

**ANNEXURE-~~A~~ I****Distribution of Courses and Credits****M.Sc. Statistics (CBCS)****Semester – I**

Course Code	Paper	Credits	Percentage Change made as per recommendations of expert committee	Contact Hours per week L-Tu-P
PSSSTC101	Probability and Distribution Theory	4	12%-15% change in syllabus	4-1-0
PSSSTC102	Programming with C++	4	Course interchanged with 10%-12% change	4-1-0
PSSSPC103	Statistical Computing - I	4	12%-15% change in syllabus	0-0-4
PSSSPC104	Computations with C++	4	Course interchanged with 20%-25% change	0-0-4
<i>Any Two of the following:</i>				
PSSSTE105	Real Analysis and Measure Theory	4	100% New course introduced	4-1-0
PSSSTE106	Linear Algebra	4	10%-15%	4-1-0
PSSSTE107	Information Theory	4	12%-15%	4-1-0
PSSSTE108	Biostatistics	4	15%-20%	4-1-0
PSSSTE109*	Basic Statistics (for the students who have not studied Statistics at UG Level)	NC	100% New course introduced	4-1-0
<b>Total</b>		<b>24</b>		<b>16-4-8</b>

\* course marked with asterik is non credited and is meant for those students who have not studied Statistics at UG Level. It is just a qualifying course in nature which the concerned students must pass.

**Semester – II**

Course Code	Paper	Credits	Percentage Change made as per recommendations of expert committee	Contact Hours per week L-Tu-P
PSSSTC201	Advanced Probability Theory	4	10%-15% change in syllabus	4-1-0
PSSSTC202	Linear Models & Regression Analysis	4	Course interchanged with 10%-15% change	4-1-0
PSSSTC203	Statistical Inference-I	4	15%-20%	4-1-0
PSSSTC204	Sample Surveys	4	Course interchanged with 10%-12% change	4-1-0
PSSSPC205	Statistical Computing – II (MATLAB)	4	100% New course introduced	0-0-4
PSSSPC206	Practical (Based on PSSSTC 202 and PSSSTC 204) SPSS	4	100% New course introduced	0-0-4
<b>Total</b>		<b>24</b>		<b>16-4-8</b>

L – Number of Lecture, Tu – Number of Tutorials, P – Number of Practical hours.

## SCHEME OF EXAMINATIONS

Each paper shall carry 100 marks and distribution of marks in each theory and practical paper shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

### NOTE FOR PAPER SETTING:

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





## ANNEXURE-~~E~~ E

Syllabus: M.A./M.Sc. (Statistics) Semester-I for the  
examination to be held in Dec-2023, 2024, 2025

Course No.: PSSSTC101

Title: Probability and Distribution Theory

Credits :4

Maximum Marks :100

Duration of Examination: 3 Hrs

a) Minor Test -I : 20

b) Minor Test -II : 20

c) Major Test : 60

**Objectives:** The objectives of this course are to make the students familiar with Distribution Theory.

### Unit-I

Review of random variable and basic distribution theory. Joint, marginal and conditional p.m.fs. and p.d.fs, Functions of random variable and their distribution using Jacobean transformation and other tools, Standard discrete distributions viz., Binomial, Poisson, Rectangular, Negative binomial, Hyper Geometric.

### Unit II

Standard continuous distributions viz., Normal, Uniform, Cauchy, Beta, Gamma, Log normal, Exponential, Bivariate normal, Bivariate Exponential (Laplace); Order statistics and their distribution, Joint and marginal distributions of order statistics, Distribution of median and range

### Unit III

Introduction to special distributions: Degenerate, Two-point, negative Hypergeometric, Multinomial, Pareto, Logistic, Weibul and Rayleigh distributions. Conditional expectation & conditional variance, Simple, partial and multiple correlations, linear and multiple regression. (in terms of conditional expectation )

### Unit IV

Compound, truncated and mixture distributions, Sampling distributions, Central and Non-central Chi- square, t-and F- distributions and their properties.

### **Books Recommended:**

1. Fisz, M. (2012)	Probability Theory and Mathematical Statistics, John Wiley & sons
2. Rohtagi, V.K. & Ehsanes Saleh, A.K. (2014)	An Introduction to Probability Theory and Mathematical Statistics, Wiley Series.
3. Kendall, M.G., Stuart, A. (2001)	The Advanced theory of Statistics: Distribution Theory Vol 1, John Wiley & Sons
4. Johnson, N.L. and Kotz, S. and Balakrishnan, N (1995)	Continuous Univariate Distributions, vol 1 and vol 2, John Wiley & Sons
5. Rohtagi, V,K (1993)	An introduction of Probability Theory and Mathematical Statistics, John Wiley & Sons
6. Johnson, N.L., Kemp, A.W. and Kotz, S. (2005)	Univariate Discrete Distributions, John Wiley & Sons
7. Thomopoulos, N. T. (2017)	Probability Distributions: With Truncated, Log and Bivariate Extensions



**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be**

**held in Dec-2023, 2024, 2025**

**Course No.: PSSSTC101**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Probability and Distribution  
Theory**

**Maximum Marks :100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**SCHEME OF EXAMINATIONS**

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

**NOTE FOR PAPER SETTING:**

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be held**

**in Dec-2023, 2024, 2025**

**Course No.: PSSSTC102**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Programming with C++**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**Objectives:** The aim of this course is to provide the knowledge of programming language C++ to the students.

**Unit I**

Flowchart, Algorithm and problem solving. General concepts of programming. C++ character set, C++ tokens (identifiers, keywords, constants, and operators), structure of C++ program, cout, cin, Use of I/O operators, Cascading of I/O operators. Data Types: Built-in data types- int , char, float, double, Integer constants, Character Constants, String Constants. Variable: Declaration of variable of built-in data types. Operators: Arithmetic operators, Relational Operators. Logical operators. Increment and decrement operator. Conditional operator, Precedence of operators. Type Conversion: Automatic type conversion, type casting. C++ short hands (--, ++, =), Assignment statement, variables initialization.

**Unit II**

Flow of control: Conditional statements, General form of if-else statement, if else if ladder, Nested if? Asan alternative to if, General form of switch, Nested Switch. Simple control statement, for loop statement, while loop, do while loop. Variation in loop statements; Nested Loops, Loop termination: break, continue, goto, exit (), gets and puts functions. Structured Data Type: Array, General form of Declaration and Use: one dimensional array, String two-dimensional, Array initialization. Pointer: Declaration, Arithmetic, Pointer and Arrays

**Unit III**

Functions: General form, Function Prototype, definition of function, accessing a function. Passing arguments to function, specifying argument Data type, Default argument, Constant argument, Call by value and Call by reference, returning value and their types, Calling function with arrays, Scope rules of function and variables, Local and Global variables, Storage class specifiers: extern, auto, register and static. Standard Header files – string.h, math.h, stdlib.h , iostream.h. Standard library functions ,Mathematical functions: fabs(), frexp() ,fmod (), log(), log10(), pow(), sqrt(), cos(), abs().Creating headerfile and to use them in a programme. Unions: Union Tag, Processing with Unions, Initialization with Union, Anonymous Union

**Unit IV**

Structures: specifying a structure, defining a structure variable, accessing structure members. Functions and structures, arrays of structures, arrays within a structure, Structure within structure Class: Specifying a class, public and private data members and member functions, defining objects, calling member function, constructor and destructor functions, concept of data hiding, encapsulation, inheritance, polymorphism. Pointer and classes, Union and classes



**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be**

**held in Dec-2023, 2024, 2025**

**Course No. :PSSSTC102**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Programming with C++**

**Maximum Marks :100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**Books Recommended:**

1.	Lafore, R. (2002)	C ++ Programming SAMS (USA)
2.	Al Stevens (1997)	Teach Yourself C++, fifth Edition, Wiley Publications, New Delhi.
3.	Ravichandran,D. (2011)	Programming in C++, McGraw Hill
4.	Asthana ,A. (2007)	Programming in C++, Narosa Publication
5.	Stroustrup, B. (2013)	The C++ Programming Language, Addison-Wesley
6.	Eckel,B. (2003)	Thinking in C++, Pearson
7.	Kanetkar , Y. (2020)	Let Us C++ ,BPB Publications
8.	Walter, S. and Mock, K. (2017)	Problem Solving with C++ ,Pearson
9.	Balagurusamy ,E. (2017)	Object Oriented Programming with C++ , McGraw Hill

**SCHEME OF EXAMINATIONS**

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

**NOTE FOR PAPER SETTING:**

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be held  
in Dec-2023, 2024, 2025

Course No.: PSSSPC103  
Credits :4  
Duration of Examination: 3 Hrs

Title: Statistical Computing -I  
Maximum Marks :100  
Internal Examination:50 Marks  
External Examination:50Marks

**Objectives:** To make students familiar with the compilation and Statistical analysis of data using Statistical Softwares.

There shall be at least twenty computing exercises covering the applications of Statistical Softwares and computing tools.

**Practicals:**

1. Practicals based on graphical representation.
2. Practicals based on t-test for Single mean and Difference of means.
3. Practicals based on Paired t-test.
4. Practicals based on Simple and Multiple correlation
5. Practicals based on Regression.
6. Practicals based on outlier detection
7. Practicals based on Chi Square test.
8. Practicals based on One way and Two way ANOVA

**SCHEME OF EXAMINATIONS**

Each practical paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Internal	50	After 60 days on completion of 50 % of syllabus <b>Written Exam: 16 Marks (two Practicals of 08 Marks Each)</b> <b>Viva Voce :12 Marks</b> <b>Attendance: 10 Marks</b> <b>Day to Day Performance: 12 Marks</b>
External	50	On completion entire syllabus <b>Written Exam: 40 Marks (two Practicals of 20 Marks Each)</b> <b>Viva Voce :10 Marks</b>
Total	100	



**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be  
held in Dec-2023, 2024, 2025**

**Course No.:**PSSSPC104  
**Credits :**4  
**Duration of Examination:** 3 Hrs

**Title:** Computation with C++  
**Maximum Marks :**100  
**Internal Examination:**50 Marks  
**External Examination:**50Marks

**Objectives:** To make students familiar with the computation work based on Course No. PSSSTC 102

There shall be at least twenty computing exercises covering the applications of C++ language

Component	Marks	Remarks
Internal	50	After 60 days on completion of 50 % of syllabus <b>Written Exam: 16 Marks (two Practicals of 08 Marks Each)</b> <b>Viva Voce :12 Marks</b> <b>Attendance: 10 Marks</b> <b>Day to Day Performance: 12 Marks</b>
External	50	On completion entire syllabus <b>Written Exam: 40 Marks (two Practicals of 20 Marks Each)</b> <b>Viva Voce :10 Marks</b>
Total	100	





Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be

held in Dec-2023, 2024, 2025

Course No. :PSSSTE105

Credits :4

Duration of Examination: 3 Hrs

Title: Real Analysis and Measure Theory

Maximum Marks:100

a) Minor Test -I : 20

b) Minor Test -II : 20

c) Major Test 60

**Objectives:** This course introduces the students to concepts of Real Analysis.

**Unit-I**

Introduction to Real number system, introduction to n-dimensional Euclidean space: Limit Points of a set, open sets, closed sets etc. (will be developed through general metric space and  $\mathbb{R}^n$  will be considered as a special case, Compact sets, Bolzano-Weirsstrass theorem, Heine-Borel Theorem.

**Unit -II**

Limit superior, limit inferior and limit of a sequence, their convergence, Cauchy sequence, Convergence of series, tests for convergence for series, Uniform convergence of sequences and series, Stone-Weirsstrass theorem (Statement Only).

**Unit- III**

Fields, sigma minimal sigma field, sigma-field generated by a class of subsets, Borel fields. Sequence of sets, limsup and liminf of sequence of sets, Measure, probability measure, properties of a measure, Continuity theorem of measure.

**Unit- IV**

Idea of Lebesgue and Lebesgue-Stieltjes measure, Signed measure, Jordan-Hahn decomposition theorem. Measurable functions, integration of a measurable function with respect to a measure, Monotone convergence theorem, Fatou's lemma, dominated convergence theorem, Radon Nikodym Theorem, Product measure, Fubini's Theorem

**Books Recommended**

1.	Apostol, T.M. (2002)	Mathematical Analysis, Narosa, Indian Edition.
2.	Rudin, W. (2013)	Principles of Mathematical Analysis, McGraw.
3.	Bartle, R.G. and Sherbat (2007)	Elements of Real Analysis (Wiley)
4.	Courant, R. and John, F. (1974)	Introduction to Calculus and Analysis (Vol I and II), Wiley
5.	Goldberg, R. R. (1970)	Methods of Real Analysis, Oxford and IBH Publisher
6.	Royden, H.L. (1988)	Real Analysis, MacMillan
7.	Ghorpade, S.R. and BV Limaye (2006)	A Course in Calculus and Real Analysis, Springer
8.	Ajit Kumar and S.Kumaresan(2015)	A Basic Course in Real Analysis, CRC Press
9.	Torence Tao (2006)	Analysis I, Hindustan Book Agency, India.
10.	Malik S. C. & Arora S.(2008)	Mathematical Analysis-New Age International Publications Wiley Eastern Limited 4 <sup>th</sup> edition.

**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be  
held in Dec-2023, 2024, 2025**

**Course No.: PSSSTE105**

**Title: Real Analysis and Measure Theory**

**Credits :4**

**Maximum Marks:100**

**Duration of Examination: 3 Hrs**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test : 60**

**SCHEME OF EXAMINATIONS**

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

**NOTE FOR PAPER SETTING:**

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be  
held in Dec-2023, 2024, 2025**

**Course No.: PSSSTE106**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Linear Algebra**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**Objectives:** This course introduces the students to concepts of Linear Algebra and Matrices.

**Unit -I**

Vector spaces with an inner product, sub spaces, linear dependence and independence, basis and dimension of a vector space, finite dimensional vector spaces, linear transformations, completion theorem, examples of vector spaces over real and complex fields, Gram-Schmidt Orthogonalization process.

**Unit- II**

Algebra of matrices, elementary matrices, row and column spaces of a matrix, rank and inverse of a matrix, null space and nullity, partitioned matrices, Kronecker product, Hermite canonical form, generalized inverse, Moore Penrose generalized inverse, left weak and right weak g-inverses, Idempotent matrices, solution of matrix equations.

**Unit- III**

Real quadratic forms, reduction and classification of quadratic forms, index and signature, triangular reduction of a positive definite matrix, characteristic roots and vectors, Cayley-Hamilton theorem, similar matrices, Hermitian quadratic forms.

**Unit -IV**

Algebraic and geometric multiplicity of a characteristic root, spectral decomposition of a real symmetric matrices, reduction of a pair of real symmetric matrices, singular values and singular value decomposition.

**Books Recommended:**

1.	Graybill, F.A. (2001)	Matrices with applications in Statistics, Cengage Learning.
2.	Rao, C. R. (2002)	Linear Statistical Inference and its Applications, John Wiley & Sons.
3.	Searle, S.R. (1982)	Matrix Algebra Useful for Statistics, John Wiley & Sons.
4.	Bellman, R. (1997)	Introduction to matrix Analysis, McGraw Hill.
5.	Biswas, S. (2012)	Topics in Algebra of matrices Academic publications.
6.	Hadley, G. (2006)	Linear Algebra, Narosa Publishing House.
7.	Halmos, P.R. (1958)	Finite Dimensional Vector Spaces, Springer.
8.	Dutta, K. B. (2014)	Matrix and Linear Algebra, PHI Learning
	DeFranza, J. and Gagliardi, D. (2017)	Introduction to Linear Algebra and Applications, Tata McGraw Hill
9.	Harville, D.A. (2001)	Matrix Algebra from a Statistician's Perspective, Springer



**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be  
held in Dec-2023, 2024, 2025**

**Course No.: PSSSTE106**  
**Credits :4**  
**Duration of Examination: 3 Hrs**

**Title: Linear Algebra**  
**Maximum Marks:100**  
**a) Minor Test -I : 20**  
**b) Minor Test -II : 20**  
**c) Major Test 60**

**SCHEME OF EXAMINATIONS**

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

**NOTE FOR PAPER SETTING:**

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be  
held in Dec-2023, 2024, 2025**

**Course No.: PSSSTE107**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Information Theory**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**Objectives:** To introduce information theoretic concepts.

**Unit I**

Concept of Entropy and information measures, Formal requirements of the average uncertainty, Shannon's measure of information and its properties, Joint and Conditional Entropy, Relative entropy and mutual information, Uniqueness of the entropy function Jensen's Inequality and its consequences, Fano's Inequality, Asymptotic Equipartition Property, Entropy Rate.

**Unit-II**

Elements of encoding, redundancy and efficiency, binary codes, Shannon Fano Encoding, Necessary and sufficient condition for noiseless coding, Average length of encoded message Kraft Inequality, McMillan Inequality, Optimal Codes, Huffman Code, Fundamental theorem of discrete noiseless coding.

**Unit-III**

Differential Entropy, Joint and Conditional Differential Entropy, Properties of Differential and Relative Entropy, Differential Entropy of distribution, Relationship of Differential Entropy to Discrete Entropy, Differential entropy bound on discrete entropy Entropy Optimization Principles, Maximum Entropy Principle, MaxEnt Formalism, Maximum Entropy Distribution

**Unit-IV**

Channel capacity, symmetric channels, Binary symmetric channel, Binary Erasure channel, Properties of channel capacity. Joint AEP theorem, channel coding theorem (statement only), Fano's inequality and converse to the coding theorem, Hamming codes.

**Books Recommended:**

1.	Shannon, C.E. (1948)	The mathematical theory of communication. Bell Syst.Tech. J, Vol. 27, pp. 379-423 and pp 623-656.
2.	Vander, L. (1997)	Information Theory, Cambridge University Press.
3.	Thomas T. M. and Cover (2006)	Elements of Information Theory. Wiley, New York.
4.	Kapur,J.N. and Kesavan H.K(1992)	Entropy Optimization Principles with Applications, Academic Press, New York.
5.	Reza, F.M. (2007)	An Introduction to Information Theory, Dover Publications.
6.	Robert Ash (1965)	Information Theory, Dover Publications
7.	Dehmer, M. and Frank E. S. (2009)	Information Theory and Statistical Learning, Springer
8.	Gray, R.M. (2011)	Entropy and Information Theory 2nd edition.Springer



**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be**

**held in Dec-2023, 2024, 2025**

**Course No.: PSSSTE107**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Information Theory**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**SCHEME OF EXAMINATIONS**

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

**NOTE FOR PAPER SETTING:**

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be  
held in Dec-2023, 2024, 2025**

**Course No. : PSSSTE108**

**Credits : 4**

**Duration of Examination: 3 Hrs**

**Title: Biostatistics**

**Maximum Marks: 100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test : 60**

**Objectives:** This course introduces the students to various applications of statistics in biology and medical fields.

**UNIT-I**

Basic biological concepts in genetics, Mendel's law, Hardy- Weinberg equilibrium, random mating, distribution of allele frequency (dominant/co-dominant cases), Approach to equilibrium for X-linked genes, natural selection, mutation, and genetic drift, equilibrium when both natural selection and mutation are operative.

**UNIT-II**

Planning and design of clinical trials, Phase I, II, and III trials. Consideration in planning a clinical trial, designs for comparative trials. Sample size determination in fixed sample designs.

**UNIT-III**

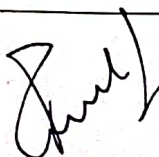
Functions of survival time, survival distributions and their applications viz. Exponential, Gamma, Weibull, Rayleigh, lognormal, death density function for a distribution having bath-tub shape hazard function. Tests of goodness of fit for survival distributions (WE test for exponential distribution, W-test for lognormal distribution, Chi-square test for uncensored observations).

**UNIT-IV**

Type I, Type II and progressive or random censoring with biological examples, Estimation of mean survival time and variance of the estimator for type I and type II censored data with numerical examples. Idea of Stochastic epidemic models: Simple epidemic models (by use of random variable technique).

**Books Recommended:**

1.	Biswas, S. (1995)	Applied Stochastic Processes. A Biostatistical and Population Oriented Approach, Wiley Eastern Ltd.
2.	Cox, D.R. & Oakes, D. (1984)	Analysis of Survival Data, Chapman and Hall.
3.	Ewens, W. J. (1979)	Mathematics of Population Genetics, Springer Verlag.
4.	Ewens, & Grant, (2010)	Statistical methods in Bio informatics.: An Introduction, Springer.
5.	Friedman, L.M., Furburg, C. and DeMets, D.L (1998)	Fundamentals of Clinical Trials, Springer Verlag.
6.	Gross, A. J. and Clark V.A. (1976)	Survival Distribution; Reliability Applications in Biomedical Sciences, John Wiley & Sons.
7.	Lee, Elisa, T. (1992)	Statistical Methods for Survival Data Analysis, John Wiley & Sons.
8.	Arora, P.N. & Malhan, P.K. (2010)	Biostatistics, Himalaya Publications
9.	Friedman, L. M., David L., & Christopher B. G. (2015)	Fundamentals of Clinical Trials, Springer



**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be  
held in Dec-2023, 2024, 2025**

**Course No. : PSSSTE108**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Biostatistics**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**SCHEME OF EXAMINATIONS**

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

**NOTE FOR PAPER SETTING:**

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be**

**held in Dec-2023, 2024, 2025**

**\*Course No. : PSSSTE109**

**Credits: NIL**

**Duration of Examination: 3 Hrs**

**Title: Basic Statistics**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**Objectives:** This course aims at acquainting about the basic tools and techniques of Statistics to those students who have not opted Statistics ad DSC at under graduate level.

**Unit I**

Measures of Central Tendency, Measures of Dispersion, Classical and axiomatic definitions of Probability. Additive and multiplicative laws of probability, Conditional probability, Bayes' theorem and applications. Discrete and continuous random variables. Distribution functions and their properties.

**Unit II**

Expectation, Moment Generating Function, Correlation: Simple, Partial and multiple correlation, Intraclass correlation, Correlation ratio, Regression lines, regression coefficients and their properties. Principle of least squares and fitting of a straight line. Bivariate and multivariate data, Association and Contingency, Curve fitting and Orthogonal Polynomials,

**Unit III**

Testing of Hypothesis: Statistical hypothesis, Null and alternative hypothesis, simple and composite hypothesis, two types of error, Critical region, Different types of critical regions and similar regions, power of test, level of significance. Best Critical Region, NP Lemma, its applications, Properties of good estimator and methods of estimation

**Unit IV**

One way and two-way classifications, fixed, random and mixed effects models. Analysis of variance (two-way classification only), Design of experiment

Official Statistics: (a) Need, Uses, Users, Reliability, Relevance, Limitations, Transparency, its visibility (b) Compilation, Collection, Processing, Analysis and Dissemination.

National Statistical Organization: Vision and Mission, NSSO and CSO, roles and responsibilities, important activities, Publications etc.

National Statistical Commission: Need, Constitution, its role, functions etc, Legal Acts/ Provisions/ Support for Official Statistics; Important Acts.

**Books Recommended:**

1.	Gupta,S.C. and Kapoor V.K.(2017)	Fundamentals of Mathematical Statistics, S Chand publication
2.	Mood,A.M., Graybill,F. and Boes,D.(2017)	Introduction to Theory of Statistics, McGraw Hill
3.	Hogg ,R. and Craig,A (2012)	Introduction to Mathematical Statistics, Pearson



**Syllabus: M.A./M.Sc. (Statistics) Semester-I for the examination to be  
held in Dec-2023, 2024, 2025**

**\*Course No. PSSSTE109**

**Credits: NIL**

**Duration of Examination: 3 Hrs**

**Title: Basic Statistics**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

4.	Das,M.N. and Giri,N. (1987)	Design and Analysis of Experiments, New Age International Publication
5.	Gupta,S.C. and Kapoor V.K.(2017)	Fundamentals of Applied Statistics, S Chand publication
6.	Goon,A.M.,Gupta M.K. and Dasgupta,B(2013)	Fundamentals of Statistics, World Press
7.	Rohtagi,V.K. and Saleh A.K.M.E. (2015)	An Introduction to Probability and Statistics, Wiley
8.	Yule G.U. (2019)	An introduction to the theory of Statistics, Wiley-Blackwell
9.	Schiller,J. Srinivasan, A. R.and Spiegel, M. (2012)	Outline of Probability and Statistics, Mc Graw Hill

**SCHEME OF EXAMINATIONS**

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

**NOTE FOR PAPER SETTING:**

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





## ANNEXURE-~~E~~ F

Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination to be held in May-2024, 2025, 2026

Course No.: PSSSTC 201

Credits :4

Duration of Examination: 3 Hrs

Title: Advanced Probability Theory

Maximum Marks:100

a) Minor Test -I : 20

b) Minor Test -II : 20

c) Major Test : 60

**Objectives:** This course introduces the students to concepts of Probability and Measure Theory.

### **UNIT-I**

Recap of Basic Concepts of Probability and Measure Theory, Chebyshevs, Markov, Holder, Minkowski, Jensen and Lyapunov inequalities, Characteristic functions and their properties, Parseval relation, Uniqueness theorem, Inversion theorem.

### **UNIT-II**

Convergence of sequence of random variables, Almost sure convergence, convergence in mean, convergence in probability, convergence in distribution, and their relationships with illustrations.

### **Unit- III**

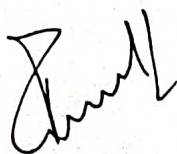
Borel-Cantelli Lemma, Zero-One Laws of Borel and Kolmogorov, Kolmogorov's inequality, weak law and strong law of large numbers of sequences of r.v.'s with illustrations, three series criterion.

### **Unit- IV**

Limiting and asymptotic distributions, Levy's continuity theorem, continuity correction, Central Limit Theorems of Lindeberg-Levy, Liapounov and Lindberg-Feller with suitable illustrations.

### **Books Recommended:**

1.	Robert Ash (1972)	Real Analysis and Probability, Academic Press
2.	Billingsley, P. (1986)	Probability and Measure, Wiley
3.	Dudley, R.M. (2002)	Real Analysis and Probability, Cambridge University Press
4.	Kingman, J.F.C. and Taylor, S.J. (1966)	Introduction to measure and probability, Cambridge University press
5.	Bhat, B. R. (2014)	Modern Probability Theory, New Age International Private Limited
6.	Basu, A.K. (2012)	Probability and Measure theory, Narosa Pub. House
7.	Rohtagi, V. K. and Saleh A.K.M.E. (2015)	An Introduction to Probability and Statistics, Wiley
8.	Chung, K. L. (2001)	A Course in Probability Theory, Academic Press
9.	Feller, W. (1998)	Introduction to Probability and its Application Vol. II, Wiley Eastern Ltd.



### ANNEXURE-C

Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination to be held in May-2024, 2025, 2026

Course No.: PSSSTC 201

Credits :4

Duration of Examination: 3 Hrs

Title: Advanced Probability Theory

Maximum Marks:100

a) Minor Test -I : 20

b) Minor Test -II : 20

c) Major Test 60

### SCHEME OF EXAMINATIONS

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

#### NOTE FOR PAPER SETTING:

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





**Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination  
to be held in May-2024, 2025, 2026**

**Course No. : PSSSTC 202**  
**Credits : 4**  
**Duration of Examination: 3 Hrs**

**Title: Linear Models & Regression Analysis**  
**Maximum Marks: 100**  
**a) Minor Test -I : 20**  
**b) Minor Test -II : 20**  
**c) Major Test : 60**

**Objectives:** The aim of this course to provide the knowledge of Linear Models and Regression analysis.

**Unit-I**

Gauss-Markov set-up, Normal equations and Direct Least squares estimates, Error and estimation spaces, variances and covariances of least squares estimates, estimation of error variance, least squares estimates with exact restriction on parameters.

**Unit-II**

Simultaneous Estimates of linear Parametric functions, Tests of hypothesis for one and more than one linear parametric functions, confidence intervals and regions, Analysis of Variance, Multiple comparison tests due to Tukey and Scheffe, simultaneous confidence intervals.

**Unit-III**

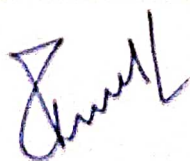
Introduction to One-way random effects linear models and estimation of variance components, Simple linear Regression, multiple and polynomial regression, orthogonal polynomials, reparameterization of linear models.

**Unit-IV**

Residuals and their plots as tests for departure from assumptions such as fitness of the model, normality, homogeneity of variances and detection of outliers, Remedies, Introduction to non-linear models; least squares in non-linear case, transformation of the model.

**Books Recommended:**

1.	Cook, R.D. and Weisber, S. (1982)	Residual and Influence in Regression, Chapman and Hall.
2.	Graybill, F.A. (2000)	Theory and Application of the Linear Models, Cengage Learning Models.
3.	Draper, N.R. and Smith, H. (1998)	Applied Regression Analysis 3 <sup>rd</sup> Ed, Wiley.
4.	Gunst, R.F. and Mason, R.L. (1980)	Regression Analysis and its Application-A Data Oriented Approach, Marcel and Dekker.
5.	Rao, C.R. (2002)	Linear Statistical Inference and its Applications, Wiley.
6.	Weisber, S. (1995)	Applied Linear Regression, Wiley Eastern.
7.	Montgomery, D.C. and E.A. Peck (2012)	Introduction to Linear Regression Analysis, John Wiley & sons



**Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination to**

**be held in May-2024, 2025, 2026**

**Course No.: PSSSTC 202**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Linear Models & Regression Analysis**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**SCHEME OF EXAMINATIONS**

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

**NOTE FOR PAPER SETTING:**

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





**Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination to be  
held in May-2024, 2025, 2026**

**Course No.: PSSSTC203**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Statistical Inference -I**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**Objectives:** The aim of this course is to provide the knowledge of Inference to the students.

**Unit -I**

Introduction to estimation; unbiasedness, consistency, sufficiency and Minimal sufficiency, Factorization Criterion, Fisher information and sufficiency, CAN estimators, Mean Square Error, Completeness and Bounded completeness, Finite and asymptotic efficiency.

**Unit -II**

UMVUE, Cramer-Rao inequality, Chapman-Robbins-Keifer lower bound, Rao-Blackwell Theorem, Lehmann Scheffe Theorem, Exponential and Pitman families Methods of Estimation: Maximum Likelihood method, methods of moments and percentiles.

**Unit -III**

Testing of hypothesis; Basic concepts, randomized and nonrandomized test procedures, Neyman-Pearson Lemma, Families with MLR property, UMP Test with applications to exponential families, UMP unbiased tests, with application to one sample and two sample problems in normal populations.

**Unit -IV**

Likelihood ratio test and its properties (without proof) and applications to normal distribution, Interval estimation, confidence level, construction of confidence, intervals using pivots, shortest expected length confidence interval, Wald's SPRT.

**Books Recommended:**

1.	Kale, B.K. (2007)	A first course a Parametric Inference, Narosa Publishing House
2.	Rohtagi, V.K. and Saleh, A.K.M.E.D. (2015)	An introduction to probability and Mathematics Statistics, Wiley Eastern Ltd.
3.	Rao, C.R. (2003)	Linear Statistical Inference and its applications, Wiley
4.	Zacks, S. (1971)	New Theory of Statistical Inference, John Wiley and sons, New York.
5.	Lehman, E.L. and Casella, G. (1998)	Theory of Point Estimation, Springer.
6.	Lehman, E.L. and Romano J.P. (2005)	Testing Statistical Hypothesis, Springer.
7.	Rajagopalan, M. and Dhanavanthan, B. (2012)	Statistical Inference PHI Learning Pvt. Ltd.
8.	Casella, G. and Berger R.L. (2001)	Statistical Inference, Duxbury



**Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination to be  
held in May-2024, 2025, 2026**

**Course No.: PSSSTC203**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Statistical Inference -I**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**SCHEME OF EXAMINATIONS**

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

**NOTE FOR PAPER SETTING:**

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





Course No.: PSSSTC 204

Credits :4

Duration of Examination: 3 Hrs

Title: Sample Surveys

Maximum Marks:100

a) Minor Test -I : 20

b) Minor Test -II : 20

c) Major Test 60

**Objectives:** The objectives of this course are to make the students familiar with various sampling methods.

### Unit-I

Review of SRS WR and WOR, Estimation of sample size, Stratified random sampling, different methods of allocation, relative precision of stratified random sampling with S.R.S., formation and construction of strata and Post Stratification.

### Unit-II

Systematic sampling, estimation of mean and sampling variance, comparison of systematic sampling with stratified and S.R.S., Varying probability sampling methods of selecting sample with p.p.s, p.p.s, sampling W.R., efficiency of p.p.s. sampling. PPS WOR, H.T. estimator, Des Raj Sampling strategy, Murthy estimator, Sen-Midzuno method.

### Unit-III

Ratio estimator, bias and mean square error, estimation of variance, comparison with SRS, ratio estimator in stratified sampling, unbiased type ratio estimators Difference estimator, regression estimator, comparison of regression estimator with SRS and ratio estimator,

### Unit-IV

Cluster sampling with equal and unequal cluster sizes, relative efficiency with SRS and optimum cluster size, Two stage sampling with equal and unequal s.s.u's, estimation of mean and sampling variance. Successive sampling, sampling on two occasions.

### **Books Recommended:**

	Cochran, W.G. (2013)	Sampling techniques, Wiley & Sons
2.	Murthy, M.N. (1967)	Sampling Theory and Methods, Statistical Publishing Society, Calcutta.
3.	Des Raj (1999)	Sampling Theory, Create Space Publishers, USA.
4.	Mukhopadhyay, P. (2014)	Theory and methods of survey sampling, PHI Learning.
5.	Singh, D. and F.S Chaudhary (2002)	Theory and Analysis of sample Survey Designs, New age International Publications.
6.	Sampath, S. (2005)	Sampling Theory & Methods, Alpha Science India Ltd.
7.	Singh, S (2003)	Advanced Sampling Theory with Applications: How Michael' selected' Amy Volume I, Springer
8.	Arijit Chaudhuri (2014)	Modern Survey Sampling, CRC Press
9.	Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Asok, C.	Sampling Theory of Surveys with Applications, Pusa Publisher

**Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination to be**

**held in May-2024, 2025, 2026**

**Course No. :PSSSTC 204**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Sample Surveys**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**SCHEME OF EXAMINATIONS**

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

<b>Component</b>	<b>Marks</b>	<b>Remarks</b>
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

**NOTE FOR PAPER SETTING:**

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.





**Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination to be**

**held in May-2024, 2025, 2026**

**Course No. :PSSSTC 204**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Sample Surveys**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test        60**

**SCHEME OF EXAMINATIONS**

Each Theory paper shall carry 100 marks and distribution of marks shall be as under:

Component	Marks	Remarks
Minor I	20	After 30 days on completion of 25 % of syllabus
Minor II	20	After 60 days on completion of 50 % of syllabus
Major End Semester	60	On completion of syllabus (Question Paper Would Cover 20% of syllabus covered in Minor I and Minor II and 80% of syllabus not covered in 2 Minors)
Total	100	

**NOTE FOR PAPER SETTING:**

**Minor Examinations:** Question paper will have two sections A and B. Section-A will consist of six questions (Short answer type) of two marks each and candidate has to attempt five questions. Section B will consist of three questions (Long answer type) of five marks each and candidate has to attempt two questions.

**Major Examinations:** Question paper will have two sections A and B. Section-A will consist of five questions of three marks each; candidate will have to attempt four questions out of five given questions. Questions in this section will be framed from the fifty percent syllabus already covered in Minor I and Minor II. Section- B will consist of six questions of 12 marks each, three questions from each of the Unit III and IV (not covered in minors) and candidate will have to attempt four questions selecting two questions from each unit.



**Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination to  
be held in May-2024, 2025,2026**

**Course No.: PSSSPC 205**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Statistical Computing -II (MATLAB)**

**Maximum Marks :100**

**Internal Examination:50 Marks**

**External Examination:50Marks**

**Objective:** To make students familiar with the computational work of MATLAB software based on the Descriptive and inductive statistics.  
There shall be at least twenty computing exercises on Statistical Computing and analysis of statistical data using SPSS software.

Component	Marks	Remarks
Internal	50	After 60 days on completion of 50 % of syllabus <b>Written Exam: 16 Marks (two Practicals of 08 Marks Each)</b> <b>Viva Voce :12 Marks</b> <b>Attendance: 10 Marks</b> <b>Day to Day Performance: 12 Marks</b>
External	50	On completion entire syllabus <b>Written Exam: 40 Marks(two Practicals of 20 Marks Each)</b> <b>Viva Voce :10 Marks</b>
Total	100	





**Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination to  
be held in May-2024, 2025,2026**

**Course No.: PSSSPC 205**  
**Credits :4**  
**Duration of Examination: 3 Hrs**

**Title: Statistical Computing -II (MATLAB)**  
**Maximum Marks :100**  
**Internal Examnation:50 Marks**  
**External Examination:50Marks**

**Objective:** To make students familiar with the computational work of MATLAB software based on the Descriptive and inductive statistics.  
There shall be at least twenty computing exercises on Statistical Computing and analysis of statistical data using SPSS software.

Component	Marks	Remarks
Internal	50	After 60 days on completion of 50 % of syllabus <b>Written Exam: 16 Marks (two Practicals of 08 Marks Each)</b> <b>Viva Voce :12 Marks</b> <b>Attendance: 10 Marks</b> <b>Day to Day Performance: 12 Marks</b>
External	50	On completion entire syllabus <b>Written Exam: 40 Marks(two Practicals of 20 Marks Each)</b> <b>Viva Voce :10 Marks</b>
Total	100	



**Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination to be  
held in May-2024, 2025,2026**

**Course No.: PSSSPC 206**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Practical based on PSSSTC 202  
and PSSSTC 204 (SPSS)**

**Maximum Marks :100**

**Internal Examnation:50 Marks**

**External Examination:50Marks**

**Objective:** To make students familiar with the computation work based on Course No. PSSSTC 202& PSSSTC 204 using SPSS.

There shall be at least twenty computing exercises on the computation work based on Course No. PSSSTC 202& PSSSTC 204.

<b>Component</b>	<b>Marks</b>	<b>Remarks</b>
Internal	50	After 60 days on completion of 50 % of syllabus <b>Written Exam: 16 Marks (two Practicals of 08 Marks Each)</b> <b>Viva Voce :12 Marks</b> <b>Attendance: 10 Marks</b> <b>Day to Day Performance: 12 Marks</b>
External	50	On completion entire syllabus <b>Written Exam: 40 Marks(two Practicals of 20 Marks Each)</b> <b>Viva Voce :10 Marks</b>
Total	100	



**Syllabus: M.A./M.Sc. (Statistics) Semester-II for the examination to**

**be held in May-2024, 2025, 2026**

**Course No.: PSSSTC 204**

**Credits :4**

**Duration of Examination: 3 Hrs**

**Title: Sample Surveys**

**Maximum Marks:100**

**a) Minor Test -I : 20**

**b) Minor Test -II : 20**

**c) Major Test 60**

**Objectives:** The objectives of this course are to make the students familiar with various sampling methods.

**Unit-I**

Review of SRS WR and WOR, Estimation of sample size, Stratified random sampling, different methods of allocation, relative precision of stratified random sampling with S.R.S., formation and construction of strata and Post Stratification.

**Unit-II**

Systematic sampling, estimation of mean and sampling variance, comparison of systematic sampling with stratified and S.R.S., Varying probability sampling methods of selecting sample with p.p.s, p.p.s, sampling W.R., efficiency of p.p.s. sampling. PPS WOR, H.T. estimator, Des Raj Sampling strategy, Murthy estimator, Sen-Midzuno method.

**Unit-III**

Ratio estimator, bias and mean square error, estimation of variance, comparison with SRS, ratio estimator in stratified sampling, unbiased type ratio estimators Difference estimator, regression estimator, comparison of regression estimator with SRS and ratio estimator,

**Unit-IV**

Cluster sampling with equal and unequal cluster sizes, relative efficiency with SRS and optimum cluster size, Two stage sampling with equal and unequal s.s.u's, estimation of mean and sampling variance. Successive sampling, sampling on two occasions.

**Books Recommended:**

	Cochran, W.G. (2013)	Sampling techniques, Wiley & Sons
2.	Murthy, M.N. (1967)	Sampling Theory and Methods, Statistical Publishing Society, Calcutta.
3.	Des Raj (1999)	Sampling Theory, Create Space Publishers, USA.
4.	Mukhopadhyay, P. (2014)	Theory and methods of survey sampling, PHI Learning.
5.	Singh, D. and F.S Chaudhary (2002)	Theory and Analysis of sample Survey Designs, New age International Publications.
6.	Sampath, S. (2005)	Sampling Theory & Methods, Alpha Science India Ltd.
7.	Singh, S (2003)	Advanced Sampling Theory with Applications: How Michael' selected' Amy Volume I, Springer
8.	Arijit Chaudhuri (2014)	Modern Survey Sampling, CRC Press
9.	Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Asok, C.	Sampling Theory of Surveys with Applications, Pusa Publisher

