

ಡಾ. ಮನಮೋಹನ್ ಸಿಂಗ್
ಬೆಂಗಳೂರು ನಗರ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ



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No.MSBCU/BoS/Syllabus/Science/ 107 /2026-27

Date: 29.06.2026

NOTIFICATION

Sub: Syllabus for the V & VI Semester Under Graduate Courses in the Faculty of Science -reg

- Ref: 1. Government Order No. ED 166 UNE 2023 Bengaluru dated. 08.05.2024
2. Recommendations of the Boards of Studies in the Faculty of Science
3. Approval of the Academic Council in its meeting held on 08.06.2026
4. Orders of Vice-Chancellor dated.29.06.2026

The Syllabus prepared by the Boards of Studies for the different Subjects of V & VI semester Under Graduate Courses, in the faculty of Science based on the Guidelines and Curriculum Structure issued by the Government under ref(1) have been approved by Academic Council meeting held on 08.06.2026.

Accordingly, the CBCS Syllabus for the V & VI Semester UG Courses of Science Faculty in respect of following subjects are hereby notified for implementation from the academic year 2026-27.

Sl. No.	Subjects
1.	Botany– V & VI Semester
2.	Chemistry– V & VI Semester
3.	Zoology and Genetics– V & VI Semester
4.	BoS in Fashion and Apparel Design i. FAD – V & VI Semester ii. IDD– V & VI Semester
5.	Geography– V & VI Semester
6.	Mathematics– V & VI Semester
7.	Physics – V & VI
8.	BoS in Home Science i) Home Science – V & VI ii)Nutrition & Dietetics – V & VI iii)Clinical Nutrition & Dietetics – V & VI iv)Food Technology – I & II Sem

p.t.o

9.	Criminology and Forensic Science– V & VI
10.	Psychology– V & VI Semester
11.	Electronics – V & VI
12.	Statistics – V & VI
13.	Microbiology– V & VI
14.	Biotechnology– V & VI
15.	Environmental Science– V & VI

The detailed Syllabi for above subjects are notified in the University Website:
www.bcu.ac.in for information of the concerned.


REGISTRAR

Copy to;

1. The Registrar(Evaluation), Dr. Manmohan Singh Bengaluru City University
2. The Dean, Faculty of Science, MSBCU.
3. The Principals of the concerned affiliated Colleges of MSBCU- through email.
4. The P.S. to Vice-Chancellor/Registrar/Registrar (Evaluation), MSBCU.
5. Office copy / Guard file / University Website: www.bcu.ac.in



Dr. MANMOHAN SINGH
BENGALURU CITY UNIVERSITY

CHOICE BASED CREDIT SYSTEM
[As per SEP]

Syllabus for B.Sc.
Statistics

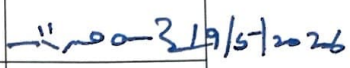
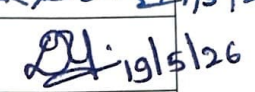
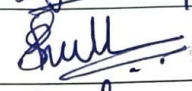
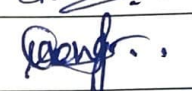
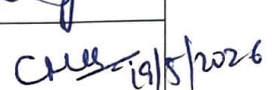
2026-27 onwards

DR MAN MOHAN SINGH BENGALURU CITY UNIVERSITY
BOARD OF STUDIES IN STATISTICS

Date: 19-05-2026

Proceedings of the meeting of the Board of Studies in Statistics (UG) held at 3.00 pm on 19-05-2026 at Dr Man Mohan Singh Bengaluru City University, Central College Campus, Bengaluru-560056.

Members Present :

1. Prof. Parameshwar V Pandit Department of Statistics, Bangalore University, Bengaluru	(Chairperson)	
2. Dr. Deepa Yogesh Kamat, Nrupathunga University, Bengaluru	(Member)	
3. Smt. Ambika, C. Mount Carmel College Autonomous, Bengaluru	(Member)	
4. Dr Shubhashree Joshi St. Joseph's University, Bengaluru	(Member)	
5. Mr Narayana Gowda, N., Reva University, Bengaluru	(Member)	
6. Dr Mohan Kumari C Mount Carmel College Autonomous, Bengaluru	(Member)	

The meeting started with welcome to the members of the Board by the Chairperson of the Board of Studies in Statistics. The syllabus for B.Sc(Statistics) program for V and VI semesters with effect from 2026-27 proposed by the Chairman was discussed in detail and the members gave inputs to improve the practicability of the subject. The members actively participated in the discussion of the above said matters and arrived at the following decisions:

1. The members approved the syllabus for V and VI semesters of UG optional Statistics as per SEP guidelines.
2. The panel of examiners for B Sc examinations for the year 2026-27 is approved.
3. The board authorized the Chairman to make modifications if necessary in the syllabus of V and VI semesters of B.Sc(Statistics) program and finalize the same.

Members Absent:

1. Ms Sarvesh Gopinathan,
Kristu Jayanthi University, Bengaluru.
2. Dr Sathish Bhat,
Yuvaraja college, Mysore.
3. Dr S R Gani,
Karnatak Science College, Dharwad.



**Dr. MAN MOHAN SINGH BENGALURU CITYUNIVERSITY,
BENGALURU
Regulations and Syllabus
for
STATISTICS
in
Three Year BSc Course 2024-25 Onwards
(Scheme:SEP)**

Eligibility

1. Only those candidates who have passed Pre-University course or an equivalent course with Mathematics/ Basic Mathematics/Applied Mathematics as one of the optional subjects are eligible to take Statistics as one of the optional subjects in BSc course.
2. Any student taking Statistics as one of the optional subjects in the BSc course shall take Mathematics as another optional subject.

Scheme of Instruction

1. The subject of Statistics in this course has to be taught by MSc/MA degree holders in Statistics / Mathematical Statistics.
2. The theory question paper for each paper shall cover all the topics in the pertaining syllabus with proportional weightage to the number of hours of instructions prescribed.
3. Practicals are to be conducted in batches as per the University norms for the faculty of science (10 students per batch per teacher).
4. It is expected that each student collects and uses real-life data for practical classes.
5. The maximum marks for each record in the examination is 5.
6. Study tour/Project/Internship for the students is recommended to gain knowledge of applications of Statistics in industries/Agriculture/Medical fields.

Program Outcomes (Pos):

By the end of the program the students will be able to:

- PO1. Acquire fundamental / systematic or coherent understanding of the academic field of Statistics and its different learning areas and applications.
- PO2. Develop and demonstrate an ability to understand major concepts in various disciplines of Statistics.
- PO3. Demonstrate the ability to use skills in Statistics and different practicing areas for formulating and tackling Statistics related problems and identifying and applying appropriate principles and methodologies to solve a wide range of problems associated with Statistics.
- PO4. Understand procedural knowledge that creates different types of professionals related to subject area of Statistics, including professionals engaged in government / public service and private sectors.
- PO5. Plan and execute Statistical experiments or investigations, analyze and interpret data / information collected using appropriate methods, including the use of appropriate statistical software including programming languages, and report accurately the findings of the experiment / investigations.
- PO6. Have a knowledge regarding use of data analytic stools like Excel and R-programming.
- PO7. Develop an ability to critically assess a standard report having graphics, probability statements.
- PO8. Analyse, interpret the data and hence help policy makers to take a proper decision.
- PO9. Recognize the importance of statistical modelling and computing, and the role of approximation and mathematical approaches to analyse the real problems using various statistical tools.
- PO10. Demonstrate relevant generic skills and global competencies such as
 - (i) Problem-solving skills that are required to solve different types of Statistics related problems with well- defined solutions, and tackle open-ended problems, that belong to the disciplinary-area boundaries;
 - (ii) Investigative skills, including skills of independent thinking of Statistics-related issues and problems;
 - (iii) Communication skills involving the ability to listen carefully, to read texts and reference material analytically and to present information in a concise manner to

different groups / audiences of technical or popular nature;

(iii) Analytical skills involving paying attention to details and ability to construct logical Arguments using correct technical language related to Statistics and ability to translate them with popular language when needed;

(iv) Personal skills such as the ability to work both independently and in a group.

PO11. Undertake research projects by using skills –preparation of questionnaire, conducting sample survey, projects using sampling techniques.

PO12. Understand and apply principles of least squares to fit a model to the given data, study the association between the variables, applications of Probability Theory and Probability Distributions.

CURRICULUM FOR THE UNDER-GRADUATE PROGRAM IN STATISTICS (SEP)
PROGRAM STRUCTURE:

SEM	COURSE TITLE	THEORY/ PRACTICAL (HOURS PER WEEK)	DURATION OF EXAM	CIA MARKS	ESE MARKS	TOTAL	CREDITS
I	STT101: BASIC STATISTICS-I	04	03	20	80	100	3
	STP101: PRACTICAL-I	03	03	10	40	50	2
II	STT201: BASIC STATISTICS-II	04	03	20	80	100	3
	STP201: PRACTICAL -II	03	03	10	40	50	2
III	STT301: STATISTICAL INFERENCE-I	04	03	20	80	100	3
	STP301: PRACTICAL-III	03	03	10	40	50	2
	STE301: POPULATION STUDIES	03	1.5	10	40	50	2
IV	STT401: STATISTICAL INFERENCE-II	04	03	20	80	100	3
	STP401: PRACTICAL-IV	03	03	10	40	50	2
	STE401: INDUSTRIAL STATISTICS	03	1.5	10	40	50	2
	STSK401: STATISTICAL DATA ANALYSIS USING R-SOFTWARE	03	03	10	40	50	2
V	STT501: SAMPLING TECHNIQUES	04	03	20	80	100	3
	STT502: DESIGN OF EXPERIMENTS	04	03	20	80	100	3
	STP501: PRACTICAL-V	03	03	10	40	50	2
	STSK501: STATISTICAL DATA ANALYSIS USING ADVANCED EXCEL	03	03	10	40	50	2
VI	STT601: APPLIED STATISTICS	04	03	20	80	100	3
	STE602: OPERATIONS RESEARCH	04	03	20	80	100	3
	STP601: PRACTICAL-VI	03	03	10	40	50	2
	STSK601: PROJECT PREPARATION	03	03	10	40	50	2

CIA-Continuous Internal Assessment; ESE-End Semester Examination

V Semester B.Sc.

Program Name	B.Sc. Statistics	Semester	V
Course Title	SAMPLING TECHNIQUES		
Course Code	STT 501	No of Credits	3
Contact Hours	60 (4 hours per week)	Duration of SEA/ Exam	3 hours
Continuous Internal Assessment Marks	20	End Semester Exam (ESE) marks	80

Course outcomes (COs):

After the successful completion of the course, the student will be able to have

CO1. Knowledge of Survey methods, data collection techniques.

CO2. Knowledge about Estimation and its efficiency

CO3. Knowledge about the usage of optimal sampling schemes.

CO4. Knowledge about generation of random sampling from the population.

CO5. Knowledge about research methods.

Contents	60 hours
Unit 1: Introduction to Sampling Population-Infinite population and finite population. Types of Survey-Complete enumeration and sample survey, Advantages and limitations of sample survey and complete enumeration, Sampling-Subjective sampling, probability sampling (equal and unequal). Methods of selecting sample- Lottery method and Random number table method. Sampling errors and Non sampling errors. Steps in a sample survey.	15 hours
Unit 2: Simple Random Sampling (SRS) Simple Random sampling without and with replacement (SRSWOR and SRSWR). Probability of inclusion of a unit in the sample, for without and with replacement schemes. Verifying the unbiasedness of sample mean for population mean. Obtaining the expression for variance of sample mean under both with and without replacement cases.	15 hours
Unit 3: Stratified Random Sampling Stratified random sampling. Estimators of population mean and variance of unbiased estimators of population mean. Allocation of sample size-Proportion allocation and Neymann allocation. Obtaining the expression for variance of unbiased estimate under Proportional and Neymann allocation.	15 hours
Unit 4: Systematic Sampling and Efficiency of Schemes Systematic sampling. Linear and circular Systematic sample, Estimation of population mean under linear systematic sample and variance of the estimate. Efficiency of various schemes, Confidence interval for population mean under different sampling schemes. Determination of sample size under different schemes.	15 hours

References

1. Bhuyan, K. C. (2023). *Design of experiments and sampling methods*. Om Publications.
2. Cochran, W. G. (2007). *Sampling techniques* (3rd ed.). John Wiley & Sons.
3. Des Raj, & Chandok, P. (1998). *Sampling theory*. Narosa Publishing House.
4. Goon, A. M., Gupta, M. K., & Das Gupta, B. (1991). *Fundamentals of statistics, Vol. II*. World Press.
5. Lohr, S. L. (2022). *Sampling: Design and analysis* (3rd ed.). Chapman & Hall/CRC.
6. Mukhopadhyay, P. (2008). *Theory and methods of survey sampling*. Books and Allied (P) Ltd.
7. Murthy, M. N. (1977). *Sampling theory and methods*. Statistical Publishing Society.
8. Sampath, S. (2006). *Sampling theory and methods* (2nd ed.). Narosa Publishing House.
9. Sharma, K. K. (2023). *Sampling techniques: An applied approach*. Springer.

Course Articulation Matrix: Mapping Course Outcomes (COs) with Program Outcomes (POs 1-12)

Course Outcomes (COs)	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	1					2		1			2
CO2	3	1			2		1		1			1
CO3			1		1				2			2
CO4	1	2		1		2	1					1
CO5	2	1		1		1	1					2

Pedagogy: The course is taught using traditional chalk and talk method using problem solving through examples and exercises along with interactive lectures, blended learning and case studies.

Continuous Internal Assessment for theory	
Assessment Occasion/Type	Marks
Test-I	05
Test-II	05
Assignment/Seminars	05
Attendance	05
Total	20

Program Name	B.Sc. Statistics	Semester	V
Course Title	DESIGN OF EXPERIMENTS		
Course Code	STT 502	No of Credits	3
Contact Hours	60 (4 hours per week)	Duration of SEA/ Exam	3 hours
Continuous Internal Assessment Marks	20	End Semester Exam (ESE) marks	80

Course outcomes (COs):

After the successful completion of the course, the student will be able to:

CO1: Acquire knowledge of designing experiments.

CO2: Understand the terminologies used in experimental design.

CO3: Apply the principles in designing experiments.

CO4: Analyze data obtained from designed experiments.

CO5: Understand treatment combinations of factors at different levels.

Contents	60 hours
Unit 1: Introduction to Design of Experiments Analysis of Variance (ANOVA) for one-way and two-way classified data. Terminology- Experiment, Comparative experiment, Treatment, Plots, Blocks, Experimental material, Uniformity trials, Experimental error, Yield, Principles of Design-Randomization, Replication and Local control. Fixed effect model, Random effect model, Mixed effect model,	15 hours
Unit 2: Completely Randomized Design (CRD) Introduction, Layout, Model, Assumptions, Obtaining the least square estimates of the parameters, Splitting the Total sum of squares, Degrees of freedom, Mean Sum of Squares, Expectation of Mean sum of squares, Derivation of F-test statistic, Estimation of variances, Testing of Hypotheses, Justification of Right-tailed Test. Post hoc test-Critical difference and Tukey's Honest Difference.	15 hours
Unit 3: Randomized Block Design (RBD) and Latin Square Design (LSD) Introduction to RBD, layout, Model, assumptions, least square estimates of the parameters, splitting the Total sum of squares, Degrees of freedom, Mean Sum of Squares, Testing of Hypotheses	15 hours

Introduction to LSD, layout, Model, assumptions, least square estimates of the parameters, Splitting the Total sum of squares, Degrees of freedom, Mean Sum of Squares, Testing of Hypotheses Missing Plot technique (single observation) in RBD and LSD, Efficiency of designs	
Unit 4: Factorial Experiment Factorial Experiments-Factors, levels, Treatment combinations. 2^2 -Factorial Experiment-Main effects and Interactions. Analysis using RBD-Yates Method to compute factorial effect totals. 2^3 -Factorial Experiment-Main effects and Interactions. Analysis using RBD-Yates Method to compute factorial effect totals. Confounding- Complete and Partial confounding, Confounding in 2^3 - Factorial experiment	15 hours

References
1. Das, D., & Selvamuthu, D. (2024). <i>Introduction to probability, statistical methods, design of experiments and statistical quality control</i> . Springer Singapore.
2. Goon, A. M., Gupta, M. K., & Das Gupta, B. (1991). <i>Fundamentals of statistics, Vol. II</i> . World Press.
3. Gupta, S. C., & Kapoor, V. K. (2020). <i>Fundamentals of applied statistics</i> (12th ed.). Sultan Chand & Co.
4. Montgomery, D. C. (2020). <i>Design and analysis of experiments</i> (10th ed.). Wiley.
5. Mukhopadhyay, P. (2015). <i>Applied statistics</i> . Books and Allied Pvt. Ltd.
6. Panneerselvam, R. (2012). <i>Design and analysis of experiments</i> . PHI Learning.

Course Articulation Matrix: Mapping Course Outcomes (COs) with Program Outcomes (POs 1-12)

Course Outcomes (COs)	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	1	1					2		1			2
CO2	2	1			2		1		2			1
CO3			1		1				3			2
CO4	2	2		1		2	1					1
CO5	3	1		3		1	1					3

Pedagogy: The course is taught using traditional chalk and talk method using problem solving through examples and exercises along with interactive lectures, blended learning and case studies.

Continuous Internal Assessment for theory	
Assessment Occasion/Type	Marks
Test-I	05
Test-II	05
Assignment/Seminars	05
Attendance	05
Total	20

PRACTICALS

Program Name	B.Sc. Statistics	Semester	V
Course Title	SAMPLING TECHNIQUES AND DESIGN OF EXPERIMENTS		
Course Code	STP 501	Practical Credits	2
Contact Hours	30 (3 hours per week)	Duration of End Semester Examination (ESE)	3 Hours
Continuous Internal Assessment Marks	10	End Semester Exam (ESE) marks	40

Practical content

Demonstration of Practicals using MS-Excel and R

1. Drawing all possible Simple Random Samples WOR and WR from a finite population and verifying the unbiasedness of the estimates
2. Estimation of the mean, total and the standard error of the estimator under stratified random sampling.
3. Systematic Sampling: Computation of mean, variance, Comparison of SRS, Stratified and systematic sampling under linear trend
4. Analysis of CRD
5. Analysis of RBD and Missing Plot Technique in RBD
6. Analysis of LSD and Missing Plot Technique in LSD
7. Analysis of 2^2 Factorial Experiment
8. Analysis of 2^3 - Factorial Experiment
9. Complete Confounding in 2^3 - Factorial Experiment
10. Partial Confounding in 2^3 - Factorial Experiment

Continuous Internal Assessment for Practical	
Test	05
Attendance	05
Total	10

V semester B. Sc.

Program Name	B.Sc. Statistics	Semester	V
Course Title	STATISTICAL DATA ANALYSIS USING ADVANCE EXCEL		
Course Code	STSK 501	Course Credits	2
Contact Hours	3	Duration of End Semester Examination (ESE)	3 Hours
Continuous Internal Assessment Marks	10	End Semester Exam (ESE) marks	40

Practical Content: STATISTICAL DATA ANALYSIS USING ADVANCE EXCEL

1. Measures of Central Tendency and Dispersion
2. Correlation and Scatter Diagram
3. Simple Linear Regression Analysis
4. Time Series Analysis and Trend Projection
5. Construction of Control Charts
6. Hypothesis Testing using t-Test
7. Chi-Square Test of Independence
8. Analysis of Variance (ANOVA)

9. Index Numbers and Inflation Analysis
10. Data Visualization using Pivot Tables and Dashboards

Continuous Internal Assessment for Practical	
Test	05
Attendance	05
Total	10

VI semester B. Sc.

Program Name	B.Sc. Statistics	Semester	VI
Course Title	APPLIED STATISTICS		
Course Code	STT601	No of Credits	4
Contact Hours	60 (4 hours per week)	Duration of SEA/ Exam	3 hours
Continuous Internal Assessment Marks	20	End Semester Exam (ESE) marks	80

Course outcomes (COs):

After the successful completion of the course, the student will be able to:
CO1: Apply time series models for analysis and forecasting.
CO2: Construct and interpret index numbers for business and economic data.
CO3: Analyse data using official statistics measures.
CO4: Solve health problems using appropriate techniques from clinical trials
CO5: Evaluate decision-making problems under certainty, uncertainty, and risk.

Contents	60 hours
Unit 1: Time Series Meaning and definition of time series, Components of time series, Time series Models, Measurement of trend by moving average method and least square method, Measurement of Seasonal Variation-Seasonal Indices by simple average method and ratio to moving average method.	10 hours
Unit 2: Official statistics and Index numbers History of Indian Statistical System. Pre and Post-Independence era. CSO, NSSO and its activities. National Income. Basic Concepts: GNP,GDP , NNP. National Income at factor cost – NDP , per capita Income. Real national income. Methods of estimating National income. Problems in estimating national income. Uses of national income statistics . National account statistics of CSO. Index numbers- Terminologies, Construction of Price index numbers-Simple and weighted method. Weighted aggregative Price index numbers-TRT, FRT. CT and UT. Consumer Price Index Number – Family Budget Method and Aggregative Expenditure method.	18 hours
Unit 3: Clinical Trials Introduction, therapeutic trials and prophylactic trials. Observational studies – Cross sectional studies, prospective studies, retrospective studies, randomized control studies. Odds ratio and its confidence interval. Relative risk and its confidence interval. Diagnostic efficacy. Application of Bayes theorem. Sensitivity, specificity, false negative and false positive rates. Receiver operating characteristic (ROC) curve. Body Mass Index.	17 hours
Unit 4: Decision Theory Basic concepts of decision- Actions, States, Payoff, Strategy, Payoff matrix, Decision making enrolment-Certainty, Uncertainty and Risk. Finding the optimum strategy under Uncertainty- Maximin, Maximax for profit, Minimax and Minimin for loss. Finding the optimum strategy under Risk-Maximum of EMV and Minimum of EL.	15 hours

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1. Goon, A. M., Gupta, M. K., & Das Gupta, B. (1991). *Fundamentals of statistics, Vol. II*. World Press.
2. Gupta, S. C., & Kapoor, V. K. (2020). *Fundamentals of applied statistics* (12th ed.). Sultan Chand & Co.
3. Jeff, R., O'Neill, R., & Joe, W. (2015). *A practical introduction to index numbers*. Wiley.
4. Montgomery, D. C., & Runger, G. C. (2013). *Applied statistics and probability for engineers*. Wiley India.
5. Mukhopadhyay, P. (2015). *Applied statistics*. Books and Allied Pvt. Ltd. Kolkata
6. Robert, H. S., & David, S. S. (2017). *Time series analysis and its applications: With R*. Springer.
7. Saluja M. R. (1972). Indian Official Statistical Systems, Statistical Publishing Society, Calcutta.
8. SundarRao P. S. S. and Richard, J.(2012). Introduction to Biostatistics and Research Methods, 5/e, Prentice Hall of India, New Delhi.
9. CSO (1980): National Accounts Statistics – Sources and Health, Govt. of India, New Delhi.
10. Sen. A. (1997): Poverty and Inequality, Stanford University Press, USA.

Course Articulation Matrix: Mapping Course Outcomes (COs) with Program Outcomes (POs 1-12)

Course Outcomes (COs)	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	1						1			1	
CO2		1			2			1		1		
CO3					1	2			1			1
CO4		1			1		2					
CO5			1			2	1			1		

Pedagogy: The course is taught using traditional chalk and talk method using problem solving through examples and exercises along with interactive lectures, blended learning and case studies.

Continuous Internal Assessment for theory	
Assessment Occasion/Type	Marks
Test-I	05
Test-II	05
Assignment/Seminars	05
Attendance	05
Total	20

Program Name	B.Sc. Statistics	Semester	VI
Course Title	OPERATIONS RESEARCH		
Course Code	STT 602	No of Credits	4
Contact Hours	60 (4 hours per week)	Duration of SEA/ Exam	3 hours
Continuous Internal Assessment Marks	20	End Semester Exam (ESE) marks	80

Course outcomes (COs):

After the successful completion of the course, the student will be able to:

CO1: Develop models for optimization problems in Operations Research.

CO2: Solve product mix problems using LPP methods.

CO3: Apply techniques for optimization of profit and cost.

CO4: Make decisions under conditions of certainty, risk, and uncertainty.

CO5: Evaluate project networks using CPM/PERT techniques.

Contents	60 hours
Unit 1: Introduction to OR and LPP: History of OR, Definitions of OR, Modelling in OR, Introduction- Formulation of LPP- Solution, Feasible solution, Optimal solution, Multiple solution, Unbounded solution, Infeasible solution. Graphical method of solving LPP. General LPP, System of linear equations- Solution, Basic solution. Degenerate and non-degenerate solution. Slack and surplus variables, Standard Form and canonical form of LPP. Simplex Method of solving LPP	15 hours
Unit 2: Transportation and Assignment Problem Introduction, Balanced and Imbalanced transportation problem, TP as LPP, Basic solution of TP. Degenerate and Non degenerate solution of TP. Finding Initial Basic solution of TP by NWCC method and LCC method. Finding Optimal solution by UV method. Assignment problem as LPP, Solving assignment problem.	15 hours
Unit 3: Game Theory and Queueing Theory: Game Theory: Basic concepts. Two – Person Zero Sum Game. Pure and Mixed Strategies. Maximin – Minimax principle, Games with saddle point. Principle of dominance. Games without saddle Point Mixed Strategies. Determination of optimum solution for a (2*2) Game. Solution by graphical method for (2*n) and (m*2) games. Queueing Theory: Basic elements, Description of a queue system and measures of effectiveness, Statement of study state solution of M/M/I queueing system, waiting time distribution, Little's formula derivation of expression for queue length and system size (length) and waiting times, Description of M/M/C queueing system.	15 hours
Unit 4: Project evaluation Basic Concepts-Event, activity, Network and its construction, slack of an event, Floats of the activities-Total float, Free float and independent float, Finding the critical path in the network, estimate of mean time of activities and their variances, mean and standard deviation of completion time of the project. Finding the probabilities of i) completion of the project within the specified time, ii) Delay of the project beyond the specified time iii) completion between two specified time points.	15 hours

References
1. Hillier, F. S., & Lieberman, G. J. (2021). <i>Introduction to operations research</i> (11th ed.). McGraw-Hill Education. 2. Kanthi Swaroop, K., Gupta, P. K., & Man Mohan. (2015). <i>Operations research</i> (14th ed.). Sultan Chand & Sons. 3. Mital, K. V., & Mohan, C. (2004). <i>Optimization methods</i> (3rd ed.). New Age International. 4. Mustafi, C. K. (2006). <i>Operations research: Methods and practice</i> (3rd ed.). New Age International. 5. Shenoy, G. V., Srivastava, U. K., & Sharma, S. C. (2009). <i>Operations research for management</i> (2nd ed.). New Age International. 6. Taha, H. A. (2017). <i>Operations research: An introduction</i> (10th ed.). Pearson.

Course Articulation Matrix: Mapping Course Outcomes (COs) with Program Outcomes (POs 1-12)

Course Outcomes (COs)	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	1						1			1	
CO2		1			2			1		1		
CO3					1	2			1			1
CO4		1			1		2					
CO5			1			2	1			1		

Pedagogy: The course is taught using traditional chalk and talk method using problem solving through examples and exercises along with interactive lectures, blended learning and case studies.

Continuous Internal Assessment for theory	
Assessment Occasion/Type	Marks
Test-I	05
Test-II	05
Assignment/Seminars	05
Attendance	05
Total	20

PRACTICALS

Program Name	B.Sc. Statistics	Semester	VI
Course Title	Applied Statistics and Operations Research		
Course Code	STP 601	Practical Credits	2
Contact Hours	30 (3 hours per week)	Duration of End Semester Examination (ESE)	3 Hours
Continuous Internal Assessment Marks	10	End Semester Exam (ESE) marks	40

Practical content

Demonstration of Practical using MS-Excel and R

1. Construction of index numbers and consumer price index numbers.
2. Tests for consistency of index numbers.
3. Time Series 1 – Measurement of trend and seasonal variation
4. Clinical Trials – 1 (Odds Ratio, Relative Risk, Confidence Interval, ROC Curve and Computation of various Rates)
5. National income.
6. Solution of L.P.P— Graphical Solution. and Simplex Algorithm
7. Transportation Problem
8. Assignment Problem.
9. Game theory Problems and Queuing Problems.
10. CPM and PERT.

Continuous Internal Assessment for Practical	
Test	05
Attendance	05
Total	10

VI semester B.Sc

Program Name	B.Sc. Statistics	Semester	VI
Course Title	PROJECT PREPARATION		
Course Code	STSK 601	Course Credits	2
Contact Hours	3	Duration of End Semester Examination (ESE)	3 Hours
Continuous Internal Assessment Marks	10	End Semester Exam (ESE) marks	40

A student has to do a project relating statistical techniques to be applied in various fields. The guidelines to perform a project are

Problem Selection

1. Select a relevant domain- Education, Economical, Medical, Social and Many more
2. Define a problem in the selected domain-It should not be too Broad and Too narrow. It should allow to obtain relevant information to address the problem
3. Define the units and describe the population
4. Choose the sample with appropriate size

Data collection and Presentation

5. Preparation of data collection form-Describe the items included in the form
6. Convert the items of the form in to variables- quantifying the items and prepare a data frame.
7. Construct the frequency distribution for the variable and present graphically using histogram and frequency curve

Analysis of data

8. Check the data for randomness and Normality using simple run test and histogram.
9. Identify the relevant parameters- they should be matched with problem
10. Obtain the estimates of the parameters, (mean, variance, correlation etc.) confidence interval and test the significance of the estimates for normal data
11. Use Non parametric estimates of the parameters and tests for non-normal data.

Interpretation

12. Write a summary about the findings,

Preparation of project Book

The project should contain the following pages:

Page 1. Title of the project

Page 2. Acknowledgment

Page 3. Index

Page 4-5. **Introduction**- Description about the Domain, problem of the domain,

Page 6-7 Description of Units, Population, and Sample

Page 8 **Data Collection Method**-Explanation about the data collection form,

Page 9- **Data Collection Form**

Page 10-11 **Quantification**-write about nominal, ordinal, interval and ratio scales. Use of these scales to convert the items of the forms into variables.

Page 12-15 **Presentation of Data**- Data frame, frequency distribution, Histogram and frequency curve

Page 16-20 **Statistical Methods**- Explanation about the statistical methods used in data analysis. Point estimation, interval estimation, testing of hypothesis, and non-parametric tests,

Page 21- **Software**-The tools used for data analysis using MS excel

Page 22-26 **Data Analysis**- Analysis using statistical methods mentioned above

Page 27-28. **Report Writing**- writing a detail report about findings and providing suggestions

Page 30. **References**

(Note: Page numbers are flexible and may vary depending on project content.)

Instructions for typing

- Paper Size: A4 (8.5 × 11 inches)
- Font Style: Times New Roman
- Font Size: 14 pt (Headings: 16 pt, Bold)
- Margins: 1 inch on all sides; left margin 1.5 inches for binding
- Line Spacing: Double spacing
- Alignment: Justified (both left and right margins)
- Indentation: First line of each paragraph – 0.5 inch (5 spaces)

- Page Numbering: Top right corner, 0.5 inch from top; include last name before page number (e.g., *Example 2*)

Power Point Presentation

Present the project using PPT with the following guidelines

Number of slides at most 10

Slide 1- Title

Slide 2 Introduction-Domain, Problem Unit, population,

Slide 3. Data collection form

Slide 4. Data frame

Slide 5. Data presentation

Slide 6. Statistical techniques

Slide 7. Data Analysis

Slide 8. Conclusion

Slide 9. References

Slide 10. Vote of thanks

Evaluation of project

For Project Book

Content	Marks
Introduction	5
Questionnaire	5
Data presentation	10
Statistical methods	10
Data analysis	10
Report writing	10
Total	50

For Presentation

Content	Marks
Slide preparation- style, colour, picture colour, font style , animation, etc	10
Communication	10
Confidence	10
Time limit	10
Response for the questions	10
Total	50

Scheme for Theory and Practicals

(Effective from 2024-2025) Scheme SEP

COURSE MODEL

Distribution of Internal Marks for Internal Assessment (Theory)

Internal assessment for 20 marks comprises of performance in the tests, assignment and seminar

Sl.No.	Head	Marks
1	Two internal tests for 5 marks each	10
2	Assignment	05
3	Seminar	05
Total		20

Distribution of Internal Marks for Internal Assessment (Practical)

Internal assessment for 10 marks comprises of performance in the tests, submission of practical record and attendance.

Sl.No.	Head	Marks
1	One mock test	05
2	Internal viva	05
Total		10

**Scheme for Theory Examination: 80 Marks,
B.Sc. Degree Examination, 2026
Scheme SEP
Subject: STATISTICS**

Time: 3 hours

Max.Marks -80

SECTION - A

I Answer any TEN of the following questions

(10 x 3 = 30)

(Answer any 10 out of 12 questions)

Number of question 12, from 1 to 12

SECTION - B

II Answer any FIVE of the following questions

(5x 10 = 50)

(Answer any 5 out of 8 questions)

Number of question 5, from 13 to 20

Scheme for Theory Examination: 80 Marks

Unit	Section A 3 Marks	Section B 10 Marks	Total Marks
Unit - I	3	2	29
Unit - II	3	2	29
Unit - III	3	2	29
Unit - IV	3	2	29
Total	10x3=30 marks (Answer any 10 out of 12 questions)	5x10=50 marks (Answer any 5 out of 8 questions)	116

Scheme for Practical Examination:

Sl.No.	Practical	Marks
1	Answer any FIVE out of EIGHT questions.(07 marks each) (5 x 7)	35
2	Practical record	5
3	Continuous Internal Assessment (CIA)	10
	Total	50
Sl.No.	Practical	Marks