

### Programme for B.Com

**Table 1** Programme Outcomes (PO) on completing B.Com

Sl. No.	Programme Outcomes
<b>Critical Thinking (PO1)</b>	This outcome involves training students to think critically and independently. Critical thinking skills help graduates make informed decisions and solve problems effectively.
<b>Problem-solving (PO2)</b>	B.Sc programmes should equip students with problem-solving skills. Graduates should be capable of identifying complex issues, analysing root causes, and proposing effective solutions. This skill is valuable in both personal life and professional careers.
<b>Interdisciplinary Knowledge (PO3)</b>	Depending on their chosen major, minor and interdisciplinary subjects within the B.Sc programme, students should develop expertise in their specific area of study, whether it's statistics, computer science, economics, or another field. This specialized knowledge provides depth in their chosen discipline.
<b>Employability (PO4)</b>	On graduating, the students will be eligible for employment in the field of education and other industries like analytics, pharmaceuticals etc. Their skills in comprehension of general social phenomena around them place them in an ideal situation for such jobs. They will also be able to appear for competitive examinations conducted for public sector jobs.

**Table 2** Programme Specific Objectives (PSO) on completing B.Com

<b>SL No.</b>	<b>On completing B.Com, the students will be able to</b>
<b>PSO 1</b>	Students of Commerce will be acquainted with the concept, factors, methods and historical development of Mathematics.
<b>PSO 2</b>	Students can gather knowledge about Mathematics and explain the application of Mathematics in different fields.
<b>PSO 3</b>	They will understand the importance of Mathematics and their uses in real life.
<b>PSO 4</b>	Develop essential knowledge and skill of planning and management which is an essential part of Mathematics.
<b>PSO 5</b>	They will understand the concept and application of modern technological development and will get acquainted with the curriculum development, inclusiveness and process of evaluation and its implementation in the field of Commerce.
<b>PSO 6</b>	Understand and apply the concept and will develop skill in analyzing descriptive measures in Mathematics.

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Course Outcomes (CO) are mapped to the revised Bloom's Taxonomy using the following abbreviations:

R: Remembering

U: Understanding

Ap: Applying

An: Analysing

E: Evaluating

C: Creating

**Semester- I (July to December)**

Programme	B.Com
paper Code	GE 1.1 Chg
GE1	Statistics
Year and Semester	1st year 1st semester
Prerequisite Course	Nil
Course Objective	Knowledge of Introduction to Statistics

**Table 3** Course Outcome (CO) on completing Unit-1 to Unit-5

Units as given in syllabus of CU	Course Outcome	On completing the course, the student will be able to:	PSO Addressed	Cognitive level
<u>Unit-1</u> Fundamentals	CO1	Gain a basic idea of the meaning and understand the nature, scope and aims of Statistics.	1 and 3	R, U, An, Ap
Unit-2 Central tendency	CO2	Explain the different types of measures.	1 and 3	R, U, An, Ap
Unit-3 Dispersion	CO3	Become aware of applications of different measures.	1 and 3	R, U, An, Ap
Unit-4 Skewness & Kurtosis	CO4	Be acquainted with the concepts.	1 and 3	R, U, An, Ap
Unit-5 Interpolation	CO5	Be acquainted with the concepts & its Applications.	1 and 3	R, U, An, Ap

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
<b>CO1</b>	3	3	3	3	2	3
<b>CO2</b>	3	3	3	3	2	3
<b>CO3</b>	3	3	3	3	2	3
<b>CO4</b>	3	3	3	3	2	3
<b>CO5</b>	3	3	3	3	2	3
<b>Average</b>						

Semester: I

Core Course: Microeconomics & Statistics-I

Paper Code: GE 1.1 Chg

Total Marks: 100 [Theory (Th) 40 + Internal Assessment 10+Attendance: 10] Total Credits =6 , No. of Lecture hours (Theory): 40

Table 5				
Units of the Course	Content	Lecture No	Faculty	Date and sign
<b>Unit-1</b>	Fundamentals:Definition of Statistics, Scope and limitation of Statistics,Attribute and variable,Primary and secondary data, Method of data collection, Tabulation of data, Graphs and charts, Frequency distribution, Diagrammatic presentation of frequency distribution	8	SR, AM, SG	
<b>Unit-2</b>	Measures of Central Tendency:Meaning of central tendency, Common measures – mean (A.M., G.M., H.M.) median and mode, Partition values- quartiles, deciles and percentiles, Applications of different measures	8	SR, SG, DH, AM	
Unit -3	Measures of Dispersion:Meaning of dispersion,Common measure– range, quartile deviation, mean deviation and standard deviation; Relative measures of dispersion,Combinedstandard deviation,Applications of different measures.	8	AM, MD, SG	
Unit - 4	Moments, Skewness and Kurtosis: Different types of moments and their relationships, Meaning of skewness and kurtosis, Different measures of skewness, Measure of kurtosis,Applications of different measures.	8	AM, SG	
Unit-5	Interpolation: Finite differences, Polynomial function, Newton's forward and backward interpolation formula, Lagrange's interpolation formula.	8	AS, AM, SR	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1			2	2	2			
CO2			2	2	2	2		
CO3	3		2	2	2	2		
CO4	3		2	2	2	2		
CO5	3		2	2	2	2		
1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)								

**Semester –III (July to December)**

**Core Course –Business Mathematics & Statistics**

Paper Code: GE 3.3 Chg

Programme	B.Com
Course Code	GE 3.3 Chg
Course Name	Business Mathematics & Statistics
Year and Semester	2nd year 3rd semester
Prerequisite Course	Nil
Course Objective	To develop an understanding of mathematics & statistics

Group, Section and Unit as given in syllabus of CU	Course outcome	On completing the course, the student will be able to:	PSO Addressed	Cognitive level
Unit 1 Permutation, Combination, log, Compound interest & annuities	CO1	Develop knowledge of mathematics	All	All
Unit 2	CO2	Develop a critical understanding of	All	All

Correlation & Regression, Index No., Time Series, Probability theory		different statistical methods		

				PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1				3	3	3	3	3	3	
CO2				3	3	3	3	3	3	
Average										
Correlation level				1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)						

Total Marks: 100 [Theory(Th) 80+ Internal Assessment 10+Attendance: 10] Total Credits=6 , No. of Lecture hours: 80

Section/ Unit of the Course	Content	Lecture No	Faculty	Date and sign
Unit 1	Permutations and Combinations: Definition, Factorial Notation, Theorems on Permutation, Permutations with repetitions, Restricted Permutations; Theorems on Combination, Basic identities, Restricted Combinations. 2 Set Theory: Definition of set, Presentation of sets, Different types of sets- Null set, Finite and infinite Sets, Universal set, Subset, Power set etc.; Set Operations, Law of algebra of Sets. 3 Binomial Theorem: Statement of the theorem for positive integral index, General term, Middle term, Simple properties of binomial coefficients. 4 Logarithm: Definition, Base and Index of Logarithm, General properties of Logarithm, Common Problems. 5 Compound Interest and Annuities: Simple AP and GP Series, Different types of interest rates, Net present value, Types of annuities, Continuous compounding, Valuation of simple loans and debentures, Problems relating to Sinking Funds.	10	SR,AS,AM,DH,MD	

Unit 2	<p>Correlation and Association: Bivariate data, Scatter diagram, Pearson's correlation coefficient, Spearman's rank correlation, Measures of association of attributes. [ 8 L /8Marks] 7. Regression Analysis: Least squares method, Simple regression lines, properties of regression, Identification of regression lines. [ 8 L /8Marks] 8. Index Numbers: Meaning and types of index numbers, Problems of constructing index numbers, Construction of price and quantity indices, Test of adequacy, errors in index numbers, Chain base index numbers; Base shifting, Splicing, Deflating, Consumer price index and its uses. [ 8 L /8Marks] 9. Time Series Analysis: Causes of variation in time series data, Components of time series, additive and multiplicative models, Determination of trend by semi-average, moving average and least squares( of linear, quadratic and exponential trend) methods; Computation of seasonal Indices by simple average, ratio-to-moving average, ratio-to-trend and link relative methods; Simple forecasting through time series data. [ 8 L /8Marks] 10. Probability Theory: Meaning of probability; Different definitions of probability; Conditional probability; Compound probability; Independent events, Simple problems.</p>	40	SG, AM, SR	
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	PO1	PO2	PO3	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1				2	2	2	3	2	2	
CO2				2		2	3	2	2	
Correlation level				1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)						

**Semester –V (January-June)****Core Course -**

Paper Code: DSE 5.1 A

Total Marks: 100 [Theory(Th) 40 + Internal Assessment 10+Attendance: 10] Total Credits=6 , No. of Lecture hours: 40

Section/ Unit of the Course	Content	Lecture No	Faculty	Date and sign
Unit 1	Functions, Limit and Continuity: Definition of functions, Classification of functions, Different types of functions(excluding trigonometrical functions), Elementary ideas of limit and continuity through the use of simple algebraic functions	8	AS,AM, SR, DH, MD	
Unit 2	Differentiation and Integration: Derivative and its meaning; Rules of differentiation; Geometrical interpretation; Significance of derivative as rate measure; Second order derivatives; Integration as anti-derivative process; Standard forms; Integration by substitution.	8	AS,AM, SR, DH, MD	
Unit 3	Applications of Derivative and Integration: Maximum and minimum values ; Cost function ; Demand function ; Profit function; Increasing and decreasing functions ; Rate measure, Applied problems on Average cost (AC), Average variable cost (AVC), Marginal cost (MC), Marginal revenue (MR), Simple area calculation by integration method.	8	AS,AM, SR, DH, MD	
Unit 4	Determinants: Determinants upto third order, Elementary properties of determinants, Minors and co-factors, Solution of a system of linear equations by Cramer's Rule (up to three variables	8	AS,AM, SR, DH, MD	
Unit 5	Matrix: Definition of matrix, Types of matrices, Operations on matrices (addition, subtraction, multiplication), Adjoint of a matrix, Inverse of a matrix , Solution of a system of linear equations by matrix inversion method (up to three variables).	8	AS,AM, SR, DH, MD	



	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1		2	3	3	2	2	
CO2		2	3	3	2	2	
CO3		2	3	3	2	2	
CO4		2	3	3	2	2	
CO5		2	3	3	2	2	
Average							

**Programme B.Sc. Mathematics (GENERAL)**

<b>Sl. No.</b>	<b>Programme Outcomes</b>
<b>Critical Thinking (PO1)</b>	This outcome involves training students to think critically and independently. Critical thinking skills help graduates make informed decisions and solve problems effectively.
<b>Problem-solving (PO2)</b>	B.Sc programmes should equip students with problem-solving skills. Graduates should be capable of identifying complex issues, analysing root causes, and proposing effective solutions. This skill is valuable in both personal life and professional careers.
<b>Interdisciplinary Knowledge (PO3)</b>	Depending on their chosen major, minor and interdisciplinary subjects within the B.Sc programme, students should develop expertise in their specific area of study, whether it's statistics, computer science, economics, or another field. This specialized knowledge provides depth in their chosen discipline.
<b>Employability (PO4)</b>	On graduating, the students will be eligible for employment in the field of education and other industries like analytics, pharmaceuticals etc. Their skills in comprehension of general social phenomena around them place them in an ideal situation for such jobs. They will also be able to appear for competitive examinations conducted for public sector jobs.

**Table 2** Programme Specific Objectives (PSO) on completing B.Sc. Mathematics (General)

<b>SL No.</b>	<b>On completing B.Sc. Mathematics, the students will be able to</b>
<b>PSO 1</b>	Students of Mathematics will be acquainted with the concept, factors, methods and historical development of Mathematics.
<b>PSO 2</b>	Students can gather knowledge about Mathematics and explain the application of Mathematics in different fields.
<b>PSO 3</b>	They will understand the importance of Mathematics and their uses in real life.
<b>PSO 4</b>	Develop essential knowledge and skill of planning and management which is an essential part of Mathematics.
<b>PSO 5</b>	They will understand the concept and application of modern technological development and will get acquainted with the curriculum development, inclusiveness and process of evaluation and its implementation in the field of Mathematics.
<b>PSO 6</b>	Understand and apply the concept and will develop skill in analyzing descriptive measures in Mathematics.

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Course Outcomes (CO) are mapped to the revised Bloom's Taxonomy using the following abbreviations:

R: Remembering

U: Understanding

Ap: Applying

An: Analysing

E: Evaluating

C: Creating

**Semester- I (July to December)**

Programme	B.Sc. Mathematics (General)
paper Code	MG(GE1)101
GE1	Introduction to Mathematics
Year and Semester	1st year 1st semester
Prerequisite Course	Nil
Course Objective	Knowledge of Introduction to Mathematics

**Table 3** Course Outcome (CO) on completing Unit-1 to Unit-4

Units as given in syllabus of CU	Course Outcome	On completing the course, the student will be able to:	PSO Addressed	Cognitive level
<u>Unit-1</u> Algebra 1	CO1	Gain a basic idea of the meaning and understand the nature, scope and aims of Mathematics.	1 and 3	R, U, An, Ap
Unit-2 Diff Calculus 1	CO2	Explain the factors of Mathematics and their interrelationship.	1 and 3	R, U, An, Ap
Unit-3 Diff Equ 1	CO3	Become aware of different aspects of Mathematics that influence Mathematics.	1 and 3	R, U, An, Ap
Unit-4 Coordinate geometry	CO4	Be acquainted with the concept in Mathematics.	1 and 3	R, U, An, Ap

**Table 4**

	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
<b>CO1</b>					3	3	3	3	2	3
<b>CO2</b>					3	3	3	3	2	3
<b>CO3</b>					3	3	3	3	2	3
<b>CO4</b>					3	3	3	3	2	3
<b>Average</b>										
<b>Correlation level</b>	1-Low (40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High (60%<Achievement)									

Mathematics - I  
 Semester: I  
 Core Course-1A  
 Paper Code: MG(GE1)101

Total Marks: 100 [Theory (Th) 65 + Tutorial (Tu) 15 + Internal Assessment 10+Attendance: 10] Total Credits: [5(Th)+1(Tu)]=6 , No. of Lecture hours (Theory): 75, No. of Tutorial contact hours:15

Table 5				
Units of the Course	Content	Lecture No	Faculty	Date and sign
<b>Unit-1</b>	<b>Complex Numbers:</b> De Moivre's Theorem and its applications. Definition of $a^z$ ( $a \neq 0$ ). Inverse circular and Hyperbolic functions.	2	SR, AS, AM	
	<b>Polynomials:</b> Polynomials with real coefficients, the $n^{\text{th}}$ degree polynomial equation has exactly $n$ roots.	2		
	<b>Statements:</b> (i) If a polynomial $f(x)$ has opposite signs for two real values $a$ and $b$ of $x$ , the equation $f(x) = 0$ has odd number of real roots between $a$ and $b$ . If $f(a)$ and $f(b)$ are of same sign, either no real root or an even number of roots lies between $a$ and $b$ . (ii) Rolle's Theorem and its direct applications.	3		
	<b>Rank of a matrix:</b> Determination of rank either by considering minors or by sweep-out process. Consistency and solution of a system of linear equations with not more than 3 variables by matrix method.	2		
<b>Unit-2</b>	<b>Number System:</b> Rational numbers, Geometrical representations, Irrational number, Real number represented as point on a line Linear Continuum.	3		
	<b>Real-valued functions:</b> Limit of a function (Cauchy's definition). Continuity of a function at a point and in an interval. Statement of existence of inverse function of a strictly monotone function and its continuity.	3		
	<b>Derivative:</b> Geometrical and physical interpretation of derivative. Sign of derivative-Monotonic increasing and decreasing functions. Differential application in finding approximation.	4		
		3		
		4		

	<p><b>Successive derivative</b> - Leibnitz's theorem and its application.</p> <p><b>Functions of two and three variables:</b> Their geometrical representations. Limit and Continuity (definitions only) for function of two variables. Partial derivatives. chain Rule. Exact differentials. Functions of two variables - Successive partial Derivatives: Statement of Schwarz's Theorem on Commutative property of mixed derivatives. Euler's Theorem on homogeneous function of two and three variables.</p> <p><b>Applications of Differential Calculus:</b> Curvature of plane curves. Rectilinear Asymptotes (Cartesian only). Envelope of family of straight lines and of curves (problems only). Definitions and examples of singular points (Viz. Node. Cusp, Isolated point).</p>			
Unit -3	<p><b>Ordinary differential equation:</b> Order, degree and solution of an ordinary differential equation (ODE) in presence of arbitrary constants, Formation of ODE.</p> <p><b>First order equations:</b> (i) Exact equations and those reducible to such equation. (ii) Euler's and Bernoulli's equations (Linear). (iii) Clairaut's Equations: General and Singular solutions.</p> <p><b>Second order linear equations:</b> Second order linear differential equation with constant coefficients. Euler's Homogeneous equations.</p> <p><b>Second order differential equation:</b> (i) Method of variation of parameters, (ii) Method of undetermined coefficients.</p>	<p><b>10</b></p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	AM	
Unit - 4	<p><b>Transformations of Rectangular axes:</b> Translation, Rotation and their combinations. Invariants.</p> <p><b>General equation of second degree in <math>x</math> and <math>y</math> :</b> Reduction to canonical forms. Classification of conic.</p> <p><b>Pair of straight lines:</b> Condition that the general equation of 2nd degree in <math>x</math> and <math>y</math> may represent two straight lines. Point of intersection of two intersecting straight lines. Angle between two lines given by <math>ax^2+2hxy+by^2 = 0</math>. Equation of bisectors. Equation of two lines joining the origin to the points in which a line meets a conic. Equations of pair of tangents from an external point, chord of contact, poles and polars in case of General conic: Particular cases for Parabola, Ellipse, Circle, Hyperbola.</p>	<p><b>20</b></p> <p>2</p> <p>2</p> <p>4</p>	AS	

	<p><b>Polar equation:</b> Polar eq. of straight lines and circles. Polar equation of a conic referred to a focus as pole. Equation of chord joining two points. Equations of tangent and normal.</p> <p><b>Sphere:</b> Sphere and its tangent plane. Right circular cone.</p>			
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	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6			
CO1							2	2	2				
CO2							2	2	2	2			
CO3					3		2	2	2	2			
CO4					3		2	2	2	2			
Average													
Correlation level					1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)								

### Semester -II (January- June)

Mathematics - II

Semester : II Credits : 5+1\*=6

Core Course-1B Full Marks : 80+20\*\*=100

Paper Code : MG(GE2)201

*Minimum number of classes required : 60*

\*1 Credit for Tutorial

\*\*20 Mark is reserved for Internal Assessment

& Attendance of 10 mark each

Programme	B.Sc. GENERAL
Course Code	MG(GE2)201
Course Name	Mathematics I
Year and Semester	1st year, 2nd Semester
Prerequisite Course	NIL
Course Objective	Developing a critical understanding

Group, Section and Unit as given in syllabus of CU	Course Outcome	On completing the course, the student will be able to:	PSO Addressed	Cognitive level
Unit 1 Differentia I calculus-II	CO1	Develop a critical understanding & application of calculus	All	All
Unit 2 Differentia I Equation-I I	CO2	Develop a critical understanding of skill of problem solving	All	All
Unit 3 Vector Algebra	CO3	Develop a critical understanding of solving real life problems.	All	All
Unit 4 Discrete Mathemati cs	CO4	Knowledge of number system & their applications.	All	All

	PO1	PO2	PO3	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1				3	3	3	3	3	3	
CO2				2	2	2	2	2	2	
CO3				2	2	2	2	2	2	
Avera ge										
Correlation level				1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)						

**Total Marks: 100 [Theory (Th) 65 + Tutorial (Tu) 15 + Internal Assessment 10+Attendance: 10]  
Total Credits: [5(Th)+1(Tu)] = 6, No. of Lecture hours: 75, No. of Tutorial contact hours: 15**

Section/ Unit of the	Content	Lecture No	Faculty	Date and sign
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Course				
Unit 1	<p><b>Sequence of real numbers :</b> Bounds of a sequence and monotone sequence. Limit of a sequence. Statements of limit theorems. Convergence and divergence of monotone sequences-applications of the theorems, definition of <math>\epsilon</math>. Cauchy's general principle of convergence and its application.</p> <ul style="list-style-type: none"> <li>• <b>Infinite series:</b> Convergence and Divergence (definitions). Cauchy's principle as applied to infinite series (application only). Series of positive terms :comparison test. D'Alembert's Ratio test. Cauchy's nth root test and Raabe's test Applications. Alternating series. Statement of Leibnitz test and its applications.</li> <li>• <b>Real-Valued functions defined on an interval:</b> Statement of Rolle's Theorem and its geometrical interpretation. Mean value theorems of Lagrange and Cauchy. Taylor's and Maclaurin's Theorems with Lagrange's and Cauchy's form of remainders. Taylor's and Maclaurin's Infinite series of functions like <math>e^x</math>, <math>\sin x</math>, <math>\cos x</math>, <math>(1+x)^n</math>, <math>\log(1+x)</math> with restrictions wherever necessary.</li> <li>• <b>Indeterminate Forms :</b> L'Hospital's Rule : Statement and Problems only.</li> <li>• <b>Maxima and Minima :</b> Application of maxima and minima for a function of single variable not more than three variables, Lagrange's Method of undetermined multiplier - Problems only.</li> </ul>	15	AM, SR	
Unit 2	<p>Linear homogeneous equations with constant coefficients, Linear non-homogeneous equations, The method of variation of parameters, The Cauchy-Euler equation, Simultaneous differential equations, Simple eigenvalue problem.</p> <p><b>Order and degree of partial differential equations:</b> Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations, Linear partial differential equation of first order, Lagrange's method, Charpit's method.</p>	10		

Unit 3	<p><b>Vector Algebra:</b></p> <p>Addition of Vectors, Multiplication of a Vector by a Scalar. Collinear and Coplanar Vectors. Scalar and Vector products of two and three vectors. Simple applications to problems of Geometry. Vector equation of plane and straight line. Volume of Tetrahedron. Applications to problems of Mechanics (Work done and Moment).</p>	10	SR	
Unit 4	<p><b>Integers</b> : Principle of Mathematical Induction. Division algorithm. Representation of integer in an arbitrary base. Prime Integers. Some properties of prime integers. Fundamental theorem of Arithmetic. Euclid's Theorem. Linear Diophantine equations.</p> <p>h Statement of Principle of Mathematical Induction, Strong form of Mathematical induction. Applications in different problems. Proofs of division algorithm. Representation of an integer uniquely in an arbitrary base, change of an integer from one base to another base.</p> <p>Computer operations with integers ^a“ Divisor of an integer, g.c.d. of two positive integers, prime integer, Proof of Fundamental theorem, Proof of Euclid's Theorem. To show how to find all prime numbers less than or equal to a given positive integer. Problems related to prime number. Linear Diophantine equation ^a“ when such an equation has solution, some applications.</p> <p>i • <b>Congruences</b> : Congruence relation on integers, Basic properties of this relation. Linear congruences, Chinese Remainder Theorem. System of Linear congruences.</p> <p>h Definition of Congruence ^a“ to show it is an equivalence relation, to prove the following :  <math>a \equiv b \pmod{m}</math> implies  (i) <math>(a + c) \equiv (b + c) \pmod{m}</math>  (ii) <math>ac \equiv bc \pmod{m}</math>  (iii) <math>an \equiv bn \pmod{m}</math>, for any polynomial <math>f(x)</math></p>	25	MD	

	<p>with integral coefficients <math>f(a) \equiv f(b) \pmod{m}</math> etc.</p> <p>Linear Congruence, to show how to solve these congruences, Chinese remainder theorem ^a“ Statement and proof and some applications. System of linear congruences, when solution exists ^a“ some applications.</p> <p>i</p> <ul style="list-style-type: none"> <li>• <b>Application of Congruences</b> : Divisibility tests. Check-digit and an ISBN, in Universal product Code, in major credit cards. Error detecting capability.</li> </ul> <p>h</p> <p>Using Congruence, develop divisibility tests for integers based on their expansions with respect to different bases, if <math>d</math> divides <math>(b - 1)</math> then <math>n = (a_k a_{k-1} \dots a_1 b)</math> is divisible by <math>d</math> if and only if the sum of the digits is divisible by <math>d</math> etc. Show that congruence can be used to schedule Round-Robin tournaments. Check digits for different identification numbers ^a“ International standard book number, universal product code etc. Theorem regarding error detecting capability.</p> <p>i</p> <ul style="list-style-type: none"> <li>• <b>Congruence Classes</b> : Congruence classes, addition and multiplication of congruence classes. Fermat’s little theorem. Euler’s theorem. Wilson’s theorem. Some simple applications.</li> </ul> <p>h</p> <p>Definition of Congruence Classes, properties of Congruence classes, addition and multiplication, existence of inverse. Fermat’s little theorem. Euler’s theorem. Wilson’s theorem - Statement, proof and some applications.</p> <p>i</p> <ul style="list-style-type: none"> <li>• <b>Boolean algebra</b> : Boolean Algebra, Boolean functions, Logic gates, Minimization of circuits.</li> </ul>			
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	PO1	PO2	PO3	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1				3	3	3	3	3	3	

CO2				3	3	3	3	3	3	
CO3				3	3	3	3	3	3	
Average										
Correlation level				1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)						

### Semester –III (July to December)

#### Core Course -1C

Paper Code: MG(GE3)301

Programme	B.SC. GENERAL Mathematics
Course Code	MG(GE3)301
Course Name	Mathematics III
Year and Semester	2nd year 3rd semester
Prerequisite Course	Nil
Course Objective	To develop an understanding of calculus and I.P.P

Group, Section and Unit as given in syllabus of CU	Course outcome	On completing the course, the student will be able to:	PSO Addressed	Cognitive level
Unit 1 Integral Calculus	CO1	Develop knowledge of calculus & its applications	All	All
Unit 2 Numerical Methods	CO2	Develop a critical understanding of different numerical methods.	All	All
Unit 3 Linear Programming	CO3	Develop knowledge of problem solving in real life issues	All	All

	PO1	PO2	PO3	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1				3	3	3	3	3	3	
CO2				3	3	3	3	3	3	
CO3				3	3	3	3	3	3	
Average										
Correlation level				1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)						

Core Course III:

Total Marks: 100 [Theory(Th) 65 + Tutorial(Tu) 15 + Internal Assessment 10+Attendance: 10] Total Credits: [5(Th)+1(Tu)]=6 , No. of Lecture hours: 75, No. of Tutorial contact hours:15

Section/ Unit of the Course	Content	Lecture No	Faculty	Date and sign
Unit 1	<p><b>Integtal Calculus:</b> Evaluation of definite integrals.</p> <ul style="list-style-type: none"> <li>• Integration as the limit of a sum (with equally spaced as well as unequal intervals).</li> <li>• Reduction formulae of <math>\int \sin^n x \cos^m x dx</math>, <math>\int \sin^m x \cos^n x dx</math>,</li> </ul> <p><math>\int \tan^n x dx</math> and associated problems (<math>m</math> and <math>n</math> are non-negative integers).</p> <ul style="list-style-type: none"> <li>• Definition of Improper Integrals : Statements of (i) <math>\mu</math>-test (ii) Comparison test (Limit from excluded) - Simple problems only. Use of Beta and Gamma functions (convergence and important relations being assumed).</li> <li>• Working knowledge of double integral.</li> <li>• Applications : Rectification, Quadrature, volume and surface areas of solids formed by revolution of plane curve and areas problems only.</li> </ul>	<b>10</b>	<b>SR,AS</b>	

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Unit 2	<p><b>Numerical Methods (30 Marks)</b> [25 classes]</p> <ul style="list-style-type: none"> <li>• Approximate numbers, Significant figures, Rounding off numbers. Error : Absolute, Relative and percentage.</li> <li>• Operators - <math>\Delta</math>, <math>\nabla</math> and <math>E</math> (Definitions and some relations among them).</li> <li>• Interpolation : The problem of interpolation Equispaced arguments Difference Tables, Deduction of Newton's Forward Interpolation Formula, remainder term (expression only). Newton's Backward interpolation Formula (Statement only) with remainder term. Unequally- spaced arguments Lagrange's Interpolation Formula (Statement only). Numerical problems on Interpolation with both equally and unequally spaced arguments.</li> <li>• Numerical Integration : Trapezoidal and Simpson's 1/3-rd formula (statement only). Problems on Numerical Integration.</li> <li>• Solution of Numerical Equation : To find a real root of an algebraic or transcendental equation. Location of root (tabular method), Bisection method, Newton-Raphson method with geometrical significance, Numerical Problems. (Note : Emphasis should be given on problems)</li> </ul>	<p><b>25</b></p> <p>2</p> <p>3</p> <p>3</p> <p>3</p> <p>4</p> <p>4</p> <p>4</p> <p>2</p>	<b>DH</b>	
<b>Unit-3 :</b>	<p><b>Linear Programming (30 Marks)</b></p> <ul style="list-style-type: none"> <li>• Motivation of Linear Programming problem. Statement of L.P.P. Formulation of L.P.P. Slack and Surplus variables. L.P.P. in matrix form. Convex set, Hyperplane, Extreme points, convex Polyhedron, Basic solutions and Basic Feasible Solutions (B.F.S.). Degenerate and Non-degenerate B.F.S.</li> <li>• The set of all feasible solutions of an L.P.P. is a convex set. The objective function of an L.P.P. assumes its optimal value at an extreme point of the convex set of feasible solutions, A.B.F.S. to</li> </ul>	<b>25</b>	<b>SR</b>	

	<p>an L.P.P. corresponds to an extreme point of the convex set of feasible solutions.</p> <p>8</p> <ul style="list-style-type: none"> <li>• Fundamental Theorem of L.P.P. (Statement only) Reduction of a feasible solution to a B.F.S. Standard form of an L.P.P. Solution by graphical method (for two variables), by simplex method and method of penalty. Concept of Duality. Duality Theory. The dual of the dual is the primal. Relation between the objective values of dual and the primal problems. Dual problems with at most one unrestricted variable, one constraint of equality. Transportation and Assignment problem and their optimal solutions.</li> </ul>			
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	PO1	PO2	PO3	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1				2	2	2	3	2	2	
CO2				2		2	3	2	2	
CO3				2		2	3	2	2	
Average										
Correlation level				1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)						

**Semester –IV (July to December)**

**Core Course -1D**

Paper Code: MG(GE4)401

Total Marks: 100 [Theory(Th) 65 + Tutorial(Tu) 15 + Internal Assessment 10+Attendance: 10] Total Credits: [5(Th)+1(Tu)]=6 , No. of Lecture hours: 75, No. of Tutorial contact hours: 15

Section/ Unit of the Course	Content	Lecture No	Faculty	Date and sign
Unit 1	<p><b>Algebra-II</b></p> <ul style="list-style-type: none"> <li>• <b>Group Theory:</b> Definition and examples taken from various branches (example from number system, roots of Unity, <math>2 \times 2</math> real matrices, non singular real matrices of a fixed order). Elementary properties using definition of Group. Definition and examples of sub- group - Statement of necessary and sufficient condition and its applications.</li> <li>• Definitions and examples of (i) Ring, (ii) Field, (iii) Sub-ring, (iv) Sub- field.</li> <li>• <b>Concept of Vector space over a Field :</b> Examples, Concepts of Linear combinations, Linear dependence and independence of a finite number of vectors, Sub- space, Concepts of generators and basis of a finitedimensional vector space. Problems on formation of basis of a vector space (No proof required).</li> <li>• Real Quadratic Form involving not more than three variables (problems only).</li> <li>• <b>Characteristic equation</b> of square matrix of order not more than three determination of Eigen Values and Eigen Vectors (problems only). Statement and illustration of Cayley-Hamilton Theorem.</li> </ul>	10	AS	
Unit 2	<p>Computer Science &amp; Programming (30 Marks):</p> <ul style="list-style-type: none"> <li>• <b>Computer Science and Programming :</b> Historical Development, Computer Generation, Computer Anatomy Different Components of a computer system. Operating System, hardware and Software.</li> <li>• Positional Number System. Binary to Decimal and Decimal to Binary. Other systems. Binary Arithmetic. Octal, Hexadecimal, etc. Storing of data in a Computer - BIT, BYTE, WORD etc. Coding of a data- ASCII, etc.</li> <li>• Programming Language : Machine language, Assembly language and High level language, Compiler and interpreter. Object Programme and source Programme. Ideas about some HLL– e.g. BASIC, FORTRAN,</li> </ul>	25	AM	



	<p>C, C++, COBOL, PASCAL, etc.</p> <ul style="list-style-type: none"> <li>Algorithms and Flow Charts– their utilities and important features, Ideas about the complexities of an algorithm.</li> </ul> <p>Application in simple problems. FORTRAN 77/90: Introduction, Data Type– Keywords, Constants and Variables - Integer, Real, Complex, Logical, character, subscripted variables, Fortran Expressions.</p>			
Unit 3	<p><b>Probability &amp; Statistics (30 Marks):</b></p> <ul style="list-style-type: none"> <li>Elements of probability Theory : Random experiment, Outcome, Event, Mutually Exclusive Events, Equally likely and Exhaustive. Classical definition of probability, Theorems of Total Probability, Conditional probability and Statistical Independence. Baye’s Theorem. Problems, Shortcoming of the classical definition. Axiomatic approach problems, Random Variable and its Expectation, Theorems on mathematical expectation. Joint distribution of two random variables.</li> <li>Theoretical Probability Distribution Discrete and Continuous (p.m.f., p.d.f.) Binomial, Poisson and Normal distributions and their properties. Elements of Statistical Methods. Variables, Attributes. Primary data and secondary data, Population and sample. Census and Sample Survey. Tabulation Chart and Diagram, Graph, Bar diagram, Pie diagram etc. Frequency Distribution Un-grouped and grouped cumulative frequency distribution. Histogram, Frequency curve, Measures of Central tendencies. Averages : AM,; GM, HM, Mean, Median and Mode (their advantages and disadvantages). Measures of Dispersions - Range, Quartile Deviation, Mean Deviation, Variance / S.D., Moments, Skewness and Kurtosis.</li> <li>Sampling Theory : Meaning and objects of sampling. Some ideas about the methods of selecting samples, Statistic and parameter, Sampling Proportion. Four fundamental distributions, derived from the normal: (i) standard Normal Distribution, (ii)</li> </ul>	25	SR	

	<p>Chi-square distribution (iii) Student's distribution (iv) Snedecor's F-distribution. Estimation and Test of Significance. Statistical Inference. Theory of estimation Point estimation and Interval estimation. Confidence Interval / Confidence Limit. Statistical Hypothesis - Null Hypothesis and Alternative Hypothesis. Level of significance. Critical Region. Type I and II error. Problems.</p> <ul style="list-style-type: none"> <li>• Bivariate Frequency Distribution. Scatter Diagram, Co-relation co-efficient Definition and properties. Regression lines.</li> </ul>			
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	PO1	PO2	PO3	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1					2	3	3	2	2	
CO2					2	3	3	2	2	
CO3					2	3	3	2	2	
Average										
Correlation level				1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)						

**Programme B.Sc. STATISTICS (GENERAL)**

**Table 1** Programme Outcomes (PO) on completing B.Sc. (General)

<b>Sl. No.</b>	<b>Programme Outcomes</b>
<b>Critical Thinking (PO1)</b>	This outcome involves training students to think critically and independently. Critical thinking skills help graduates make informed decisions and solve problems effectively.
<b>Problem-solving (PO2)</b>	B.Sc programmes should equip students with problem-solving skills. Graduates should be capable of identifying complex issues, analysing root causes, and proposing effective solutions. This skill is valuable in both personal life and professional careers.
<b>Interdisciplinary Knowledge (PO3)</b>	Depending on their chosen major, minor and interdisciplinary subjects within the B.Sc programme, students should develop expertise in their specific area of study, whether it's mathematics, economics, geography, computer science or another field. This specialized knowledge provides depth in their chosen discipline.
<b>Employability (PO4)</b>	On graduating, the students will be eligible for employment in the field of statistics and other industries like analytics, agriculture, data scientist, etc. Their skills in comprehension of general social phenomena around them place them in an ideal situation for such jobs. They will also be able to appear for competitive examinations conducted for public sector jobs.

**Table 2** Programme Specific Objectives (PSO) on completing B.Sc. Statistics(General)

<b>SL No.</b>	<b>On completing B.Sc. Statistics, the students will be able to</b>
<b>PSO 1</b>	get acquainted with the concept, methods, analysis and historical development of Statistics.
<b>PSO 2</b>	Students can gather knowledge about Statistics from its beginning till present day and explain the various applications in different fields.
<b>PSO 3</b>	They will understand the importance of Statistics through projects and assignments using real life data.
<b>PSO 4</b>	Develop essential knowledge so that one can relate and apply Statistics in various disciplines.
<b>PSO 5</b>	They will understand the concept and application of modern technological softwares.
<b>PSO 6</b>	Acquire research skills in the field.

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Course Outcomes (CO) are mapped to the revised Bloom's Taxonomy using the following abbreviations:

R: Remembering

U: Understanding

Ap: Applying

An: Analysing

E: Evaluating

C: Creating

**Semester- I (July to December)**

Programme	B.Sc. Statistics(General)
Course Code	STS-G-CC-1-1-TH
GE1	Descriptive Statistics
Year and Semester	1st year 1st semester
Prerequisite Course	Nil
Course Objective	Knowledge of Introduction to Statistics

**Table 3** Course Outcome (CO) on completing Unit-1 to Unit-3

Units as given in syllabus of CU	Course Outcome	On completing the course, the student will be able to:	PSO Addressed	Cognitive level
<u>Unit-1</u> Introduction	CO1	Gain a basic idea of the meaning and understand the nature, scope and aims of Statistics.	1 and 3	R, U, An, Ap
Unit-2 Measures of Central Tendency	CO2	Understand different formula and their applications.	1 and 3	R, U, An, Ap
Unit-3 Bivariate data	CO3	Become aware of different formula and their applications.	1 and 3	R, U, An, Ap

**Table 4**

	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
<b>CO1</b>					3	3	3	3	2	2
<b>CO2</b>					3	3	3	3	2	2
<b>CO3</b>					3	3	3	3	2	2
<b>Average</b>										
<b>Correlation level</b>	1-Low (40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High (60%<Achievement)									

**Semester: I**

**Core Course-1A**

**Paper Code: STS-G-CC-1-1-TH**

**Total Marks: 100 [Theory (Th) 50 + Practical (Pr) 30 + Internal Assessment 10+Attendance: 10]**

**Total Credits: [4(Th)+2(Tu)] = 6 , No. of Lecture hours (Theory): 60, No. of Practical contact hours:15**

Table 4				
Units of the Course	Content	Lecture No	Faculty	Date and sign
<b>Unit-1</b>	<b>Introduction:</b> Definition and scope of Statistics, concepts of statistical population and sample. Quantitative and qualitative data, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio. Frequency distribution, Presentation: tabular and graphic, including histogram and ogives.	20	SG	
<b>Unit-2</b>	Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, moments, skewness and kurtosis.	15		
Unit -3	Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), rank correlation (Spearman ). Simple linear regression, principle of least squares and fitting of polynomials and exponential curves.	25		


**Table 5:**

	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1							2	2	2	
CO2							2	2	2	2
CO3					3		2	2	2	2
CO4					3		2	2	2	2
Average										
Correlation level					1-Low ( 40% < Achievement<50%), 2- Medium ( 50% < Achievement<60% ), 3- High ( 60% < Achievement					

**Semester -II (January- June)**

Semester : II Credits : 4+2\*=6

Core Course-1B Full Marks : 80+20\*\*=100

Paper Code : CC2/GE 2

*Minimum number of classes required : 60*

\*4 credit for theory & 2 Credit for practical

\*\*20 Mark is reserved for Internal Assessment

& Attendance of 10 mark each

**Table 6:**

Programme	B.Sc. GENERAL
Course Code	STS-G-CC-2-2-TH

Course Name	Elementary Probability Theory
Year and Semester	1st year, 2nd Semester
Prerequisite Course	NIL
Course Objective	To gain an idea about Probability Theory

**Table 7** Course Outcome (CO) on completing Unit-1 to Unit-3

Units as given in syllabus of CU	Course Outcome	On completing the course, the student will be able to:	PSO Addressed	Cognitive level
<u>Unit-1</u> Probability	CO1	Gain a basic idea of the meaning and scope of probability.	1 and 3	R, U, An, Ap
Unit-2 Random Variables	CO2	Understand different formula and their applications.	1 and 3	R, U, An, Ap
Unit-3 Standard probability distributions	CO3	Become aware of different distributions and their applications.	1 and 3	R, U, An, Ap

**Table 8:**

	PO1	PO2	PO3	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
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CO1				3	3	3	3	3	3	
CO2				2	2	2	2	2	2	
CO3				2	2	2	2	2	2	
Average										
Correlation level				1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)						

### Semester-II

**Total Marks: 100 [Theory (Th) 50 + Practical (Pr) 30 + Internal Assessment 10+Attendance: 10]**

**Total Credits: [4(Th)+2(Pr)] = 6, No. of Lecture hours: 60, No. of Practical contact hours: 15**

**Table 9:**

Section/ Unit of the Course	Content	Lecture No	Faculty	Date and sign
Unit 1	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.	<b>20</b>	<b>SG</b>	
Unit 2	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.	<b>15</b>	<b>SG</b>	
Unit 3	Standard probability distributions: Binomial, Poisson, geometric, negative binomial, Uniform, normal, exponential. Weak law of large numbers and Lindeberg-Levy Central Limit Theorem (C.L.T).	<b>25</b>	<b>SG</b>	

### Semester –III (July to December)

Course Code: CC3

**Table 10:**

Programme	B.SC. GENERAL STATISTICS
Course Code	STS-G-CC-3-3-TH
Course Name	Introduction to Statistical Inference
Year and Semester	2nd year 3rd semester
Prerequisite Course	Nil
Course Objective	To develop an understanding of Inferential Statistics

**Table 11:**

	PO1	PO2	PO3	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1				3	3	3	3	3	3	
CO2				3	3	3	3	3	3	
CO3				3	3	3	3	3	3	
Average										
Correlation level	1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)									

**Table 12:**

Course Outcome (CO) on completing <u>Unit-1</u> to <u>Unit-3</u>				
Units as given in syllabus of CU	Course Outcome	On completing the course, the student will be able to:	PSO Addressed	Cognitive level

Unit-1 Population & Sample	CO1	Gain a basic idea of the population & sample.	1 and 3	R, U, An, Ap
Unit-2 Estimation	CO2	Understand the concept of estimation.	1 and 3	R, U, An, Ap
Unit-3 Analysis of variance & DOE	CO3	Become aware of different types of ANOVA & DOE.	1 and 3	R, U, An, Ap

### SEMESTER-III

**Total Marks: 100 [Theory(Th) 50 + Practical (30) + Internal Assessment 10+Attendance: 10]  
Total Credits: [4(Th)+2(Pr)]=6 , No. of Lecture hours: 60, No. of Practical contact hours:15**

**Table 13:**

Section/ Unit of the Course	Content	Lecture No	Faculty	Date and sign
Unit 1	Population and Sample, Parameter and Statistic, Population distribution and Sampling distribution. Statistical Inference: Point Estimation, Interval Estimation and Testing of Statistical Hypothesis. Four useful distributions for statistical Inference; Normal, t and F (Statement of the pdf's & shape of the curves)	<b>15</b>	<b>SG</b>	
Unit 2	Estimation of population mean, confidence intervals for the parameters of a normal distribution (one sample and two sample problems). The basic idea of significance test. Null and alternative hypothesis. Type I& Type II errors, level of significance, concept of p-value. Tests of proportions. Tests of hypotheses for the parameters of a normal distribution (one sample and two sample problems). Sign test (Single Sample)	<b>25</b>	<b>SG</b>	
Unit 3	Analysis of variance, one-way and two-way classification (one & multiple observation(s))	<b>20</b>	<b>SG</b>	

	per cell). Brief exposure of three basic principles of design of experiments, Statistical concepts of “treatment”, “plot” and “block”. Analysis of completely randomized design, randomized complete block design.			
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### Semester -IV (January- June)

Credits : 4+2\*=6

Core Course-1B Full Marks : 80+20\*\*=100

Paper Code : CC4/GE 4

*Minimum number of classes required : 60*

\*4 credit for theory & 2 Credit for practical

\*\*20 Mark is reserved for Internal Assessment

& Attendance of 10 mark each

**Table 14:**

Programme	B.Sc. GENERAL
Course Code	STS-G-CC-4-4-TH
Course Name	Applications of Statistics
Year and Semester	2nd year, 4th Semester
Prerequisite Course	NIL
Course Objective	To apply Statistical theory in various fields

**Table 15:** Course Outcome (CO) on completing Unit-1 to Unit-3

Units as given in syllabus of CU	Course Outcome	On completing the course, the student will be able to:	PSO Addressed	Cognitive level
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Unit-1 Sample Survey	CO1	Gain a basic idea of how surveys are conducted.	1 and 3	R, U, An, Ap
Unit-2 Index no. & Time Series	CO2	Understand different formula and their applications in economics.	1 and 3	R, U, An, Ap
Unit-3 Demographic methods	CO3	Become aware of different mortality & fertility measures and their applications in life table.	1 and 3	R, U, An, Ap

**Table 16:**

	PO1	PO2	PO3	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1				3	3	3	3	3	3	
CO2				2	2	2	2	2	2	
CO3				2	2	2	2	2	2	
Average										
Correlation level				1-Low( 40%<Achievement<50%), 2- Medium (50%<Achievement<60%), 3- High ( 60%<Achievement)						

#### SEMESTER IV

**Total Marks: 100 [Theory (Th) 50 + Practical (Pr) 30 + Internal Assessment 10+Attendance: 10]**

**Total Credits: [4(Th)+2(Pr)] = 6, No. of Lecture hours: 60, No. of Practical contact hours: 15**

**Table 17:**

Section/ Unit of the Course	Content	Lecture No	Faculty	Date and sign
Unit 1	Concept of population and sample, complete enumeration versus sampling, sampling and non-sampling 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. Stratified random sampling: Technique, estimates of population mean and total, variances of these estimates, estimates of their variances, proportional and optimum allocations.	<b>20</b>	<b>SG</b>	

Unit 2	<p>Index numbers: Definition, Criteria for a good index number, different types of index numbers. Construction of index numbers of prices and quantities, consumer price index number &amp; wholesale price index number. Uses and limitations of index numbers. Tests for index numbers</p> <p>Economic Time Series: Components of time series, Decomposition of time series- Additive and multiplicative model with their merits and demerits, Illustrations of time series. Measurement of trend by method of free-hand curve, method of least squares. Moving average method.</p>	<b>15</b>	<b>SG</b>	
Unit 3	<p>Demographic Methods: Introduction, measurement of population, rates and ratios of vital events. Measurement of mortality: CDR, SDR (w.r.t. Age and sex), IMR, Standardized death rates.</p> <p>Life (mortality) tables: definition of its main functions and uses. Measurement of fertility and reproduction: CBR, GFR, and TFR. Measurement of population growth: GRR, NRR.</p>	<b>25</b>	<b>SG</b>	