	5	5	1	1	1	1	2	2	4
CO2	1	5	4	1	1	1	2	1	1	4
CO3	1	5	2	1	1	1	2	1	1	2
CO4	1	5	5	1	1	1	1	2	2	4

ETHICS AND VALUE

Course Outcomes:

After reading this paper the students will be able to

IX. Have changes in their perceptions and practices towards women and eve lop proper
attitude towards women and value their work and contribution.

X. Come forward to challenge the unethical treatments against women.

XI. End gender-based hierarchy and hegemony, remove the feeling that women are counter to men and bring about a complementarity among the hitherto existing gender binary.

XII. Pioneer in creating a gender equal society where the well-being, happiness and security of the women will be well protected & contributing towards a better and happiersociety.

SEMESTER-III

Unit-3

Title: - Issues of Drug, Tobacco and Alcohol Addiction

Total no. of Periods-15   Full mark-25   Credit point -1

3.0 Aims of the Unit:

- Creating awareness about health and Societal hazards of drugs, tobacco and alcohol addiction
- Sensitizing students about professional support system for treatment and rehabilitation

Learning Objectives:

- The students become aware of the grave danger of consuming alcohol, tobacco and drugs
- Students would encourage their friends to remain away from tobacco ,alcohol , drugs and seek professional help when needed

	Teaching Hours
3.1 Extent of the Problem Extent of Drug and Tobacco addiction and alcoholism in India, Myths associated with them, Health hazards associated with them and how they have become silent killers	1-2-3-4
3.2 Socio- economic impact Socio- economic impact of Drug and Tobacco addiction and alcoholism: Loss of physical and mental strength, Loss of character, Loss of family ties and relationship, Loss of earning and livelihood potentials, Loss of societal respect and dignity etc	5-6-7-8
3.3 Laws to Address this Problem Silent features of social legislation such as NDPS Act, 1985 and COTPA Act , 2003 , Mechanism and Government Schemes for prevention , de-addiction and rehabilitation	9-10-11-12
3.4 Role of Stake - holders Provision of Tobacco free campus and role of students, Role of students in their family and immediate surroundings, Role of NGOs and other agencies	13-14-15

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	4	5	2	4	4	4	2	2	4
CO2	1	4	4	2	2	2	4	1	1	4
CO3	1	4	2	2	2	2	2	1	1	2
CO4	1	4	5	1	2	2	4	2	2	4

SEMESTER-IV

CC VIII: STATISTICAL INFERENCE

Course Outcomes:

CO1: The students are introduced to the concept of point estimation and criterion of a goodestimator.

CO2: The students are taught important concepts like MVUE, Rao-Blackwell theorem, Lehmann-Scheffe theorem and Cramer-Rao inequality.

CO3: This course teaches students Different methods of estimation.

CO4: The course introduces students Principles of test of significance.

CO5: Sequential Analysis and its application to real life is taught to the students.

Syllabus:

UNIT-I:	Estimation: Concepts of point estimation, Criterion of a good estimator, unbiasedness,sufficiency, consistency and efficiency. Factorization theorem. Complete statistics.
	Minimum variance unbiased estimator (MVUE), Rao-Blackwell and Lehmann-Scheffetheorems and their applications. Cramer-Rao inequality and MVB estimators (statement and applications).
Unit-II:	Methods of Estimation: Method of moments, method of maximum likelihoodestimation, method of minimum Chi-square, basic idea of Baye's estimators.
Unit- III:	Principles of test of significance: Null and alternative hypotheses (simple and composite), Type-I and Type-II errors, critical region, level of significance, size andpower, best critical region, most powerful test, uniformly most powerful test, Neyman Pearson Lemma (statement and applications to construct most powerful test). Likelihood ratio test, properties of likelihood ratio tests (without proof).

Unit- IV: Sequential Analysis: Sequential probability ratio test (SPRT) for simple vs simple hypotheses. Fundamental relations among α, β, A and B, determination of A and B in practice. Wald's fundamental identity and the derivation of operating characteristics(OC) and average sample number (ASN) functions, examples based on binomial and normal distributions.

List of Practicals:

1. Unbiased estimators (including unbiased but absurd estimators)

2. Consistent estimators, efficient estimators and relative efficiency of estimators.

3. Maximum Likelihood Estimation

4. Most powerful critical region (NP Lemma)

5. Uniformly most powerful critical region

6. Unbiased critical region

7. Power curves

8. OC function and OC curve , ASN function and ASN curve

Prescribed Books:

1. Goon A.M., Gupta M.K.: Das Gupta.B. (2005), Fundamentals of Statistics, Vol. I, World Press, Calcutta.

2. Gun, A.M., Gupta, M.K. and Dasgupta, B.: An Outline of Statistical Theory, Vol.II, (4thed.), WorldPress.

Books for Reference:

1. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics. 2ndEdn.(Reprint) John Wiley and Sons.

2. Miller, I. and Miller, M. (2002) : John E. Freund's Mathematical Statistics (6th addition, low priceedition), Prentice Hall ofIndia.

3. Dudewicz, E. J., and Mishra, S. N. (1988): Modern Mathematical Statistics. John Wiley &Sons.

4. Mood A.M, Graybill F.A. and Boes D.C,: Introduction to the Theory of Statistics, McGrawHill.

5. Bhat B.R, Srivenkatramana T and Rao Madhava K.S. (1997) Statistics: A Beginner's Text, Vol. I, NewAge International (P)Ltd.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	5	4	5	5	5	4	5	4	4	2
CO2	5	5	2	5	5	5	4	5	4	4
CO3	5	4	5	5	5	4	5	4	4	2
CO4	5	5	5	5	5	4	5	4	5	2
CO5	5	5	4	5	5	5	5	4	4	2

CC IX: LINEAR MODEL

Course Outcomes:

CO1: The students are introduced to the Gauss-Markov set-up and its application.

CO2: The students are taught Regression analysis and its application in real life.

CO3: The students are introduced to the concept of Analysis of variance and its applications to real life.

CO4: The students in this course learn to check the Model adequacy.

CO5: Application of Linear model and regression to real life situations.

Syllabus:

Unit- I	Gauss-Markov set-up: Theory of linear estimation, Estimability of linear parametric functions, Method of least squares, Gauss-Markov theorem, Estimation of error variance.
Unit-II	Regression analysis: Simple regression analysis, Estimation and hypothesis testing in case of simple and multiple regression models, Concept of model matrix and its use in estimation.
Unit- III	Analysis of variance: Definitions of fixed, random and mixed effect models, analysis of variance and covariance in one-way classified data for fixed effect models, Analysis of variance and covariance in two-way classified data with one observation per cell for fixed effect models.
Unit- IV	Model checking: Prediction from a fitted model, Violation of usual assumptions concerning normality, Homoscedasticity and collinearity, Diagnostics using quantile- quantile plots.

List of Practicals:

1. Estimability when X is a full rank matrix and not a full rank matrix
2. Simple Linear Regression
3. Multiple Regression
4. Tests for Linear Hypothesis
5. Orthogonal Polynomials
6. Analysis of Variance of a one way classified data
7. Analysis of Variance of a two way classified data with one observation per cell
8. Analysis of Covariance of a one way classified data

Prescribed Book:

1. Draper, N.R. and Smith, H.: Applied Regression Analysis, John Wiley &Sons.
2. Sengupta, D, Linear model: an integrated approach, World Scientific Pub.

Books for Reference:

1. Weisberg, S. (2005). Applied Linear Regression (Third edition).Wiley.
2. Wu, C. F. J. And Hamada, M. (2009). Experiments, Analysis, and Parameter Design Optimization(Second edition), John Wiley.
3. Renchner, A. C. And Schaalje, G. B. (2008). Linear Models in Statistics (Second edition), JohnWiley and Sons

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	4	4	5	5	4	4	5	4	4	4
CO2	4	5	2	4	5	5	5	5	5	4
CO3	5	4	5	5	4	4	5	4	5	4
CO4	4	2	5	5	5	4	5	4	5	4
CO5	4	5	4	5	4	5	5	4	4	4

CC X: STATISTICAL QUALITY CONTROL

Course Outcomes:

CO1: The students are introduced to the Basics about Quality.

CO2: The students are taught how to check Quality and standards of the system.

CO3: The students are taught to draw Control charts.

CO4: The students learn about the criteria for the Acceptance of a sampling plan.

CO5: The students learn to use and apply Six-Sigma in different industrial processes.

Syllabus:

Unit-I	Quality: Definition, dimensions of quality, historical perspective of quality control and improvements starting from World War II, historical perspective of Quality Gurus and Quality Hall of Fame. Quality system and standards: Introduction to ISO quality standards, Quality registration. Statistical Process Control - Seven tools of SPC, chance and assignable Causes of quality variation. Statistical Control Charts- Construction and Statistical basis of 3-σ Control charts, Rational Sub-grouping.
Unit- II	Control charts for variables: X-bar & R-chart, X-bar & s-chart. Analysis of patterns on control chart, estimation of process capability. Control charts for attributes: np-chart, p-chart, c- chart and u-chart. Comparison between control charts for variables and control charts for attributes.
Unit- III	Acceptance sampling plan: Principle of acceptance sampling plans. Single and Double sampling plan their OC, AQL, LTPD, AOQ, AOQL, ASN, ATI functions with graphical interpretation, use and interpretation of Dodge and Romig's sampling inspection plan tables.
Unit-IV	Introduction to Six-Sigma: Overview of Six Sigma, Lean Manufacturing and Total Quality Management (TQM). Organizational Structure and Six Sigma training plans- Selection Criteria for Six-Sigma roles and training plans. Voice of customers (VOC): Importance and VOC data collection.

List of Practicals:

1. Construction and interpretation of statistical control charts
2. X-bar &R-chart
3. X-bar &s-chart
4. np-chart, p-chart, c-chart and u-chart
5. Single sample inspection plan: Construction and interpretation of OC, AQL, LTPD, ASN,ATI, AOQ, AOQL curves

Prescribed Book:

1. Montogomery, D. C. (2009): Introduction to Statistical Quality Control, 6th Edition, WileyIndia Pvt. Ltd.

Books for Reference:

1. Goon A.M., Gupta M.K. and Das gupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8thEdn. The World Press, Kolkata.
2. Mukhopadhyay,P(2011):Applied Statistics,2nd edition revised reprint, Booksand Allied(P)Ltd.
3. Montogomery, D. C. and Runger, G.C. (2008): Applied Statistics and Probability for Engineers,3rd Edition reprint, Wiley India Pvt.Ltd.
4. Ehrlich, B.Harris(2002):Transactional Six Sigma and Lean Servicing,2ndEdition, St. Lucie Press.
5. Hoyle, David (1995): ISO Quality Systems Handbook, 2nd Edition, Butterworth HeinemannPublication.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	4	5	5	4	4	5	4	4	2
CO2	4	5	2	4	5	5	4	5	4	4
CO3	5	4	5	5	4	4	5	4	4	2
CO4	4	2	5	4	5	4	5	4	5	2
CO5	4	5	4	5	4	5	4	4	4	2

SEC-2 QUANTITATIVE APTITUDE AND LOGICAL THINKING

Course Outcomes:

After studying this paper, the students can

i   Use their logical thinking and analytical abilities to solve Quantitative aptitude questions from company specific and other competitive tests and

Solve questions related to Time and distance and time and work etc. from company specific and other competitive tests.

ii Understanding solve puzzle related questions from specific and other competitive tests and Solve questions related to permutation & combinations and probabilities from company specific and other competitive tests.

iii Detect errors of grammar and usage in a given sentence/text and rectify them by making appropriate changes and Solve questions based on critical reasoning.

iv Analyze reading passages and quickly find out the correct responses to questions asked by using reading skills like skimming, scanning,

reading between the lines, etc.

Syllabus:

Unit - 1:

Whole numbers, Integers, Rational and irrational numbers, Fractions, Square roots and Cube roots, Surds and Indices, Problems on Numbers, Divisibility Steps of Long Division Method for Finding Square Roots:

Unit -2:

Basic concepts, Different formulae of Percentage, Profit and Loss, Discount, Simple interest, Ratio and Proportion, Mixture

Unit- 3:

Time and Work, Pipes and Cisterns, Basic concepts of Time, Distance and Speed; relationship among them.

Unit - 4:

Concept of Angles, Different Polygons like triangles, rectangle, square, right angled triangle, Pythagorean Theorem, Perimeter and Area of Triangles, Rectangles, Circles

Unit - 5:

Raw and Grouped Data, Bar Graphs, Pie charts, Mean, Median and Mode, Events and Sample Space, Probability

II. LOGICAL REASONING
Unit-1:

Analogy basing on kinds of relationships, Simple Analogy; Pattern and Series of Numbers, Letters, Figures. Coding- Decoding of Numbers, Letters, Symbols (Figures), Blood relations

Unit 2: Logical Statements - Two premise argument, More than two premise argument using connectives Unit - 3: Venn Diagrams, Mirror Images, Problems on Cubes and Dices

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	5	5	5	2	2	2	5	2	5	5
CO2	5	5	5	4	2	2	5	4	5	5
CO3	5	5	5	2	2	2	5	2	5	5
CO4	5	5	5	2	2	4	5	2	5	5

ETHICS AND VALUE

Course Outcomes:

After reading this paper the students will be able to
1. Have changes in their perceptions and practices towards women and eve lopproper attitude towards women and value their work and contribution.
2. Come forward to challenge the unethical treatments against women.
3. End gender-based hierarchy and hegemony, remove the feeling that women are counter to men and bring about a complementarity among the hitherto existing gender binary.
4. Pioneer in creating a gender equal society where the well-being, happiness and security of the women will be well protected & contributing towards a better and happier society.

SEMESTER-IV
Unit-4

Title: - Ethical Values for Student Life

Total no. of Periods-15   **Full mark-25**   **Credit point -1**

4.0 Aims of the Unit:

- To familiarize the students with core values of Academics and Goals of Education
- To create an awareness about Unethical practices in the academics

Learning Objectives:
- The students will learn to behave ethically in the campus
- Exhibit respectful treatment to others in an organizational context
- Contribute to develop a positive social environment through active participation and cooperation with others

Teaching Hours

4.1 Meaning and Objective of Education: Knowledge is power and quest for knowledge is the real meaning of education, not quest for Degree and qualifications; Real education builds character: Difference between Academic Qualification and Ability, Academic failure could be failure within the classroom, but not outside (i.e. Failed in exam, passed in life!)	1-2-3
4.2 Challenges for Ethical Practices in Institutions of Higher Education: Ragging, Suicide and Need for Educational Counseling, Violence vs. Peaceful Protest, Conflict resolution, Plagiarism and Violation of Intellectual property Rights, Cheating in Examination and other Fraudulent Practices	4-5-6-7
4.3 Inter personal Relation and Community Life in HEI: Green Preacher and conservation of Energy, Community Life in Campus including Hostels, Local Common area, Inter personal relations (Students-Teacher, Students-Student and Man-Woman, Positive Friendship).	8-9-10-11
4.4 Ethical Leadership in Academic Institution: Concept and Traits of Leadership to provide solution, everyone has Leadership Role (not limited to position), Concept of Ethical leadership, Scope of Leadership in college and Universities for Students, Teachers and Administrators, Importance of co-curricular and extra – curricular activities.	12-13-14-15

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	4	5	2	4	4	4	2	2	4
CO2	1	4	4	2	2	2	4	1	1	4
CO3	1	4	2	2	2	2	2	1	1	2
CO4	1	4	5	1	2	2	4	2	2	4

SEMESTER-V

CC XI: STOCHASTIC PROCESS & QUEUING THEORY

Course Outcomes:

CO1: The students are introduced to basic Probability Distributions.

CO2: The students are introduced to Stochastic Process and stationary process.

CO3: The students are taught how to model real life problems using Markov Chains and how to solve them.

CO4: The students are taught about the Poisson Process and its real life applications.

CO5: The students are taught about the Queuing System and its applications.

Syllabus:

Unit- I   Probability Distributions: Generating functions, Bivariate probability generating function. Stochastic Process: Introduction, Stationary Process.

Unit- II   Markov Chains: Definition of Markov Chain, transition probability matrix, order of Markov chain, Markov chain as graphs, higher transition probabilities. Generalization of independent Bernoulli trials, classification of states and chains.

Unit- III Poisson Process: postulates of Poisson process, properties of Poisson process, inter-arrival time, pure birth process, Yule Furry process, birth and death process, pure death process.

Unit- IV Queuing System: General concept, Characteristics of queuing models, steady state distribution, queuing model, M/M/1 with finite and infinite system capacity, waiting time distribution (without proof).

List of Practicals:

1. Calculation of transition probability matrix
2. Identification of characteristics of reducible and irreducible chains.
3. Identification of types of classes
4. Calculation of probabilities for given birth and death rates and vice-versa
5. Calculation of Probability and parameters for (M/M/1) model and change in behaviour of queue as N tends to infinity.

Prescribed Book:

1. Medhi, J. (2009): Stochastic Processes, New Age International Publishers.
2. Kanti Swarup, Gupta, P.K. and Manmohan (2007): Operations Research, 13th Edition,Sultan Chand and Sons.

Books for Reference: -

1. Basu, A.K. (2005): Introduction to Stochastic Processes, Narosa Publishing.
2. Bhat,B.R.(2000): Stochastic Models: Analysis and Applications, New Age InternationalPublishers.
3. Taha, H. (1995): Operations Research: An Introduction, Prentice- Hall India.
4. Karlin, S and Taylor H.M, A first course in Stochastic Process. Academic Press

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	5	4	5	5	4	4	5	4	4	2
CO2	5	5	4	5	5	5	4	5	5	4
CO3	5	4	5	5	5	4	5	4	4	2
CO4	4	5	5	5	5	4	5	4	5	2
CO5	5	5	4	5	4	5	4	4	4	2

CC XII: STATISTICAL COMPUTING USING C & R PROGRAMMING

Course Outcomes:

CO1: The students are introduced to the basics of computer and programming.

CO2: The students are introduced to the basics of C.

CO3: The students are taught how to do Looping in C.

CO4: The students are introduced to User- defined functions.

CO5: The students are introduced to R. They can use R programming in different areas of research and industry.

Syllabus:

Unit-I History and importance of C. Components, basic structure programming, Keywords and Identifiers and execution of a C program. Data types: Basic data types, Enumerated data types, derived data types. Constants and variables: declaration and assignment of variables, Symbolic Constants, overflow and underflow of data. Operators and Expressions: Arithmetic, relational, logical, assignment, increment/decrement, operators, precedence of operators in arithmetic, relational and logical expression. Implicit and explicit type conversions in expressions, library functions. Managing input and output operations: reading and printing formatted and unformatted data

Unit-II Decision making and branching - if…else, nesting of if…else, else if ladder, switch, conditional operator. Looping in C: for, nested for, while, do…while, jumps in and outof loops. Arrays: Declaration and initialization of one-dim and two-dim arrays.
Character arrays and strings: Declaring and initializing string variables, reading andwriting strings from Terminal (using scanf and printf only).

Unit- III User- defined functions: A multi-function program using user-defined functions, definition of functions, return values and their types, function prototypes and calls. Category of Functions : no arguments and no return values, arguments but no returnvalues, arguments with return values, no arguments but returns a value, functions that return multiple values.

Unit- IV Introducing R: Getting R, Running R program, Finding your way in R, Command packages, Starting Out: Reading and Getting Data into R, Viewing Named Objects, Types of Data Items, Structure of Data Items, Examining Data Structure, Saing Your Work in R,Working with objects: Manipulating objects, Viewing Objects, Constructing data objects,Different forms of Data Objects. Descriptive Statistics and Tabulation.

List of Practicals:

1. Plot of a graph y= f(x)
2. Roots of a quadratic equation (with imaginary roots also)
3. Sorting of an array and hence finding median
4. Mean, Median and Mode of a Grouped Frequency Data
5. Variance and coefficient of variation of a Grouped Frequency Data
6. Value of n! using recursion
7. Matrix addition, subtraction, multiplication Transpose and Trace
8. t-test for difference of means
9. Paired t-test
10. F-ratio test

Prescribed Book:

1. Kanetkar Y. P. Let us C ; BPB Publications; 15thedition.
2. Gardener, M. Beginning R: The Statistical Programming Language, WileyIndia

Books for Reference:

1. Balagurusamy, E. (2011): Programming in ANSI C, 6th Edition, Tata McGraw Hill.
2. Kernighan, B.W. and Ritchie, D. (1988): C Programming Language, 2 ndEdition, Prentice Hall.
3. Gottfried,B.S.(1998): Schaum's Outlines: Programming with C, 2nd Edition,Tata Mc Graw Hill

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	5	4	5	5	4	4	5	4	5	4
CO2	4	5	4	4	5	5	4	5	5	4
CO3	5	4	5	5	2	4	5	4	5	2
CO4	4	5	5	4	5	4	5	4	5	4
CO5	4	5	4	5	4	5	4	4	5	2

DISCIPLINE SPECIFIC ELECTIVE

DSE I: OPERATIONS RESEARCH

Course Outcomes:

CO1: Introduction to Operations Research and LPP methods.

CO2: Transportation Problem and Assignment Problem.

CO3: The students are introduced to basic concepts of Game theory and its application.

CO4: The students are introduced to Graph theory networking problems.

CO5: The students are introduced to Inventory Management.

Syllabus:

Unit-I:	Introduction to Operations Research, phases of O.R., model building, various types of O.R. problems. Linear Programming Problem, Mathematical formulation of the L.P.P, graphical solutions of a L.P.P. Simplex method for solving L.P.P. Charne's M-technique for solving L.P.P. involving artificial variables. Special cases of L.P.P. Concept of Duality in L.P.P: Dual simplex method.
Unit-II:	Transportation Problem: Initial solution by North West corner rule, Least cost method and Vogel's approximation method (VAM), MODI's method to find the optimal solution, special cases of transportation problem. Assignment problem: Hungarian method to find optimal assignment problem.
Unit-III:	Game theory: Rectangular game, minimax-maximin principle, solution to rectangular game using graphical method, dominance and modified dominance property to reduce the game matrix and solution to rectangular game with mixed strategy. Networking: Shortest route and minimal spanning tree problem.
Unit-IV:	Inventory Management: ABC inventory system, characteristics of inventory system. EOQ Model and its variations, with and without shortages, Quantity Discount Model with price breaks.

List of Practicals:

1. Mathematical formulation of L.P.P and solving the problem using graphical method, Simplex technique and Charne's Big M method involving artificial variables.
2. Identifying Special cases by Graphical and Simplex method and interpretation (Unbounded, Infeasible and alternate solution)
3. Allocation problem using Transportation model
4. Allocation problem using Assignment model 5. Problems based on game matrix

Prescribed Books:

1. KantiSwarup, Gupta, P.K. and Manmohan (2007): Operations Research, 13thEdition, Sultan Chand and Sons.

Reference Books:

1. Taha, H. A. (2007): Operations Research: An Introduction, 8th Edition, Prentice Hall ofIndia.
2. Hadley, G: (2002) : Linear Programming, Narosa Publications
3. Hillier, F.A and Lieberman, G.J. (2010): Introduction to Operations Research Concepts and cases, 9th Edition, Tata Mc Graw Hill

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	5	4	5	5	4	4	5	4	4	2
CO2	4	5	5	4	5	5	4	5	4	4
CO3	5	4	5	4	2	4	5	4	4	2
CO4	4	5	5	4	4	4	5	4	5	2
CO5	4	5	4	5	4	5	4	4	4	2

DSE-II: TIME SERIES ANALYSIS

Course Outcomes:

CO1: Time series introduction, application and components.

CO2: The students learn to find trends in time series data.

CO3: The students learn to find trend count in time series.

CO4: The students learn to find seasonal components and count in time series.

CO5: The students learn about stationary time series.

Syllabus:

Unit-I: Introduction to times series data, application of time series from various fields, Components of a times series, Decomposition of time series. Trend: Estimation of trend by freeh and curve method, method of semi averages, fitting a various mathematical curve, and growth curves.

Unit-II: Trend Cont.: Method of moving averages. Detrending. Effect of elimination of trend on other components of the time series. Seasonal Component: Estimation of seasonal component by Method of simple averages, Ratio to Trend.

Unit-III: Seasonal Component cont: Ratio to Moving Averages and Link Relative method, Deseasonalization. Cyclic Component: Harmonic Analysis. Some Special Processes: Movingaverage (MA) process and Autoregressive (AR) process of orders one and two, Estimation of the parameters of AR (1) and AR (2) – Yule-Walker equations.

Unit-IV: Stationary Time series: Weak stationarity, auto correlation function and correlogram of moving average; its applications. Random Component: Variate component method. Forecasting: Exponential smoothing methods.

List of Practicals:

1. Fitting and plotting of modified exponential curve
2. Fitting and plotting of Gompertz curve
3. Fitting and plotting of logistic curve
4. Fitting of trend by Moving Average Method
5. Measurement of Seasonal indices Ratio-to-Trend method
6. Measurement of Seasonal indices Ratio-to-Moving Average method
7. Measurement of seasonal indices Link Relative method
8. Forecasting by exponential smoothing

Prescribed Books:

1. Kendall M.G. (1976): Time Series, Charles Griffin.
2. Brockwell, P.J. and Davis, R. A. (2003). Introduction to Time Series Analysis, Springer

Reference Books:

1. Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals of Applied Statistics, 4th Edition (Reprint), Sultan Chand &Sons
2. Chatfield C. (1980): The Analysis of Time Series –An Introduction, Chapman & Hall.
3. Mukhopadhyay P. (2011): Applied Statistics, 2nd ed. Revised reprint, Books and Allied

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	4	5	5	4	4	5	4	4	2
CO2	4	5	2	4	5	5	4	5	4	4
CO3	5	4	4	5	5	4	5	4	4	2
CO4	4	2	4	4	5	4	5	4	5	2
CO5	4	5	4	5	4	5	4	4	4	2

ETHICS AND VALUE

Course Outcomes:

After reading this paper the students will be able to
1. Have changes in their perceptions and practices towards women and eve lop proper attitude towards women and value their work and contribution.
2. Come forward to challenge the unethical treatments against women.
3. End gender-based hierarchy and hegemony, remove the feeling that women are counter to men and bring about a complementarity among the hitherto existing gender binary.
4. Pioneer in creating a gender equal society where the well-being, happinessand security of the women will be well protected & contributing towards a better and happier society.

SEMESTER-V
Unit-5

Title: -Vulnerable Sections of Society: Understanding their Issues

Total no. of Periods-15   **Full mark-25**   **Credit point -1**

5.0 Aims of the Unit:

To create an awareness amongst students about the need for ensuring dignity and equality for the vulnerable sections of the society.

Learning Objectives:

- Students would be able to appreciate values and ethics relating to vulnerable sections of the society.
- Students would learn to practice equality, diversity and social justice.
- Students would become more empathetic and compassionate towards vulnerable sections of the society.

	Teaching Hours
5.1 Issues Relating to Children: Nutrition and health, Child Exploitation: Child labour, trafficking, Sexual exploitation	1-2-3-4
5.2 Issues Relating to Elderly Persons: Abuse of Elders, Financial Insecurity, Loneliness and Social Insecurity, Health Care Issues, Needs for a Happy and Dignified Ageing	5-6-7-8
5.3 Issues Relating to Persons with disability: Rights of PWD, affirmative action, Prevention of discrimination, providing equal opportunity, various scheme for empowering PWD and social justice for PWD	9-10-11-12
5.4 Issues Relating to Third Gender: Understanding the Third Gender, Social justice for them, Removal of discrimination, Affirmative action and Acceptance of diversity of gender.	13-14-15

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	4	5	2	4	4	4	2	2	4
CO2	1	4	4	2	2	2	4	1	1	4
CO3	1	4	2	2	2	2	2	1	1	2
CO4	1	4	5	1	2	2	4	2	2	4

CCXIII: DESIGN OF EXPERIMENTS

Course Outcomes:

CO1: The students are introduced to Analysis of variance (ANOVA).
CO2: The students are exposed to the concepts of Experimental designs.**CO3:** The students are introduced to Basic designs.
CO4: The students are introduced to Factorial experiments.

CO5: The students are introduced to Balanced Incomplete Block Design (BIBD).

Syllabus:

Unit-I:	Analysis of variance (ANOVA) for one way and two way classified data (one observation per cell) Experimental designs: Role, historical perspective, terminology, experimental error, basic principles, uniformity trials, fertility contour maps, choice of size and shape of plots and blocks.
Unit-II:	Basic designs: Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD) – layout, model and statistical analysis, relative efficiency, analysis with missing observations.
Unit-III:	Factorial experiments: advantages and disadvantages , notations and concepts, 22, 23 … 2n and 32 factorial experiments, design and its analysis and applications.
Unit-IV:	Total and Partial confounding for 2n (n≤5), 32 and 33. Factorial experiments in a single replicate. Advantages and disadvantages. Balanced Incomplete Block Design (BIBD) – parameters, relationships among its parameters.

List of Practicals:

1. Analysis of a CRD
2. Analysis of an RBD
3. Analysis of an LSD
4. Analysis of an RBD with one missing observation
5. Analysis of an LSD with one missing observation
6. Analysis of 22 and 23 factorial in CRD and RBD
7. Analysis of a completely confounded two level factorial design in 2blocks
8. Analysis of a completely confounded two level factorial design in 4blocks
9. Analysis of a partially confounded two level factorial design

Prescribed Books:

1. Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals of Applied Statistics, 4th Edition (Reprint), Sultan Chand &Sons
2. Goon, A.M., Gupta, M.K.and Das gupta, B.(2005):Fundamentals of Statistics. Vol. II, 8thEdn. World Press, Kolkata.

Reference Books:

1. Cochran, W.G. and Cox, G.M. (1959): Experimental Design. Asia Publishing House.
2. Das, M.N. and Giri, N.C. (1986): Design and Analysis of Experiments. Wiley Eastern Ltd.
3. Kempthorne, O. (1965): The Design and Analysis of Experiments. John Wiley.
4. Montgomery, D. C. (2008): Design and Analysis of Experiments, John Wiley.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	4	5	5	4	4	5	4	4	2
CO2	4	5	2	4	5	5	4	5	4	4
CO3	5	4	5	5	4	4	5	4	4	2
CO4	4	2	5	4	5	4	5	4	5	2
CO5	4	5	4	5	4	5	4	4	4	2

CCXIV: MULTIVARIATE ANALYSIS AND NON PARAMETRIC METHODS

Course Outcomes:

CO1: The students are introduced to concepts of Bivariate Normal Distribution (BVN).

CO2: The students are exposed to the concept of Multivariate Data.

CO3: The students learn about Multivariate Normal distribution and its properties.

CO4: The students learn Nonparametric Tests.

CO5: The students learn Two sample and ranked tests.

Syllabus:

Unit-I: Bivariate Normal Distribution (BVN): p.d.f. of BVN, properties of BVN, marginal and conditional p.d.f. of BVN. Multivariate Data: Random Vector: Probability mass/density functions, Distribution function, Mean vector & Dispersion matrix, Marginal & Conditional distributions.

Unit-II: Multivariate Normal distribution and its properties. Sampling distribution for mean vector and variance- covariance matrix. Multiple and partial correlation coefficient and their properties.

Unit-III: Nonparametric Tests: Introduction and Concept, Parametric versus non-parametric tests, advantages and disadvantages of non- parametric tests. Test for randomness based on total number of runs, Empirical distribution function, Kolmogrov Smirnov test for one sample, Sign tests- one sample.

Unit-IV: Kolmogrov Smirnov two samples test, Wilcoxon signed rank tests, Wilcoxon-Mann- Whitney U test, Kruskal-Wallis test.

List of Practicals:

1. Multiple Correlation
2. Partial Correlation
3. Bivariate Normal Distribution
4. Test for randomness based on total number of runs.
5. Kolmogrov Smirnov test for one sample.
6. Sign test: one sample, two samples, large samples.
7. Wilcoxon-Mann-Whitney U-test.
8. Kruskal-Wallis test

Prescribed Books:

1. Bhuyan, KC., Multivariate Analysis and its Applications, New Central Book Agency (P) Limited
2. Gun, A.M., Gupta, M.K. and Das gupta, B.: An Outline of Statistical Theory, Vol.II,(4thed.), World Press.

Reference Books:

1. Johnson, R.A. and Wichern, D.W. (2007): Applied Multivariate Analysis, 6thEdn., Pearson & Prentice Hall
2. Anderson, T.W. (2003): An Introduction to Multivariate Statistical Analysis, 3rdEdn., JohnWiley
3. Kshirsagar, A.M. (1972):Multivariate Analysis, 1stEdn. Marcel Dekker.
4. Mukhopadhyay, P.: Mathematical Statistics. Books and Allied (P)Ltd
5. Gibbons, J.D. and Chakraborty, S(2003):Non parametric Statistical Inference.4th Edition. Marcel Dekker, CRC.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	4	5	5	4	4	5	4	2	2
CO2	4	5	4	4	5	5	4	5	4	4
CO3	5	4	5	5	4	4	5	4	4	2
CO4	4	2	5	4	5	4	5	4	2	2
CO5	4	5	4	5	4	5	4	4	4	2

DSE

DSE –III: DEMOGRAPHY AND VITAL STATISTICS

Course Outcomes:

CO1: The students learn about different population theories.

CO2: The students are Introduced to sources of collecting data on vital statistics.

CO3: The students learn different ways of measuring mortality.

CO4: The students learn how to make tables in demography and vital statistics.

CO5: The students learn different ways of Measurements of Fertility and Growth.

Syllabus:

Unit-I: Population Theories: Coverage and content errors in demographic data, use of balancing equations and Chandrasekharan-Deming formula to check completeness of registration data. Adjustment of age data, use of Myer and UN indices, Population composition, dependencyratio.

Unit-II: Introduction and sources of collecting data on vital statistics, errors in census and registration data. Measurement of population, rate and ratio of vital events. Measurements of Mortality: Crude Death Rate (CDR), Specific Death Rate (SDR), Infant Mortality Rate (IMR) and Standardized Death Rates.

Unit-III: Stationary and Stable population, Central Mortality Rates and Force of Mortality. Life (Mortality)Tables: Assumption, description, construction of Life Tables and Uses of Life Tables.

Unit-IV: Abridged Life Tables; Concept and construction of abridged life tables by Reed-Merrell method, Measurements of Fertility: Crude Birth Rate (CBR), General Fertility Rate (GFR), Specific Fertility Rate (SFR) and Total Fertility Rate (TFR). Measurement of Population Growth: Crude rates of natural increase, Pearl's Vital Index, Gross Reproduction Rate (GRR) and Net Reproduction Rate (NRR).

List of Practicals:
1. To calculate CDR and Age Specific death rate for a given set of data
2. To find Standardized death rate by:- (i) Direct method (ii) Indirect method
3. To construct a complete life table
4. To fill in the missing entries in a life table
5. To calculate probabilities of death at pivotal ages and use it construct a bridgedlife table
6. To calculate CBR, GFR, SFR, TFR for a given set of data
7. To calculate Crude rate of Natural Increase and Pearle's Vital Index for a givenset of data
8. Calculate GRR and NRR for a given set of data and compare them

Prescribed Books:

1. Pathak, K.B. and Ram, F.: Techniques of Demography Analysis, Himalayan Publishers
2. Gun,A.M., Gupta,M.K. and Dasgupta, B.(2008):Fundamentals of Statistics, Vol. II, 9th Edition, World Press.

Reference Books:

1. 9Mukhopadhyay P. (1999): Applied Statistics, Books and Allied (P)Ltd.
2. Biswas, S. (1988): Stochastic Processes in Demography & Application, Wiley Eastern Ltd.
3. Croxton, Fredrick E., Cowden, Dudley J. and Klein, S. (1973): Applied General Statistics, 3rd Edition. Prentice Hall of India Pvt. Ltd.
4. Keyfitz N., Beckman John A.: Demography through Problems S-Verlag Newyork.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	4	5	5	4	4	5	4	4	2
CO2	4	5	2	4	5	5	4	5	4	4
CO3	5	4	5	5	2	4	5	4	4	2
CO4	4	2	5	4	5	4	5	4	5	2
CO5	4	5	4	5	4	5	4	4	4	2

- Note related: 1
- From What Related: 2
- Neutral: 3
- Moderately Related: 4
- Highly Related: 5

DSE-IV: ECONOMETRICS

(ECONOMETRICS/ PROJECT)

Course Outcomes:

CO1: The students are Introduced to concepts of Econometrics.

CO2: The student learns to make and analyze the General Linear Model (GLM). **CO3:** The students learn how to identify and eradicate multicollinearity from data.**CO4:** The students learn how to deal with autocorrelation in data. **CO5:** The students learn how to tackle Hetero scedastic disturbances.

Syllabus:

Unit-I: Introduction: Objective behind building econometric models, nature of econometrics, model building, role of econometrics, structural and reduced forms. General linear model (GLM). Estimation under linear restrictions.

Unit-II: Multi collinearity: Introduction and concepts, detection of multicollinearity, consequences, tests and solutions of multicollinearity, specification error.

Unit-III: Generalized least squares estimation, Aitken estimators. Autocorrelation: concept, consequences of auto correlated disturbances, detection and solution of autocorrelation.

Unit-IV: Hetero scedastic disturbances: Concepts and efficiency of Aitken estimator with OLS estimator under hetero-scedasticity. Autoregressive models, Dummy variables, Qualitative data.

List of Practicals:

1. Problems based on estimation of General linear model
2. Testing of parameters of General linear model
3. Forecasting of General linear model
4. Problems related to consequences of Multicollinearity
5. Diagnostics of Multicollinearity
6. Problems related to consequences of Autocorrelation(AR(I))
7. Diagnostics of Autocorrelation
8. Problems related to consequences Hetero scedasticity
9. Diagnostics of Hetero scedasticity

Prescribed Books:

1. Gujarati, D. and Sangeetha, S. (2007): Basic Econometrics, 4th Edition, McGraw Hill Companies.
2. Maddala, G.S. and Lahiri, K. (2009): Introduction to Econometrics, 4th Edition, John Wiley &Sons.

Reference Books:

1. Johnston,J.(1972):Econometric Methods, 2nd Edition, Mc Graw Hill International.
2. Koutsoyiannis, A. (2004): Theory of Econometrics, 2nd Edition, Palgrave Macmillan

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	4	5	5	4	4	5	4	4	2
CO2	4	5	4	4	5	5	4	5	4	2
CO3	5	4	5	5	4	4	5	4	4	4
CO4	4	2	5	4	4	4	5	4	5	2
CO5	4	5	4	5	4	5	4	4	4	4

Project (Optional)

Course Outcomes:

After studying this paper, the students can

I. Helps the students to undertake research in systematic way in their higher studies.
II. Helps them in selecting a topic with social relevance for writing a research article.
III. Helps them to become critical in their thought and actions.
IV. Teaches the students to apply their theoretical knowledge in reallife situations.

Eligibility:

Students who have scored more than 60% marks in Semester –I, II, III &IV are eligible to opt for project paper. The aim of the course is to initiate students to write and present a statistical report, under the supervision of a faculty, on some area of social interest. The project work will provide hands-on training to the students to deal with data emanating from some real-life situation and propel them to do well on some theory or relate it to some theoretical concepts. The project should be prepared basing on the own idea and interpretation of the student. It should not be copied from anywhere. A student has to consult his / her supervisor for the preparation of the project. The student has to prepare a project of his own by selecting a topic (list of a few topics is given below). The dissertation carries 60 marks which will be evaluated by an external examiner andhe / she will face a viva-voice test of 40 marks by an external examiner along with his / her supervisor of the concerned project.

1. Game Theory and its application
2. Vital Statistics
3. Survey Sampling
4. Operations Research
5. Graph Theory and Algorithm
6. Indian Official Statistics
7. Statistical Inference
8. Demography

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	4	2	5	4	2	4	5	5	5
CO2	5	4	5	5	4	5	2	5	5	5
CO3	4	5	4	2	5	5	5	4	5	5
CO4	5	5	5	2	5	5	5	5	5	5

ETHICS AND VALUE

Course Outcomes:

After reading this paper the students will be able to

XIII. Have changes in their perceptions and practices towards women and eve lop proper
attitude towards women and value their work and contribution.

XIV. Come forward to challenge the unethical treatments against women.

XV. End gender-based hierarchy and hegemony, remove the feeling that women are counter to men and bring about a complementarity among the hitherto existing gender binary.

XVI. Pioneer in creating a gender equal society where the well-being, happiness and security of the women will be well protected & contributing towards a better and happier society.

Unit-6
Title: - Environmental &Techno Ethics

Total no. of Periods-15   Full mark-25   Credit point -1

Aims of the Unit:

- To develop awareness and sensitize students about the importance of environment for a sustainable earth and to bring Green Technology into action
- To focus their attention towards cleanliness, preservation of biodiversity and practice of conservation of natural resources
- To make them understand the judicious use of modern technology strictly on need basis
- To use science and technology for preservation of environment and its sustainable development but not for destruction.

Learning Objectives:

- Develop an understanding of environmental ethics and work towards sustainable development
- Commitment to Green Technology for sustainable future
- Understand ethical issues relating to use of digital medium

Teaching Hours

6.1 Environmental Ethics: Types of Ecological Values, Environmental Values & Valuing Nature, Equitable use of Resources, Role of Individual in the conservation of resources for future generation, Bio-Ethics-Genetic manipulation in plants and animals for benefit of society and cruelty against animal.	1-2-3
6.2 Promotion of Green Technology: **Goal of Green Technology:** Reduce recycling, **Renew** (removal of chemicals), **Refuse** and **Responsibility.** **Green Technology in relation to:** -Energy and Construction.	4-5-6-7
6.3 Ethics and Technology with reference to Science, gadget, machine etc. and interaction with each other; **Agricultural, Industrial, Digital, Globalized Age etc**	8-9-10-11
6.4 Judicious Use of Technology: **Judicious use of** Mobile Phones, Electrical machines, Plastics, Television, Computers and their harmful effects **Ethics and Use of Digital Technology:** Cyber ethics- Crimes and Ethical hacking, **Ethics of social media:** WhatsApp, Facebook, Twitter and others.	12-13-14-15

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	4	5	2	4	4	4	2	2	4
CO2	1	4	4	2	2	2	4	1	1	4
CO3	1	4	2	2	2	2	2	1	1	2
CO4	1	4	5	1	2	2	4	2	2	4

- Note related: 1
- From What Related: 2
- Neutral: 3
- Moderately Related: 4
- Highly Related: 5