Department of Statistics, University of Jammu
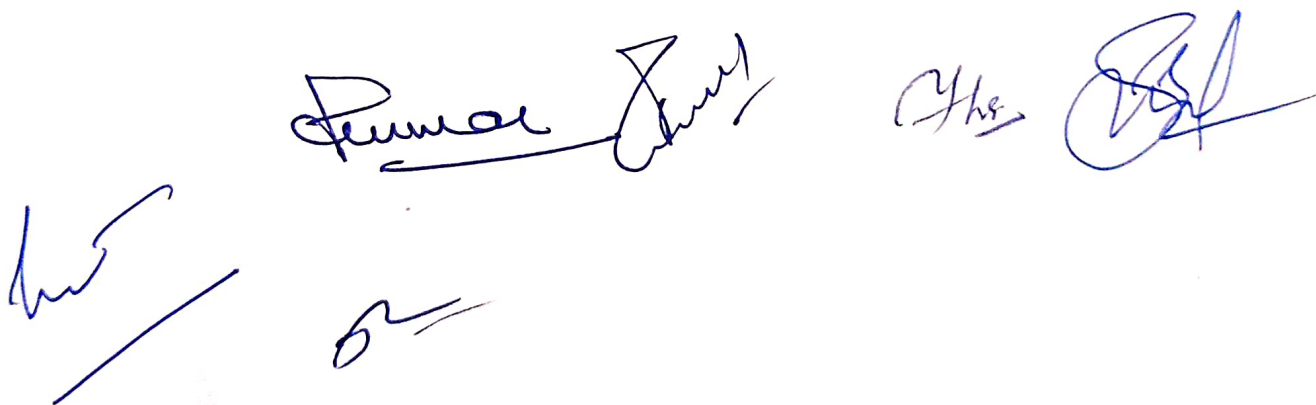
Course Structure for PG Programme in Statistics- Two Years (NEP 2020)

Programme code – PGFMS005

Semester–II

Course Code	Course Title	Credit Hours	Contact Hours per week L-Tu-P
P2STTC201	Advanced Probability Theory	04	4-1-0
P2STTC202	Linear Models and Regression Analysis	04	4-1-0
P2STTC203	Advanced Statistical Inference-I	04	4-1-0
P2STTC204	Advanced Multivariate Analysis	04	4-1-0
P2STPC205	Data Analytics with Python	04	0-0-4
P2STPC206	Computational Statistics with SPSS	04	0-0-4
P2STPC207	Seminar	01	0-1-0
P2STPC208	Communication Skills	01	0-0-2
Total Credits		26	

EXIT OPTION VOCATIONAL COURSES			
P2STV251	Advanced Data Analytics with Statistical Softwares	04	0-0-4

Course No.: P2STTC201
Credit Hours : 04
Duration of Examination: 3 Hrs

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

Course Outcomes:

- **CO1**: Develop a strong foundation in probability and measure theory, including key inequalities and fundamental properties of characteristic functions.

- **CO2**: Analyse various modes of convergence for sequences of random variables and understand their interrelationships with practical illustrations.

- **CO3**: Apply key probability lemmas and laws, including Borel-Cantelli and Kolmogorov's Zero-One laws, to understand the behaviour of large sequences of random variables.

- **CO4**: Explore limiting distributions, Levy's continuity theorem, and central limit theorems to assess asymptotic behaviour in probability theory.

- **CO5**: Examine advanced probability concepts such as martingale convergence and tail events, gaining insights into stochastic processes.

UNIT-I

Recap of Basic Concepts of Probability and Measure Theory, Chebyshev's, Markov, Holder, Minkowski, Jensen and Lyapunov inequalities, Characteristic function and its 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 criteria.

UNIT- IV

Limiting and asymptotic distributions, Levy's continuity theorem, continuity correction, Central Limit Theorems of Lindeberg-Levy, Lyapunov and Lindberg-Feller with suitable illustrations, Martingale convergence, tail events.

Books Recommended:

1.	Basu, A.K. (2012)	Measure theory and Probability, PHI, India
2.	Bhat, B. R. (2014)	Modern Probability Theory, New Age International Private Limited, India
3.	Billinsley, P. (1986)	Probability and Measure, Wiley, USA
4.	Chung, K. L. (2001)	A Course in Probability Theory, Academic Press, USA

5.	Dudley, R.M. (2002)	Real Analysis and Probability, Cambridge University Press, UK
6.	Feller, W. (1998)	Introduction to Probability and its Application Vol. II, Wiley Eastern, USA
7.	Kingman, J.F.C. and Taylor, S.J.(1966)	Introduction to measure and probability, Cambridge University Press, UK
8.	Robert , Ash (1972)	Real Analysis and Probability, Academic Press, USA
9.	Rohtagi, V. K. and Saleh A.K.M.E. (2015)	An Introduction to Probability and Statistics, Wiley, USA

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

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 questions from each unit) of 03 marks each. (10*3=30 marks).
Section-B will have 04 questions each of 15 marks 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.

Title: Linear Models and Regression Analysis

Course No.: P2STTC202
Credit Hours :04
Duration of Examination: 3 Hrs

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

Course Outcomes:

- **CO1**: Understand the Gauss-Markov setup, least squares estimation, and properties of estimation spaces, including variance and covariance analysis.

- **CO2**: Apply hypothesis testing techniques for linear parametric functions, confidence intervals, analysis of variance, and multiple variance comparison tests.

- **CO3**: Develop proficiency in regression modelling, including simple, multiple, logistic, and polynomial regression, along with diagnostic tools for model validation.

- **CO4**: Explore generalized linear models (GLMs) and link functions, understanding their applications in statistical modelling and inference.

- **CO5**: Analyse non-linear models, large sample tests, model selection criteria (AIC and BIC), and techniques for goodness-of-fit assessment

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 estimate with exact restriction on parameters.
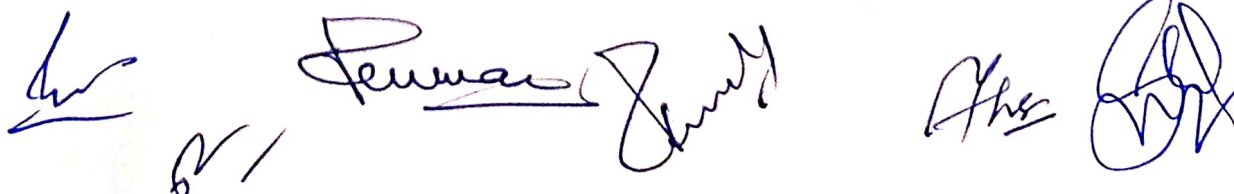
UNIT -II

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 variance comparison test(s), simultaneous confidence intervals.

UNIT -III

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

UNIT -IV

Fundamental concept of generalized linear model (GLM), exponential family of random variables. Link functions such as Logit, Probit, binomial, inverse Gaussian, gamma. Introduction to non-linear models; least squares in non-linear case, transformation of the model. Large sample tests about parameters, goodness of fit, analysis of deviance. Variable selection: AIC and BIC.

Course No.: '
P2STTC202 Credit
Hours :04
Duration of Examination: 3 Hrs

Title: Linear Models and Regression Analysis
Maximum Marks:100
    Minor Test -I : 20
    Minor Test -II : 20
    Major Test   : 60

Books Recommended:

1.	Cook, R.D. and Weisber, S. (1982)	Residual and Influence in Regression, Chapman and Hall, USA.
2.	Draper, N.R. and Smith, H. (1998)	Applied Regression Analysis 3ʳᵈ Ed. Wiley, USA.
3.	Graybill, F.A. (2000)	Theory and Application of the Linear Models, Cengage Learning Models, Boston
4.	Gunst, R.F. and Mason,R.L.(1980)	Regression Analysis and its Application-A Data Oriented Approach, Marcel and Dekker, New York.
5.	Hosmer Jr, D. W.,Lemeshow S., & Sturdivant, R. X.(2013).	Applied logistic regression (Vol. 398). John Wiley & Sons, New Jersy.
6.	Montgomery, D.C. and E.A. Peck (2021)	Introduction to Linear Regression Analysis, John Wiley &sons, New Jersy.
7.	Rao, C.R. (2002)	Linear Statistical Inference and its Applications, Wiley, USA.
8.	Weisber, S. (1995)	Applied Linear Regression, Wiley Eastern, USA.

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

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.

Course No.:
P2STTC202 Credit
Hours :04
Duration of Examination: 3 Hrs

Title: Linear Models and Regression Analysis
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 questions from each unit) of 03 marks each. (10*3=30 marks) .
Section-B will have 04 questions each of 15 marks 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-2 examinations to be held in May-2026,2027 and 2028

Course No.: P2STTC203   Title: Advanced Statistical Inference-I
Credit Hours :04   Maximum Marks : 100
Duration of Examination: 3 Hrs   Minor Test -I :   20
                                    Minor Test -II : 20
                                    Major Test :   60

Course Outcomes:

- CO1: Apply advanced hypothesis testing techniques, including the Neyman-Pearson Lemma, UMPU tests, and likelihood ratio tests for statistical inference.

- CO2: Utilize estimation methods such as MVUE, Cramer-Rao Inequality, and Maximum Likelihood Estimation (MLE) for parameter estimation and model evaluation.

- CO3: Analyse confidence intervals, tolerance intervals, and statistical decision rules, incorporating Bayes and minimax estimators for optimal decision-making.

- CO4: Perform non-parametric inference using goodness-of-fit tests, rank-based tests, and bootstrapping methods for robust statistical analysis.

- CO5: Understand key asymptotic properties, empirical distribution functions, and order statistics to enhance statistical modelling and inference techniques.

Unit-I

Review of Neyman-Pearson Lemma and its generalization. Unbiasedness in hypothesis testing, UMPU tests for one and two-sided hypothesis – in case of exponential families, similar tests and tests of Neyman structure and its relation to bounded completeness, Concept and applications of Wald's SPRT and Likelihood ratio tests.
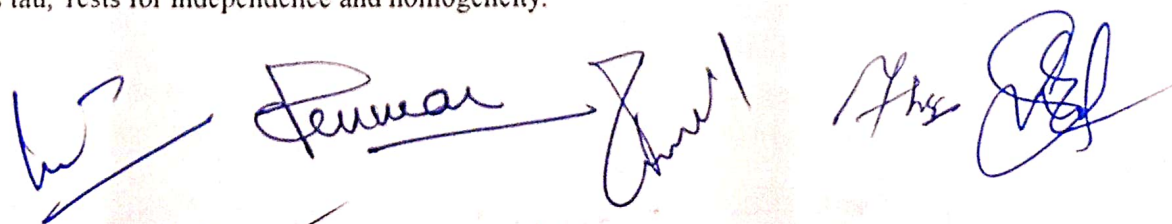
Unit-II

MVUE and Review of methods to obtain MVUE viz., Cramer-Rao Inequality, Chapman-Robbins-Kiefer Inequality, Rao-Blackwellization and Lehmann-Scheffe. Review of moment, percentile and maximum likelihood estimation, MLE for Censored and truncated distribution, Cramer-Huzurbazar theorem, solution of likelihood equation by method of scoring, Introduction to Sequential Estimation and Sequential Cramer –Rao inequality.

Unit-III

Coverage probabilities and confidence intervals, tolerance intervals, empirical distribution function and its properties, asymptotic distributions of order-statistics, bounds on expected values. Concept of Shortest Expected length Confidence Intervals based on Pivots.
Statistical Decision Problem: non –randomized and randomized decision rules, loss functions, risk function, admissibility, Bayes rule, minimax rule, least favourable distribution, priori and posterior distributions, admissible, Bayes and minimax estimators with illustrations.

Unit-IV

Non-parametric inference: Goodness of fit tests- Chi square test and Kolmogorov Smirnov test for one and two sample problems, Sign test, Signed rank test, Wald-Wolfowitz run test, Median test, Man-Whitney U-test, Kruskal-Wallis Test, Bootstrapping confidence intervals, P-P Plot and Q-Q plot, Kendall's tau, Tests for independence and homogeneity.

Course No.: P2STTC203
Credit Hours :04
Duration of Examination: 3 Hrs

Title: Advanced Statistical Inference-I
Maximum Marks : 100
    Minor Test -I : 20
    Minor Test -II : 20
    Major Test :   60

Books Recommended:

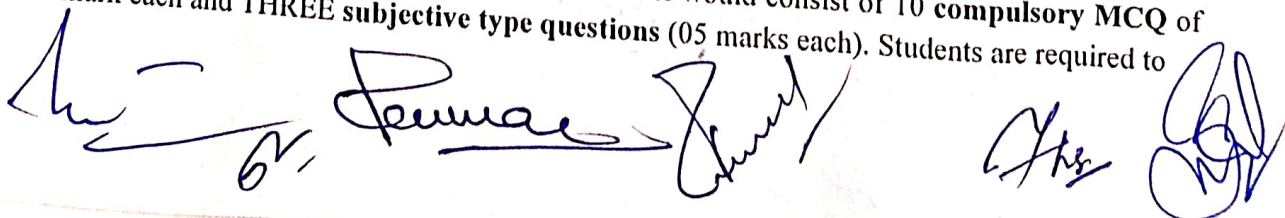|		
1.	Ferguson, T.S. (1967)	Mathematical Statistics: A Decision Theoretic Approach, John Wiley, USA.
2.	Gibbons, D. & Chakraborty, S. (2011)	Non-parametric Statistical Inference, Chapman and Hall, USA.
3.	Goon, A.M., Gupta, M.K. & Das Gupta, B. (2003)	An outline of Statistical Theory, World Press Pvt. Ltd., India.
4.	Kale, B.K. (2007)	Parametric Inference, Alpha science Int. Ltd., UK
5.	Lehman, E.L. (1998)	Theory of Point Estimation, Springer, London.
6.	Lehman, E.L. (1998)	Testing Statistical Hypothesis, Springer, London.
7.	Rajagopalan, M and Dhanavanthan, P. (2012)	Statistical Inference, PHI, India.
8.	Randles, H.R. & Wolfe, D.A. (1991)	Introduction to the Theory of Nonparametric Statistics, Krieger Publishing Company, USA
9.	Rohatgi, V.K. (1997)	Statistical Inference, Wiley, USA.
10.	Rohatgi, V.K. (1998)	An Introduction to Probability Theory and Mathematical Statistics, Wiley, USA.
11.	Zacks, S. (1981)	Theory of Statistical Inference, John Wiley, USA.
12.	Conover, W.J. (1999)	Practical Non-Parametric Statistics, John Wiley & Sons, New Jersy.

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

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

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-2 examinations to be held in May-2026,2027 and 2028

Course No.: P2STTC203
Credit Hours :04
Duration of Examination: 3 Hrs

Title: Advanced Statistical Inference-I
Maximum Marks : 100
      Minor Test -I : 20
      Minor Test -II : 20
      Major Test : 60

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 questions from each unit) of 03 marks each. (10*3=30 marks) .

Section-B will have 04 questions each of 15 marks 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.

Course No.: P2STTC204
Credit Hours :04
Duration of Examination: 3 Hrs

Title: Advanced Multivariate Analysis
Maximum Marks   : 100
Minor Test -I: 20
Minor Test -II: 20
Major Test: 60

Course Outcomes:

- **CO1:** Understand the properties and characterization of the multivariate normal distribution, including marginal and conditional distributions and maximum likelihood estimation.

- **CO2:** Apply statistical methods such as Hotelling's T^2 statistic, Mahalanobis D^2 statistic, and Wishart matrix for hypothesis testing and data analysis in multivariate settings.

- **CO3:** Analyse correlation and regression coefficients, sampling distributions, classification methods, and decision rules for multivariate statistical inference.

- **CO4:** Utilize dimension reduction techniques, including principal component analysis, canonical correlations, and factor analysis for complex data interpretation.

- **CO5:** Develop proficiency in classification models, discriminant analysis, and clustering methods for effective multivariate data segmentation

UNIT- I

Multivariate normal distribution, its properties and characterization, marginal and conditional distributions, distribution of linear combinations of normal variates. Maximum likelihood estimators of parameters. Distribution of Quadratic forms. Likelihood ratio Test for mean vectors, Comparing several mean vectors and variance co-variance matrix.
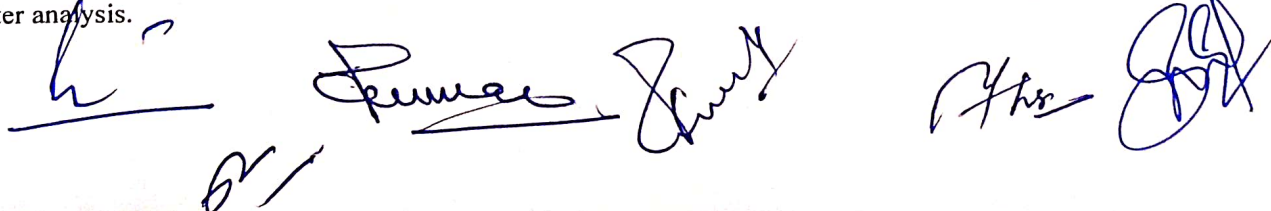
UNIT- II

Hotelling's T^2 statistic-its distribution and application in testing of mean vector for one and more multivariate normal populations, Mahalanobis D^2 statistic and its applications. Wishart matrix- its distribution, characteristic function and properties, Wilk's Distribution, density function of Wilk's statistic;

UNIT- III

Null and non-null distribution of sample correlation coefficient, Distribution of sample regression coefficients, sampling distribution of multiple correlation coefficient. Application in testing and interval estimation. Testing independence of sets of variates, testing equality of covariance matrices and means. Classification problem-standards of good classification, procedures of classification into one of two populations with known probability distributions, classification into one of two known multivariate normal populations, classification into one of several populations; Bayes solution, Fisher's discriminant function

UNIT-IV

Principal component analysis; canonical variables and canonical correlations, factor analysis and cluster analysis.

Course No.: P2STTC204
Credit Hours :04
Duration of Examination: 3 Hrs

Title: Advanced Multivariate Analysis
Maximum Marks : 100
Minor Test -I: 20
Minor Test -II: 20
Major Test: 60

Books Recommended:

1.	Anderson, T.W. (2003)	An introduction to Multivariate Statistical Analysis, Wiley, USA.
2.	Hardle, W. & Simar, L. (2012)	Applied Multivariate Statistical Analysis, Springer International Ltd., London.
3.	Jobson, D.B. (1997)	Applied Multivariate Analysis, Springer, London.
4.	Johnson, R.A. & Wichern D.W. (2012)	Applied Multivariate Statistical Analysis, PHI, India.
5.	Morrison, D.F. (2003)	Multivariate Analysis, McGraw Hill, New York.
6.	Searle, S.R., Casella, G. & McCulloch, C.E. (1992)	Variance Components, Wiley, USA.
7.	Srivastava, M.S. & Khatri, C.G. (1983)	An introduction to multivariate statistics, Elsevier North Holland, New York

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

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-2 examinations to be held in May-2026,2027 and 2028

Title: Advanced Multivariate Analysis
Maximum Marks   : 100
Minor Test -I: 20
Minor Test -II: 20
Major Test: 60

Course No.: P2STTC204
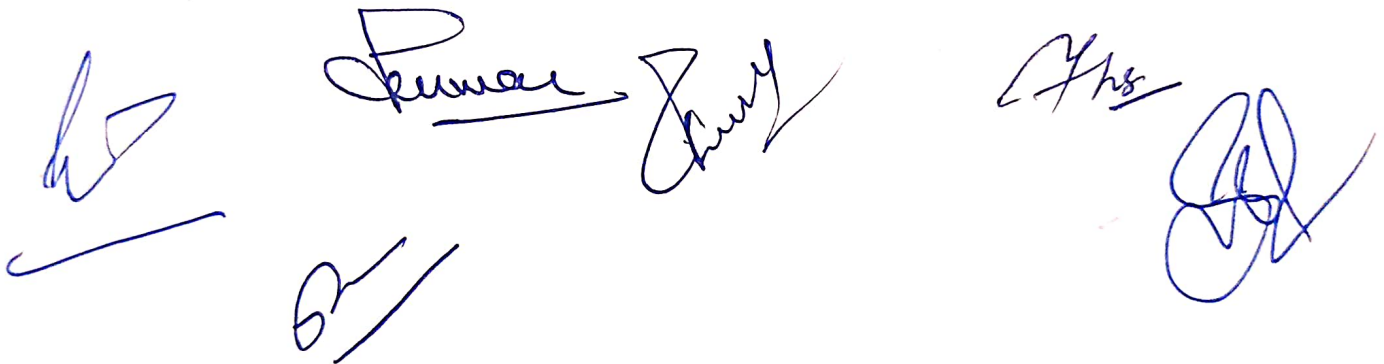Credit Hours :04
Duration of Examination: 3 Hrs

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 questions from each unit) of 03 marks each. (10*3=30 marks) .
Section-B will have 04 questions each of 15 marks 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.

Course No.: P2STPC205
Credit Hours :04
Duration of Examination: 4 Hrs

Title: Data Analytics with Python
Maximum Marks:100
       Internal: 50
       External: 50

Course Outcome (C.O):

After completion of this course the students will be able to

1. Define python environment Understand

2. Explain python programming language Evaluate

3. Develop a scientific computing environment using python Evaluate

4. Identify the use of python software to meet the given scientific objective

Module I:

Introduction: The Process of Computational Problem Solving, Python Programming Language, Python Data Types: Expressions, Variables and Assignments, Strings, List, Objects and Classes, Python Standard Library, Imperative Programming: Python programs, Execution Control Structures, User-Defined functions, Python Variables and Assignments, Parameter Passing. Text Files: Strings, Formatted Output, Files, Errors and Exception Handling, Execution and Control Structures: if Statement, for Loop, Two Dimensional lists,
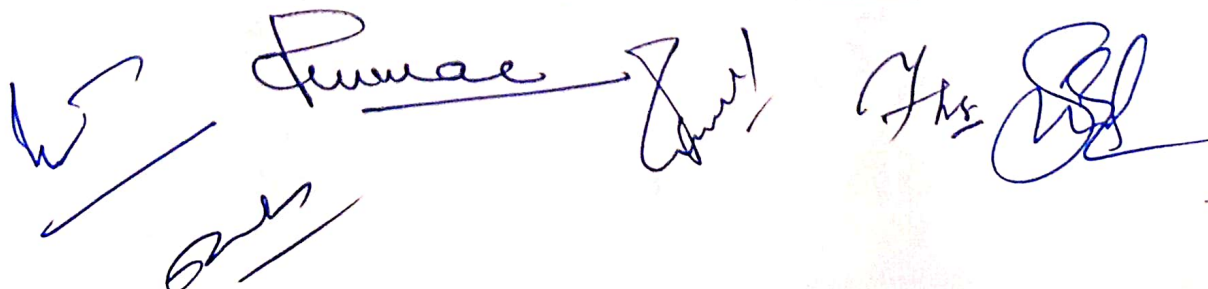
while Loop, More Loop Patterns, Additional Iteration Control Statements, Containers and Randomness: Dictionaries, Other Built-in Container Types, Character Encoding and Strings, Module random, Set Data Type.

Module II:

Lists: Basic Operations, Iteration, Indexing, Slicing and Matrixes; Dictionaries: Basic dictionary operations; Tuples and Files; Functions: Definition, Call, Arguments, Scope rules and Name resolution; Modules: Module Coding Basics.

References

1.	Charles Dierbach. (2012).	Introduction to computer science using Python a computational problem-solving focus, John-Wiley & Sons.
2.	Perkovie, L. (2011).	Introduction to computing using python: An Application development focus. Wiley Publishing.
3.	McKinney, W. (2012).	Python for data analysis: Data wrangling with Pandas, NumPy, and 1 Python. "O Reilly Media, Inc."

Title: Data Analytics with Python

Maximum Marks:100

Internal: 50

External: 50

Course No.: P2STPC205

Credit Hours :04
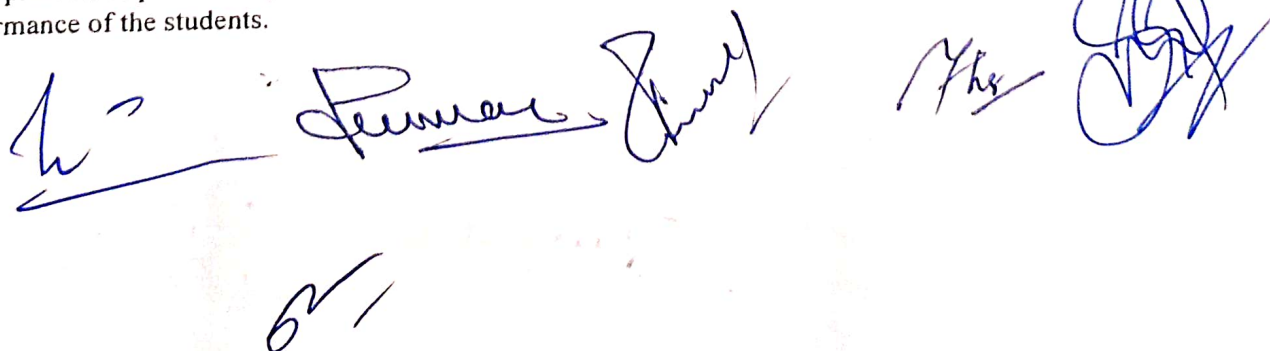
Duration of Examination: 4 Hrs

SCHEME OF EXAMINATION

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.

Course No.: P2STPC206   Title: Statistical Computing with SPSS

Credits Hours:04   Maximum Marks:100

Duration of Examination: 4 Hrs   Internal: 50

External: 50

Course Outcomes:

- **CO1**: Develop proficiency in SPSS, including data entry, coding, recoding, and pre-processing techniques for efficient data management.

- **CO2**: Utilize data visualization tools in SPSS, such as histograms, box plots, scatter plots, and map plots, for insightful statistical interpretations.

- **CO3**: Apply descriptive statistical methods, including measures of central tendency, correlation analysis, and regression modelling, for data-driven decision-making.

- **CO4**: Perform parametric and non-parametric hypothesis tests using SPSS, including t-tests, ANOVA, Chi-square tests, and rank-based tests for statistical inference.

- **CO5**: Assess survey data reliability and validity through Likert scale analysis, questionnaire testing, and advanced statistical modelling techniques.

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

Practical

The SPSS Environment

- Getting Started, the SPSS data Editor, Data View and Variable View
- Arranging the variable view to input primary data, Data Entry, Text Entry
- Coding and Decoding of data, Recoding into same and different variable.
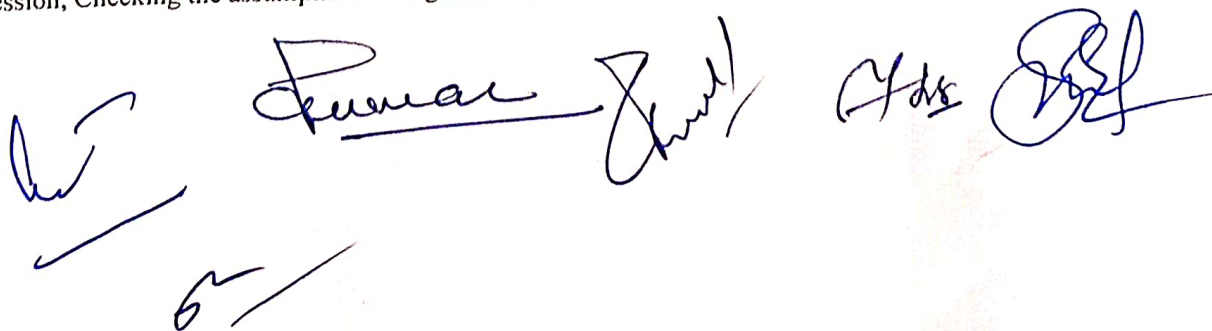
Pre-processing and tabulation of Data

Data Visualisation:

- 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.
- Map plots, Population Pyramid, Error-bar plots, Weibull Plots and their interpretation through some case studies.

Descriptive Statistics

- Computation of frequencies, cross-tabulation, measures of central tendency, dispersion, skewness and kurtosis, analysis of grouped frequency distributions and their interpretation through some case studies
- Computation of correlation coefficient (Pearson, Spearman, Kendall, Biserial and Point-biserial correlation), correlation matrix, partial correlation
- Simple Linear Regression, Non-linear regression involving two variables, Multiple Regression, Checking the assumptions of regression, use of dummy variables in regression.
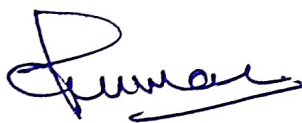
Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-2 examinations to be held in May-2026,2027 and 2028

Course No.: P2STPC206
Credits Hours:04
Duration of Examination: 4 Hrs

Title: Statistical Computing with SPSS
Maximum Marks:100
Internal: 50
External: 50

Parametric and Non-parametric Tests in SPSS

- Performing basic parametric tests in SPSS- Z-test for proportions (one sample and two sample), t-test (single mean, independent samples, paired sample), Levine test, Chi square test for independence of attributes and Goodness-of-fit
- ANOVA-one way, two-way (with single and multiple number of observations per cell), Latin Square Design experiment.
- Basic non-parametric tests: Wilcoxon Signed Rank Test, Mann-Whitney U Test, Wilcoxon Matched Pair Signed Rank Test, Median test, run test (one sample, two samples), Wald-Wolfowitz Run Test, Kolmogorov-Smirnov (one sample and two sample tests),
- Kruskal-Wallis One-way ANOVA, Binomial test, McNemar's Test, Cochran's Q Test, Kendall's Coefficient of Concordance.
- Collection and analysis of Likert Scale type data.
- Testing Reliability and Validity of the Questionnaire

Course No.: P2STPC206
Credits Hours:04
Duration of Examination: 4 Hrs

Title: Statistical Computing with SPSS
Maximum Marks:100
Internal: 50
External: 50

Books Recommended

1	Carver RH. and Nash JG. (2012)	Doing Data Analysis in SPSS: Version 18.0, Cengage Learning.
2.	Field A. (2024)	Discovering Statistics Using SPSS, Sage Publications.
3.	Ho, Robert (2006)	Handbook of Univariate and Multivariate Data Analysis and Interpretation with SPSS, Chapman and Hall/CRC Press, London.
4.	Landu, S. and Everitt, BS. (2004)	A Handbook of Statistical Analysis in SPSS, Chapman and Hall/CRC Press, London.
5.	Schmidt W (2019)	IBM SPSS: Comprehensive Beginners Guide to Learn Statistics Using IBM SPSS from A to Z, Independently Published.

SCHEME OF EXAMINATION

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	

Syllabus for Two Years PG Programme in Statistics as per National Education Policy (NEP) 2020 for Semester-2 examinations to be held in May-2026,2027 and 2028

Course No.: P2STPC206

Credits Hours:04

Duration of Examination: 4 Hrs

Title: Statistical Computing with SPSS

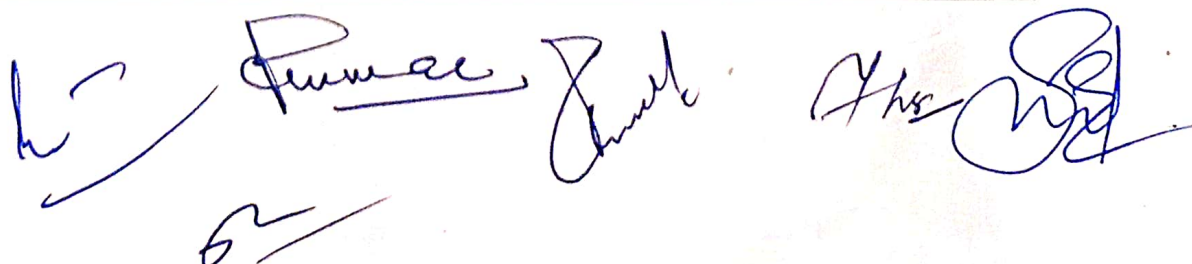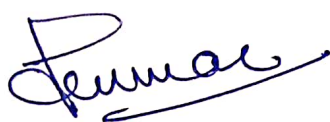Maximum Marks:100

Internal: 50

External: 50

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-2 examinations to be held in May-2026,2027 and 2028

Course No.: P2STPC207
Credit Hours :01
Duration of Examination: 1 Hour

Title: Seminar
Maximum Marks:25

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 making.

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.
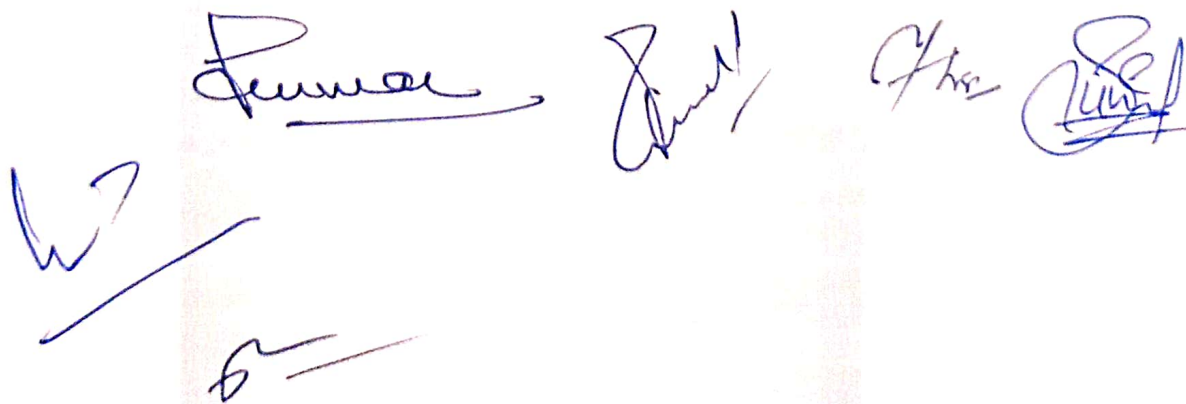
SCHEME OF EXAMINATIONS

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.

Course No.: P2STPC208
Credit Hours :01
Duration of Examination: 3 Hrs

Title: Communication Skills
Maximum Marks: 25
Internal: 10
External: 15

Course Outcomes:

- CO1: Understand the fundamentals of communication, including its process, types, professional relevance, and barriers to effective communication.

- CO2: Develop oral communication skills, including listening techniques, paralinguistic features, and proficiency in group discussions, debates, interviews, and public speaking.

- CO3: Enhance reading skills through various reading strategies such as skimming, scanning, and intensive/extensive reading for effective information processing.

- CO4: Apply written communication techniques in academic and professional contexts, including business letters, reports, emails, and research papers.

- CO5: Develop soft skills such as body language awareness, presentation skills, and interpersonal communication for professional and personal effectiveness

Module-1

Fundamentals of Communication: Definition, Process, Importance of Communication, Types of Communication, Purpose of Professional Communication, Barriers to Communication.

Oral Communication: Listening Skill - Effective Listening, Intensive Listening vs Extensive listening, Techniques of Effective Listening, Listening and Note Taking.

Speaking Skills: Paralinguistic features - Rate, Pauses, Volume, Pitch/Intonation/Voice Modulation, Pronunciation and Articulation. Group Discussions, Debates, Interviews, Public Speaking.

Readings Skills - Effective Reading, Types of Reading (Skimming, Scanning, Extensive Reading, Intensive Reading).
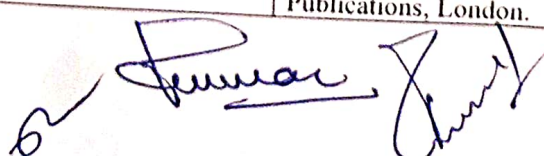
Module-2

Written communication: Academic Writing; Critical Thinking; Technical Writing vs Creative Writing - Paragraph Writing (structure, construction, coherence and cohesion), Business Letters (Acknowledgement letter, Appreciation letter, Order letter), Business Reports, Research Papers, Advertising, Notices, Emails, Resume writing, Cover Letter.
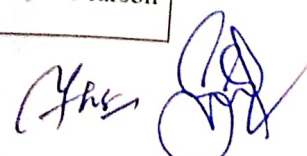
Soft Skills: Body Language – Personal Appearance, Gesture, posture, facial expression, eye contact; Proxemics/ Space Distance; Presentation Skills.

Books Recommended:

1.	Banerjee Meera & Mohan Krishna (1990)	Developing Communication Skills, Macmillan Publications, UK.
2.	Chaturvedi, P.D. (2013)	Business Communication, Pearson Publications, London.
3.	M.J. Mathew (2005)	Business Communication, RBSA Publications, India.
4.	Taylor Shirley (2005)	Communication for Business, Pearson Publications, London.

Course No.: P2STPC208
Credit Hours :01
Duration of Examination: 3 Hrs

Title: Communication Skills
Maximum Marks: 25
Internal: 10
External: 15

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	

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-2 examinations to be held in May-2026,2027 and 2028

Course No.: P2SV251   Title: Advanced Data Analytics with Statistical
Credit Hours :01   Softwares
Duration of Examination: 3 Hrs   Maximum Marks: 25
                                                       Internal: 10
                                                       External: 15

Course Outcomes:

- **CO1**: Develop proficiency in data management, organization, cleaning, and visualization techniques for effective statistical analysis.
- **CO2**: Utilize advanced regression models, non-parametric statistical methods, and predictive analytics to enhance data-driven decision-making.
- **CO3**: Explore time series analysis, forecasting techniques, and survival models such as Cox regression and Kalman filters for practical applications.
- **CO4**: Implement statistical techniques in real-world scenarios, including direct marketing case studies, ensuring practical proficiency in analytical methodologies.

Module 1: Advanced Statistical Methods and Applications

1. **Advanced Regression and Models**
   - Loglinear Models
   - Repeated Measures ANOVA
   - Non-linear Regression
   - Optimal Scaling
2. **Classification and Predictive Analytics**
   - Hierarchical Cluster Classification
   - Cluster Silhouettes
   - Receiver Operating Characteristic (ROC) Curve Analysis
3. **Time Series and Forecasting Techniques**
   - Seasonal Decomposition
   - Spectral Analysis
   - Sequence Charts

Module 2: Case Study

SCHEME OF EXAMINATION FOR VOCATIONAL COURSE

The incumbent shall undertake a case study using the advance statistical tools and techniques under the supervision of a departmental teacher who will be designated as Vocational Course Supervisor. After completion of coursework the student will have to produce a report related to the case study carried out duly signed by the vocational supervisor and Head of the department.

The Board of Examiners consisting of Head of the Department, one teacher of concerned department, and vocational supervisor shall evaluate/assess performance of the students.

The work will be assessed on the following components:

Contents of the Report	Seminar Presentation	Domain Knowledge	Total
40	20	40	100