Department of Statistics, University of Jammu

Course Structure for PG Programme in Statistics- Two Years (NEP 2020)

Programme code – PGFMS005

Semester –I

Course Code	Course Title	Credit Hour	Contact Hours per week L-Tu-P
P2STTC101	Probability and Distribution Theory	04	4-1-0
P2STTC102	Real Analysis and Measure Theory	04	4-1-0
P2STTC103	Sample Survey and Sampling Designs	04	4-1-0
P2STTC104	Linear Algebra	04	4-1-0
P2STPC105	Computing with MATLAB	04	0-0-4
P2STPC106	Statistical Computing with Excel	04	0-0-4
P2STPC107	Scientific Publishing using Latex	01	0-1-2
P2STPC108	Seminar	01	0-1-0
P2STTE109*	Basic Statistics	NC	4-1-0
Total Credit		26	

* Non-Credit Course meant for those students who have not studied Statistics at UG Level.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC101
Credit Hours :04
Duration of Examination: 3 Hrs

Title: Probability and Distribution Theory
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test 60

Course Outcomes:

- CO1: Demonstrate an understanding of random variables, basic distribution theory, and fundamental probability concepts, including joint, marginal, and conditional distributions.
- CO2: Apply standard discrete and continuous distributions to statistical modelling and problem-solving in various practical contexts.
- CO3: Analyse order statistics, special probability distributions, and their applications in data interpretation and decision-making.
- CO4: Utilize concepts of conditional expectation, variance, correlation, and regression for statistical inference and predictive modelling.
- CO5: Examine advanced distribution models, including compound, truncated, and mixture distributions, along with key sampling distributions used in hypothesis testing.

Unit-I

Review of random variable and basic distribution theory. Joint, marginal and conditional p.m.fs. and p.d.fs, Functions of random variables and their distribution (One and two dimensional), Standard discrete distributions viz., Binomial, Poisson, Rectangular, Negative Binomial, Geometric and 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, Weibull 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.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC101
Credit Hours :4
Duration of Examination: 3 Hrs

Title: Probability and Distribution Theory
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test : 60

Books Recommended:

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

SCHEME OF EXAMINATIONS

Scheme of Examination:

	Syllabus to be covered in the examination	**Time allotted for the examination**	**%Weightage (Marks)**
MINOR TEST I (after 30 days)	25%	1 hour	20
MINOR TEST II (after 60days)	26 to 50%	1 hour	20
Major Test (after 90 days)	100%	3 hours	60
Total			100

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC101
Credit Hours :4
Duration of Examination: 3 Hrs

Title: Probability and Distribution Theory
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test : 60

The student shall be continuously evaluated during the conduct of each course based on his/her performance as follows:

Minor Test I and Minor Test II

The Subjective Tests of Minor Test I and Minor Test II would consist of 10 **compulsory MCQ** of one mark each and THREE **subjective type questions** (05 marks each). Students are required to answer any **TWO** questions out of three asked questions. **No preparatory holidays shall be provided for the Test I and Test II.**

Those candidates who have appeared in Minor Test I and II and failed to get the minimum required marks i.e. 14 out of 40 will be eligible to re-appear in the Test I and Test II only once.

Major Test

The Major test will comprise of **two sections**, Section-A and Section-B.

Section-A will have **one compulsory question** comprising of 10 parts (minimum 02 from each unit) of 03 marks each. (10*3=30 marks).

Section-B will have 04 questions of 15 marks each to be set from the last two units (02 from each unit). In Section B students are required to attempt 01 question from each unit. (15*2=30 marks).

In major test there should not be a gap of more than two days in between two tests.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC102
Credits Hours:04
Duration of Examination: 3 Hrs

Title: Real Analysis and Measure Theory
Maximum Marks:100
Minor Test -I : 20
Minor Test -II : 20
Major Test : 60

Course Outcomes:

- **CO1:** Develop a fundamental understanding of the real number system, Euclidean space, and key concepts in metric spaces, including limit points, open and closed sets, and compactness.
- **CO2:** Analyse sequences and series through concepts of limit superior, limit inferior, convergence tests, and uniform convergence, applying key theorems like Stone-Weierstrass.
- **CO3:** Explore measure theory, including sigma-fields, probability measures, and the continuity theorem of measure, to establish a strong foundation in advanced mathematical analysis.
- **CO4:** Understand Lebesgue and Lebesgue-Stieltjes measure, signed measures, and measurable functions, along with integration techniques and theorems related to convergence.
- **CO5:** Apply advanced mathematical tools such as the Radon-Nikodym theorem, product measures, and Fubini's theorem to practical problems in analysis and probability.

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 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-Steiltjes 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

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC102
Credits Hours:04
Duration of Examination: 3 Hrs

Title: Real Analysis and Measure Theory
Maximum Marks:100
Minor Test -I : 20
Minor Test -II : 20
Major Test : 60

Books Recommended

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

SCHEME OF EXAMINATIONS

	Syllabus to be covered in the examination	Time allotted for the examination	%Weightage (Marks)
MINOR TEST I (after 30 days)	25%	1 hour	20
MINOR TEST II (after 60days)	26 to 50%	1 hour	20
Major Test (after 90 days)	100%	3 hours	60
Total			100

The student shall be continuously evaluated during the conduct of each course based on his/her performance as follows:

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC102
Credits Hours:04
Duration of Examination: 3 Hrs

Title: Real Analysis and Measure Theory
Maximum Marks:100
Minor Test -I : 20
Minor Test -II : 20
Major Test : 60

Minor Test I and Minor Test II

The Subjective Tests of Minor Test I and Minor Test II would consist of 10 **compulsory MCQ** of one mark each and THREE **subjective type questions** (05 marks each). Students are required to answer any **TWO** questions out of three asked questions. **No preparatory holidays shall be provided for the Test I and Test II.**

Those candidates who have appeared in Minor Test I and II and failed to get the minimum required marks i.e. 14 out of 40 will be eligible to re-appear in the Test I and Test II only once.

Major Test

The Major test will comprise of **two sections**, Section-A and Section-B.

Section-A will have **one compulsory question** comprising of 10 parts (minimum 02 from each unit) of 03 marks each. (10*3=30 marks).

Section-B will have 04 questions of 15 marks each to be set from the last two units (02 from each unit). In Section B students are required to attempt 01 question from each unit. (15*2=30 marks).

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Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC103
Credits Hours:04
Duration of Examination: 3 Hrs

Title: Sample Survey and Sampling Designs
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test : 60

Course Outcomes:

- **CO1**: Demonstrate an understanding of various sampling techniques, including simple random sampling (SRS), stratified sampling, and post-stratification, along with their relative precision and applications.
- **CO2**: Apply systematic sampling and probability proportional to size (PPS) methods for estimating mean and variance, and evaluate the efficiency of different sampling strategies.
- **CO3**: Utilize ratio, difference, and regression estimators in statistical inference, comparing their efficiency with standard sampling techniques, and explore cluster and double-phase sampling.
- **CO4**: Analyse advanced sampling methods, including two-stage and successive sampling, identifying sources of non-sampling errors and applying appropriate estimation techniques.
- **CO5**: Understand randomized response techniques for handling sensitive characteristics and apply estimators such as Hansen-Hurwitz and Warner-Simmons methods in data collection.

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, Cluster sampling with equal and unequal cluster sizes, relative efficiency with SRS and optimum cluster size, Double (two-phase) sampling with special reference to the selection with unequal probabilities in at least one of the phases.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC103
Credits Hours:04
Duration of Examination: 3 Hrs

Title: Sample Survey and Sampling Designs
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test : 60

Unit-IV

Two stage sampling with equal and unequal s.s.u's, estimation of mean and sampling variance. Successive sampling, sampling on two occasions. Kinds of non-sampling errors with special reference to non-response problems. Hansen and Hurwitz estimator for population mean. Concept of randomized response and some well-known randomized response techniques for sensitive characteristics. Warner's and Simmons' randomized response techniques for one qualitative sensitive characteristic.

Books Recommended:

1.	Arijit Chaudhuri (2014)	Modern Survey Sampling, CRC Press
2.	Cochran, W.G. (2013)	Sampling techniques, Wiley & Sons
3.	Des Raj (1999)	Sampling Theory, Create Space Publishers, USA.
4.	Mukhopadhayay, P. (2014)	Theory and methods of survey sampling, PHI Learning.
5.	Murthy, M.N. (1967)	Sampling Theory and Methods, Statistical PublishingSociety, Calcutta.
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.	Singh,D. and F.S Chaudhary (2002)	Theory and Analysis of sample Survey Designs, New age, International Publications.
9.	Sukhatme,P.V.,Sukhatme, B.V., Sukhatme, S. and Asok, C.	Sampling Theory of Surveys with Applications, Iowa State University Press and Indian Society of Agricultural Statistics.
10.	Chaudhuri, A. and R. Mukherjee (1988)	Randomised response: theory and techniques, New York, Marcel Deckker Inc.

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Course No.: P2STTC103
Credits Hours:04
Duration of Examination: 3 Hrs

Title: Sample Survey and Sampling Designs
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test : 60

SCHEME OF EXAMINATIONS

Scheme of Examination:

	Syllabus to be covered in the examination	Time allotted for the examination	%Weightage (Marks)
MINOR TEST I (after 30 days)	25%	1 hour	20
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Major Test (after 90 days)	100%	3 hours	60
Total			100

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Minor Test I and Minor Test II

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Major Test

The Major test will comprise of **two sections**, Section-A and Section-B.

Section-A will have **one compulsory question** comprising of 10 parts (minimum 02 from each unit) of 03 marks each. (10*3=30 marks).

Section-B will have 04 questions of 15 marks each to be set from the last two units (02 from each unit). In Section B students are required to attempt 01 question from each unit. (15*2=30 marks).

In major test there should not be a gap of more than two days in between two tests.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC104
Credits Hours:04
Duration of Examination: 3 Hrs

Title: Linear Algebra
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test : 60

Course Outcomes:

- **CO1**: Understand the concepts of vector spaces, inner products, basis, dimension, and linear transformations, including their applications in real and complex fields.
- **CO2**: Apply matrix algebra, including elementary matrices, rank, inverse, null space, and generalized inverses, to solve mathematical problems.
- **CO3**: Analyse real quadratic forms, classification techniques, characteristic roots and vectors, and key theorems like Cayley-Hamilton for matrix computations.
- **CO4**: Explore spectral decomposition, singular value decomposition, and reduction techniques for symmetric matrices to enhance problem-solving skills in linear algebra.
- **CO5**: Develop mathematical reasoning and computational proficiency in vector and matrix theories for applications in advanced mathematical and engineering domains.

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.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC104
Credits Hours:04
Duration of Examination: 3 Hrs

Title: Linear Algebra
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test : 60

Books Recommended:

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

SCHEME OF EXAMINATIONS

	Syllabus to be covered in the examination	**Time allotted for the examination**	**%Weightage (Marks)**
MINOR TEST I (after 30 days)	25%	1 hour	20
MINOR TEST II (after 60days)	26 to 50%	1 hour	20
Major Test (after 90 days)	100%	3 hours	60
Total			100

The student shall be continuously evaluated during the conduct of each course based on his/her performance as follows:

Minor Test I and Minor Test II

The Subjective Tests of Minor Test I and Minor Test II would consist of 10 **compulsory MCQ** of one mark each and THREE **subjective type questions** (05 marks each). Students are required to answer any **TWO** questions out of three asked questions. **No preparatory holidays shall be provided for the Test I and Test II.**

Those candidates who have appeared in Minor Test I and II and failed to get the minimum required marks i.e. 14 out of 40 will be eligible to re-appear in the Test I and Test II only once.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC104
Credits Hours:04
Duration of Examination: 3 Hrs

Title: Linear Algebra
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test : 60

Major Test

The Major test will comprise of **two sections**, Section-A and Section-B.

Section-A will have **one compulsory question** comprising of 10 parts (minimum 02 from each unit) of 03 marks each. (10*3=30 marks).

Section-B will have 04 questions of 15 marks each to be set from the last two units (02 from each unit). In Section B students are required to attempt 01 question from each unit. (15*2=30 marks).

In major test there should not be a gap of more than two days in between two tests.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STPC105
Credit Hours :04
Duration of Examination: 04 Hrs

Title: Computing with MatLab
Maximum Marks: 100
Internal : 50
External : 50

Course Outcomes:

- **CO1**: Develop proficiency in MATLAB programming, utilizing variables, operators, control structures, and functions for mathematical computations and matrix operations.
- **CO2**: Apply data visualization techniques in MATLAB, including various plotting methods such as histograms, box plots, scatter plots, and probability plots for analytical interpretation.
- **CO3**: Implement numerical methods for integration, root extraction, and random number generation, alongside simulation exercises for probabilistic modelling.
- **CO4**: Perform statistical analysis using MATLAB, including fitting probability distributions, testing goodness of fit, and executing Principal Component Analysis (PCA) and regression methods.
- **CO5**: Conduct parametric tests such as Z-test, t-test, Chi-square test, and explore their applications in hypothesis testing and statistical inference.

There shall be at least twenty computing exercises on Statistical Computing and analysis of statistical data using MatLab software.

Module -I

Programming in MatLab: Variables, Operators, Selection statements, Loop statement, Functions, Computation of Determinants of matrix, Inverses of a matrix by partitioning, Rank of a matrix, Solutions of matrix equations, Characteristic roots and vectors of a matrix, Covariance and Correlation Matrices.

Plot function in MatLab, Histograms, Box Plot, Simple and Clustered Bar Chart, Line Charts, Scatter plot, Probability plots and Q-Q Plot and their interpretation through some case studies. Violin Plots, Candle Bar Charts, Heat Plots, Population Pyramid, Error-bar plots, Weibull Plots and their interpretation through some case studies.

Module -II

Numerical Integration, Root extraction using different methods, Random number generation from different distributions, Simple exercise on simulation

Fitting of probability distributions and testing the goodness of fit, Principal Component Analysis (PCA), Linear Regression Analysis.

Performing basic parametric tests- Z-test for proportions (one sample and two sample), t-test (single mean, independent samples, paired sample), Chi square test for independence of attributes.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STPC105
Credit Hours :04
Duration of Examination: 04 Hrs

Title: Computing with MatLab
Maximum Marks: 100
Internal : 50
External : 50

Books Recommended:

1.	Bruce L.L. and Hanselman D. C. (1996).	Mastering Matlab 7, Pearson Education India, India
2.	Gilat A. (2004)	Matlab: An Introduction with Applications, 4th Edition, Wiley India Pvt. Ltd., New Delhi
3.	Stephen J. Chapman (2024)	MATLAB Programming for Engineers , Cengage Learning

SCHEME OF EXAMINATIONS

Each practical Internal and External paper shall carry **50 marks** and will be of **04 hours** and distribution
of marks shall be as under:

Component	Marks	Remarks
Internal	25	After 60 days on completion of 50 % of syllabus **Written Exam: 20 Marks (Attempt two Practical of 10 Marks Each out of three Practicals)** **Viva Voce :05 Marks**
External	75	On completion of entire syllabus **Written Exam: 40 Marks (two Practicals each of 20 Marks out of three Practicals)** **Case study report: 10** **Viva Voce: 25 Marks**
Total	100	

External Practical examination shall be conducted by Board of Examiners consisting of Head of the Department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance of the students.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STPC106
Credit Hours :04
Duration of Examination: 4 Hrs

Title: Computational Statistics with Excel
Maximum Marks:100
Internal : 50
External : 50

Course Outcomes:

- **CO1**: Develop proficiency in MS Excel, including interface navigation, data entry, formatting, and fundamental functions for efficient data handling.
- **CO2**: Apply data management techniques such as sorting, filtering, conditional formatting, and error checking for effective data cleaning and organization.
- **CO3**: Utilize Excel's statistical functions to perform descriptive analysis, probability distribution modelling, regression analysis, and correlation studies.
- **CO4**: Create and interpret data visualizations using charts, pivot tables, dashboards, and advanced plotting methods to enhance statistical reporting.
- **CO5**: Implement Excel-based statistical modelling, hypothesis testing, automation through VBA macros, and real-world applications across industries.

Module-1

1. **Introduction to MS Excel**
   - Interface and navigation
   - Data entry and formatting
   - Basic formulas and functions
2. **Data Management & Cleaning**
   - Sorting and filtering data
   - Conditional formatting
   - Data validation and error checking
3. **Statistical Functions in Excel**
   - Descriptive statistics (mean, median, mode, standard deviation)
   - Probability distributions
   - Regression analysis and correlation
4. **Data Visualization**
   - Creating and customizing charts (histograms, scatter plots, box plots)
   - Pivot tables and pivot charts
   - Dashboard creation for statistical reporting
5. **Advanced Excel Functions**
   - Lookup functions (VLOOKUP, HLOOKUP, INDEX-MATCH)
   - Logical functions (IF, AND, OR)
   - Array formulas and dynamic ranges

Module-2

6. **Excel for Statistical Modeling**
   - Hypothesis testing (t-tests, chi-square tests)
   - ANOVA and variance analysis
   - Time series analysis and forecasting

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STPC106
Credit Hours :04
Duration of Examination: 4 Hrs

Title: Computational Statistics with Excel
Maximum Marks:100
Internal : 50
External : 50

7. **Excel Macros & Automation**
   - Introduction to VBA (Visual Basic for Applications)
   - Writing simple macros for repetitive tasks
   - Automating statistical computations
8. **Case Studies & Applications**
   - Real-world statistical problems solved using Excel
   - Industry applications in finance, healthcare, and research

SCHEME OF EXAMINATIONS

Each practical Internal and External paper shall carry **50 marks** and will be of **04 hours** and distribution
of marks shall be as under:

Component	**Marks**	**Remarks**
Internal	25	After 60 days on completion of 50 % of syllabus **Written Exam: 20 Marks (Attempt two Practical of 10 Marks Each out of three Practicals)** **Viva Voce :05 Marks**
External	75	On completion of entire syllabus **Written Exam: 40 Marks (two Practicals each of 20 Marks out of three Practicals)** **Case study report: 10** **Viva Voce: 25 Marks**
Total	100	

External Practical examination shall be conducted by Board of Examiners consisting of Head of the Department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance of the students.

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Course No.: P2STPC107
Credits Hours:01
Duration of Examination: 3 Hrs

Title: Scientific Publishing using Latex
Maximum Marks: 25
Internal: 10
External: 15

Module - 1

Installation of Kile and MikeTeX. Class and packages. Latex programming and commands, sample packages. Error messages, Some sample errors, list of LaTeX error messages. Fonts, symbols, indenting, paragraphs, line spacing, word spacing, titles and subtitles. Document class, page style, parts of the documents, table of contents. Command names and arguments, environments, declarations. Theorem like declarations, comments within text.

Module - 2

Mathematical environments, math mode, mathematical symbols. Graphic package, multivalued functions, drawing matrices. Tables, tables with captions. References to figures and tables in text. Picture environments. Extended pictures, other drawing packages. Preparing book, project report in LaTeX, LaTeX Beamer for Technical Presentations.

Books Recommended

1.	Kopka, H., Daly, P. W. (2003)	Guide to LaTeX. United Kingdom: Pearson Education
2.	Kottwitz, S. (2021)	LaTeX Beginner's Guide: Create Visually Appealing Texts, Articles, and Books for Business and Science Using LaTeX. United Kingdom: Packt Publishing.
3.	Lamport (1994)	Latex: A Document Preparation System, 2/E. India: Pearson Education.

SCHEME OF EXAMINATION

Each practical paper shall have the following distribution of marks and will be of **03 Hours:**

Component	Marks	Remarks
Internal	10	After 60 days on completion of 50 % of syllabus **Written Exam: 10 Marks (Attempt two Questions of 05 Marks Each out of Three asked questions from Module-1)**
External	15	On completion of entire syllabus **Written Exam: 10 Marks (Attempt two questions of 05 Marks Each out of Three Questions from Module-2)** **Viva Voce :05 Marks**
Total	25	

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STPC107
Credits Hours:01
Duration of Examination: 3 Hrs

Title: Scientific Publishing using Latex
Maximum Marks: 25
Internal: 10
External: 15

External Practical examination shall be conducted by Board of Examiners consisting of Head of the Department and the concerned teacher who shall evaluate/assess final practical performance of the students.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTC108 **Title: Seminar**
Credits Hours :01 **Maximum Marks:25**
Duration of Examination: 1 Hour

Course Learning Outcomes (CLO)

After completing this course, the learner will be able to:

1: To enhance the critical thinking and communication skills of students, enabling them to effectively evaluate, synthesize, and apply information in academic and professional contexts for decision makings.

2: To enhance the research acumen and statistical as well as interpretation skills of students, enabling them to effectively apply statistical tools in academic and professional contexts.

SCHEME OF EXAMINATION

The seminar presentation shall carry 25 marks and distribution of marks shall be as under:

Presentation	Contents	Domain Knowledge	Total
05	10	10	25

Evaluation Criteria: Each student will be allotted a mentor under whose guidance student will prepare the Seminar.

Each Seminar presentation will be of **duration 45-60 minutes**. Evaluation of the seminar will be done by the DAC members on the above parameters. There will be no external examination/viva-voce examination. The schedule of the Seminar will be issued by the Head of the Department.

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTE109
Credits Hours: Non-Credit
Duration of Examination: 3 Hrs

Title: Basic Statistics
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test: 60

Course Outcomes:

- **CO1:** Understand fundamental statistical concepts, including measures of central tendency, dispersion, probability laws, and random variables, applying Bayes' theorem in problem-solving.
- **CO2:** Analyze statistical relationships using expectation, moment generating functions, correlation, regression analysis, and curve fitting methods for data interpretation.
- **CO3:** Apply hypothesis testing techniques, including significance levels, power of tests, NP Lemma, and estimation methods for effective statistical inference.
- **CO4:** Explore classification models, analysis of variance, and experimental design principles to enhance statistical modeling and decision-making.
- **CO5:** Develop an understanding of official statistics, including data compilation, dissemination, and the roles of National Statistical Organizations and Commissions in policymaking.

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 function 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

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTE109
Credits Hours: Non-Credit
Duration of Examination: 3 Hrs

Title: Basic Statistics
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test: 60

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

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course No.: P2STTE109
Credits Hours: NC
Duration of Examination: 3 Hrs

Title: Basic Statistics
Maximum Marks:100
Minor Test -I: 20
Minor Test -II: 20
Major Test: 60

SCHEME OF EXAMINATIONS

	Syllabus to be covered in the examination	Time allotted for the examination	%Weightage (Marks)
MINOR TEST I (after 30 days)	25%	1 hour	20
MINOR TEST II (after 60days)	26 to 50%	1 hour	20
Major Test (after 90 days)	100%	3 hours	60
Total			100

The student shall be continuously evaluated during the conduct of each course based on his/her performance as follows:

Minor Test I and Minor Test II

The Subjective Tests of Minor Test I and Minor Test II would consist of 10 **compulsory MCQ** of one mark each and THREE **subjective type questions** (05 marks each). Students are required to answer any **TWO** questions out of three asked questions. **No preparatory holidays shall be provided for the Test I and Test II.**

Those candidates who have appeared in Minor Test I and II and failed to get the minimum required marks i.e. 14 out of 40 will be eligible to re-appear in the Test I and Test II only once.

Major Test

The Major test will comprise of **two sections,** Section-A and Section-B.

Section-A will have **one compulsory question** comprising of 10 parts (minimum 02 from each unit) of 03 marks each. (10*3=30 marks).

Section-B will have 04 questions of 15 marks each to be set from the last two units (02 from each unit). In Section B students are required to attempt 01 question from each unit. (15*2=30 marks).

In major test there should not be a gap of more than two days in between two tests.