

# SHRI GURU RAM RAI UNIVERSITY

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017  
& recognized by UGC u/s (2f) of UGC Act 1956]

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## SYLLABUS

### FOR


**BACHELOR OF ARTS/ BACHELOR OF SCIENCE (STATISTICS)  
SCHOOL OF HUMANITIES AND SOCIAL SCIENCES**

**Choice Based Credit System**

**Curriculum Framework Under National Education Policy-2020**

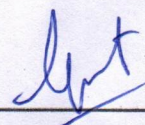
**(w.e.f. 2022-2023 )**

Shri Guru Ram Rai University Patel Nagar, Dehradun, Uttarakhand-248001

  
24/12/2022



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# SHRI GURU RAM RAI UNIVERSITY

PATEL NAGAR, DEHRADUN-248001

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized by UGC u/s (2f) of UGC Act 1956]

## MINUTES OF MEETING

### FOURTH BOARD OF STUDIES MEETING

The fourth meeting of all the members of the Board of Studies in Statistics was held on 31 December 2022 from 11:00 am onwards at Shri Guru Ram Rai University, Pathribagh Campus Dehradun. The following members were present:

1. Dr. Smita Sharma (External Expert) Associate Professor, Department of Statistics, DAV (P.G) College Dehradun, Uttarakhand. **(External Expert)**

*[Signature]*  
31.12.2022

2. Prof. (Dr.) Sarwati Kala (Chairperson) Dean, School of Humanities & Social Science, SGRRU. **(Chairperson)**

*[Signature]*

3. Mr. Manish Kumar (Convener) Coordinator & Assistant Professor, Department of Statistics, School of Humanities & Social Sciences, SGRRU. **(Convener)**

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31.12.2022

4. Dr. Geeta Rawat (Member) Head & Associate Professor, Department of Geography, School of Humanities & Social Sciences, SGRRU. **(Member)**

*[Signature]*  
31/12/22

### PROCEEDINGS AND RESOLUTIONS:

The members of the BOS discussed the agenda item wise, and resolutions were made accordingly

**Agenda No. 1:** To implement of New Education Policy (NEP) 2020 in Statistics Department from Academic Session 2022-2023 for B.A /B.S.c 1<sup>st</sup> and 2<sup>nd</sup> Semester.

**Resolutions:** The external expert and internal expert drafted New Education Policy (NEP) 2020 for B.A/B.S.c 1<sup>st</sup> and 2<sup>nd</sup> Semester with inclusion of Major Core Paper, Minor Elective Paper, Vocational Paper and Open Elective Paper.

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**Agenda No.2:** Implementation of NEP-2020 from the Academic Session 2022-23 & Inclusion and finalization of Program outcomes (POs), Program specific outcomes (PSOs), Course outcomes (COs) of B.A/B.S.c (Statistics 1<sup>st</sup> and 2<sup>nd</sup> semester as per NEP 2020 and CBCS)

**Resolution:** It was recommended by the members of the board that from the academic session 2022-23 implementing NEP in the UG course and course outcomes should be included in the curriculum. The Program outcomes (POs), Program specific outcomes (PSOs), Course outcomes (COs) for B.A/B.S.c Statistics were discussed in detail with the honorable members and all the members resolved to approve the same from the honorable external expert.

**Agenda No. 3:** To introduce Statistical Methods as an Open Elective Course in Statistics for University students.

**Resolutions:** The board unanimously decided to introduce the Statistical Methods as an open elective course for the academic session 2022-23. The course objectives and outcomes discuss with in the honorable members and experts.

**Agenda No. 4:** Allotment and description of course code and credits to B.A/B.S.c Statistics 1<sup>st</sup> and 2<sup>nd</sup> semester.

**Resolution:** The course codes in the B.A/B.S.c Statistics 1<sup>st</sup> and 2<sup>nd</sup> semester course programme were allotted as per **Uttarakhand State Govt. Guidelines** and University norms and all the members resolved to approve the same. The credit system in the UG Course program was approved as per UGC norms/NEP guidelines. The theory lectures were of 4 credits each. Each lab course was of 2 credits for B.A/B.S.c Statistics in 1<sup>st</sup> and 2<sup>nd</sup> semester where the teaching hours of lab course of each credit were of 2 hours.

**Agenda No. 5:** Medium of instruction, question paper pattern, medium of examination, and duration of examination, allotment of marks in internal and external exams.

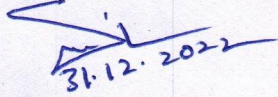
**Resolution:**

- ❖ The members were of the view and recommended that the medium of instruction would be English medium/Hindi medium for UG Course program as per SGRR University norms.
- ❖ It was resolved by all the members that the duration of the End term examination would be as per the guidelines issued by the Board of Examination SGRR University from time to time including the duration of Lab Course examinations.
- ❖ Each paper would be of 100 marks. The distribution of mid-term and end term examination marks will be as per guidelines issued by the Board of Examination SGRR University from time to time.

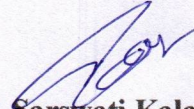
**Agenda No. 6:** Evaluation pattern and distribution of marks.

**Resolutions:** All the members of BOS were of the view that the evaluation pattern and distribution of marks should be as per with other subjects and should follow university norms to bring uniformity.

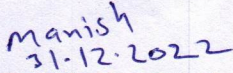
The meeting ended with the vote of thanks.

  
31.12.2022

**Dr. Smita Sharma (External Expert)**  
Associate Professor  
Department of Statistics  
D.A.V (P.G) College  
Dehradun, Uttarakhand.



**Prof. Sarswati Kala (Chairperson)**  
Dean  
School of Humanities & Social Sciences  
Shri Guru Ram Rai University  
Dehradun, Uttarakhand

  
31.12.2022

**Mr. Manish Kumar (Convener)**  
Coordinator & Assistant Professor  
Department of Statistics  
School of Humanities & Social Sciences  
Shri Guru Ram Rai University  
Dehradun, Uttarakhand



**Dr. Geeta Rawat (Member)**  
Head & Associate Professor  
Department of Geography  
School of Humanities & Social Sciences  
Shri Guru Ram Rai University  
Dehradun, Uttarakhand

**Bachelor of Arts/ Bachelor of Science  
OUTCOME BASED EDUCATION  
Program outcome (POs)**

Students will be able to:

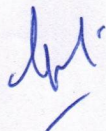
<b>PO 1</b>	Acquire knowledge of the discipline and conduct proper academic in various areas of discipline.
<b>PO2</b>	Recognize the social structures in our society.
<b>PO3</b>	Communicate effectively in context which one is operating and develop soft skills
<b>PO4</b>	Leader in teams in multidisciplinary courses and engage in initiatives that encourage growth for all.
<b>PO5</b>	Develop awareness of issues among students
<b>PO6</b>	Recognize and respect different value systems by following the norms of academic integrity.
<b>PO7</b>	Explain awareness of local, regional, national and global needs.
<b>PO8</b>	Work on career enhancement by adapting to professional and social needs engaged in lifelong learning.
<b>PO9</b>	Exhibit capability as lifelong learners adapting new technologies, modern concepts and skills for sustainable development.
<b>PO10</b>	Imbibe qualities of good citizenship, morality and ethics so as to work for the betterment of mankind
<b>PO11</b>	Cultivate a broad array of interdisciplinary knowledge and skills integrating concepts of humanities and social sciences.
<b>PO12</b>	Able to apply critical thinking, creativity, skills, cultural sensitivity, and humanity to to create awareness within society for problem –solving and interpretation..

**Program Specific Outcome (PSOs)**

<b>PSO 1</b>	To familiarize students with basic to high- level statistical concepts.
<b>PSO2</b>	To Apply the concepts of statistics, Probability theory, Time Series, Designs of Experiment, survey sampling etc. in real life problems.
<b>PSO3</b>	To update students with various statistical tools that aid in statistical theory.
<b>PSO4</b>	Practical exercises done will enable students to analyze and interpret data and also to draw valid conclusions. This will enable students to face real time applications



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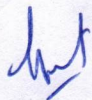



**Eligibility for admission:**

Any candidate who has passed the Plus Two of the Higher Secondary Board of Examinations in any state recognized as equivalent to the Plus Two of the Higher Secondary Board in with not less than 40%/45%-marks in aggregate is eligible for admission, However, SC/ST, OBC and other eligible communities shall be given relaxation as per University rules.



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## STUDY & EVALUATION SCHEME

### SEM-I

S. N.	Course Category	Subject Code	Subject Title	Periods per week			Evaluation Scheme				Subject Total
				L	T	P	Seasonal			SEE	
							Credit	CT	TA		
1	Theory	STAMC 101	Descriptive Statistics & Probability Theory	4	-	-	4	25	05	70	100
2	Practical	STAMC 102	Lab course based on MC101	-	-	2	2	25	05	70	100
3	Theory	STAME 101	Descriptive Statistics	4	-	-	4	25	05	70	100
4	Practical	STAME 102	Lab course based on ME101	-	-	2	2	25	05	70	100
5	Theory	STAOE 101	Statistical Methods	2	-	-	2	25	05	70	100
6	Theory	STAVC 101	Network Analysis & Theory of Sequencing	3	-	-	3	25	05	70	100
							17				600

### SEM-II

S. N.	Course Category	Subject Code	Subject Title	Periods per week			Evaluation Scheme				Subject Total
				L	T	P	Seasonal			SEE	
							Credit	CT	TA		
1	Theory	STAMC 201	Probability Distribution	4	-	-	4	25	05	70	100
2	Practical	STAMC 202	Lab course based on MC201	-	-	2	2	25	05	70	100
3	Theory	STAME 201	Probability Theory	4	-	-	4	25	05	70	100
4	Practical	STAME 202	Lab course based on ME201	-	-	2	2	25	05	70	100
5	Theory	STAOE 201	Statistical Methods	2	-	-	2	25	05	70	100
6	Theory	STAVC 201	Understand Probability & Statistics through Practical's	3	-	-	3	25	05	70	100
							17				600

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**Programme Name: B.A/B.Sc.**

<b>Course code</b> : STAMC101				
<b>Course Name</b> : Descriptive Statistics & Probability Theory				
<b>Semester /Year</b> : I Sem/ Ist Year				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	4	0	0	4

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives:**

**The objectives of this course are:**

1. To summarize the data and to obtain its salient features from the mass of original data
2. To understand the basic fundamental processes and core Statistics concepts and their applications in everyday life.
3. To understand the concepts of probability and its applications
4. To understand the concept of random variables and law of probability.

**Course Contents**

**Unit 1**

**Introduction** : Nature of Statistics ,Uses of Statistics, Statistics in relation to other disciplines, Concepts of a statistical population and sample from a population, quantitative and qualitative data, discrete and continuous data, graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods)

**Unit 2**

**Measures of Central tendency:** Mean, Median, Mode, Geometric Mean and Harmonic Mean; their properties **Measures of Dispersion:** Range, Quartile Deviation, Mean Deviation, Standard Deviation and their properties, Coefficient of variation, Moments, Skewness and Kurtosis.

**Unit 3**

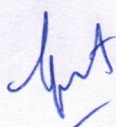
**Bivariate data:** Scatter diagram, principle of least-square and fitting of polynomials and exponential curves. Correlation and regression. Karl Pearson coefficient of correlation, Lines of regression.

**Unit- 4**

**Probability:** Random experiment, sample point and sample space, event, algebra of events, Definition of Probability- classical, relative frequency and axiomatic approaches to probability,



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merits and demerits of these approaches (only general ideas to be given). Theorem on probability conditional probability Independent events Bayes' theorem and its applications.

**Text Books:**

1. Arun Kumar and Alka Chaudhary 2010. Descriptive Statistics, Krishna Prakash, 11, Shivaji Road, Meerut.
2. S.C.Gupta and V.K. Kapoor. 2007. Fundamentals of Mathematical Statistics (11<sup>th</sup> Ed.) Sultan Chand and Sons.

**Reference Books:**

1. R.V.Hogg, A.T.Craig and J.W.Mckean. 2005. Introduction to Mathematical Statistics (6<sup>th</sup> Ed.). Pearson Education,
2. A.M. Mood, F.A. Graybill and D.C.Boes. 2007. Introduction to the Theory of Statistics (3<sup>rd</sup> Ed.). Tata McGraw Hill Publication.

**Course outcomes (COs):**

Upon successful completion of the course a student will be able to:

CO1	Identify the fundamental of descriptive statistics and probability theory.
CO2	Explain the concept of descriptive statistics
CO3	Apply the knowledge of descriptive statistics in the analysis of data.
CO4	Analysis the result of descriptive statistics
CO5	Evaluate the result of descriptive statistics
CO6	Develop the skill and ability to correctly analysis the data.

**CO-PO-PSO Mapping**

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO1 2	PS O1	PSO 2	PSO 3	PS O4
CO1	3	1	1	-	-	1	2	1	1	1	1	1	3	2	1	-
CO2	3	2	1	-	-	1	1	-	1	1	1	1	2	1	1	-
CO3	3	2	2	1	1	1	2	1	1	2	2	3	3	2	2	1
CO4	2	3	2	1	-	1	2		1	1	2	2	3	2	1	1
CO5	3	3	3	-	-	1	2	1	2	1	-	-	2	2	1	1
CO6	2	2	2	2	1	2	2	2	2	2	2	3	2	3	2	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

**Examination Scheme:**

Components	I <sup>st</sup> internal (Assignment)	II <sup>nd</sup> Internal (Written Exam )	External (ESE)
Weightage (%)	15	15	70

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**Programme Name: B.A/B.Sc.**

<b>Course code</b> : STAME101				
<b>Course Name</b> : Descriptive Statistics				
<b>Semester /Year</b> : I Sem/ Ist Year				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	4	0	0	4

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives:**

**The objectives of this course are:**

1. To summarize the data and to obtain its salient features from the mass of original data
2. To understand the basic fundamental processes and core Statistics concepts and their applications in everyday life.
3. To understand the concepts of probability and its applications
4. To understand the concept of random variables and law of probability.

**Course Contents**

**Unit 1**

**Introduction :** Nature of Statistics ,Uses of Statistics, Statistics in relation to other disciplines, Concepts of a statistical population and sample from a population, quantitative and qualitative data, discrete and continuous data.

**Unit 2**

**Graphical representation of a frequency distribution:** Histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusivemethods).

**Unit 3**

**Measures of Central tendency:** Mean, Median, Mode, Geometric Mean and Harmonic Mean; their properties Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation and their properties, Coefficient of variation, Moments, Skewness and Kurtosis.

**Unit- 4**

**Correlation and regression.** Karl Pearson coefficient of correlation, Lines of regression. Properties of correlation and regression.

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**Text Books:**

1. Arun Kumar and Alka Chaudhary 2010. Descriptive Statistics, Krishna Prakash, 11, Shivaji Road, Meerut.
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1. R. V. Hogg, A. T. Craig and J. W. McKean. 2005. Introduction to Mathematical Statistics (6<sup>th</sup> Ed.). Pearson Education,
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**Course outcomes (COs):**

Upon successful completion of the course a student will be able to:

CO1	Identify the fundamental of descriptive statistics and probability theory.
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**CO-PO-PSO Mapping**

Course	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO1 2	PS O1	PSO 2	PSO 3	PSO 4
CO1	3	1	1	-	-	1	2	1	1	1	1	1	3	2	1	-
CO2	3	2	1	-	-	1	1	-	1	1	1	1	2	1	1	-
CO3	3	2	2	1	1	1	2	1	1	2	2	3	3	2	2	1
CO4	2	3	2	1	-	1	2		1	1	2	2	3	2	1	1
CO5	3	3	3	-	-	1	2	1	2	1	-	-	2	2	1	1
CO6	2	2	2	2	1	2	2	2	2	2	2	3	2	3	2	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

**Examination Scheme:**

Components	I <sup>st</sup> internal (Assignment)	II <sup>nd</sup> Internal (Written Exam )	External (ESE)
Weightage (%)	15	15	70

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**Programme Name: B.A/B.Sc.**

<b>Course code</b>	: STAMC102 / STAME102			
<b>Course Name</b>	: Lab course based on C101			
<b>Semester /Year</b>	: Ist sem / Ist Year			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	2

**L - Lecture T – Tutorial P – Practical C – Credit**

**Course Objectives:**

**The objectives of this course are:**

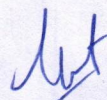
1. To analyse the problem and its solution.
2. To study the average and measures for analysis it.
3. To enrich students' understanding of the influence of dispersion on average
4. To assess the effect of knowledge of the result on the performance of individual for analysis the data.

**Course Contents**

1. Problems based on graphical representation of data: Histograms (equal class intervals and unequal class intervals), Frequency polygon, Ogive curve.
2. Problems based on measures of central tendency and measures of dispersion.
3. Problems based on combined mean and variance and coefficient of variation.
4. Problems based on moments, relationships between moments about origin and central moments.
5. Problems based on Skewness and kurtosis.
6. Pearson correlation coefficient.
7. Lines of regression and regression coefficients.
8. Spearman rank correlation with or without ties.
9. Fitting of polynomials and exponential curves.



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**Text Books:**

1. A.M.Goon, M.K.Gupta and B.Das Gupta. 2005. Fundamentals of Statistics, Vol.I, 8<sup>th</sup>Ed., World Press, Kolkatta.
2. S.C Gupta and V.K.Kapoor. 2007. Fundamentals of Mathematical Statistics, 11<sup>th</sup>Ed., Sultan Chand and Sons.

**Reference Books:**

1. V.Hogg, A.T.Craig and J.W.Mckean . 2005. Introduction to Mathematical Statistics (6th Ed.). Pearson Education.
- 2 A.M.Mood F.A.Graybill and D.C.Boes. 2007. Introduction to the Theory of Statistics (3<sup>rd</sup> Ed.). Tata McGraw Hill Publication.

**Course outcomes (COs):**

Upon successful completion of the course a student will be able to:

CO1	Remember the skill regarding analysis of data.
CO2	Apply the concepts of statistics through experiments.
CO3	Apply suitable technique for analysis data
CO4	Differentiate Quantitative and Qualitative data through practicals.
CO5	Evaluate the concepts of statistics through practical's
CO6	Develop basic tools and techniques for performing experiment

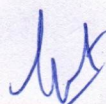
**CO-PO-PSO Mapping**

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PS O4	
CO1	1	1	2	1	1	1	2	-	1	1	1	1	1	2	1	3	2
CO2	1	1	2	1	1	1	1	-	1	1	1	1	1	-	3	2	
CO3	1	2	3	1	1	1	2	1	2	1	2	3	1	1	2	3	2
CO4	1	1	2	1	1	1	2	-	1	1	1	2	3	-	2	3	
CO5	1	1	2	1	1	1	2	1	1	1	1	-	2	-	2	2	
CO6	3	2	3	2	1	2	2	1	2	1	2	3	2	-	3	3	

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated



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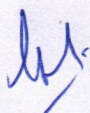


**Examination Scheme:**

<b>Components</b>	<b>I<sup>st</sup> internal (Assignment)</b>	<b>II<sup>nd</sup> Internal (Written Exam )</b>	<b>External (ESE)</b>
<b>Weightage (%)</b>	<b>15</b>	<b>15</b>	<b>70</b>



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**Programme Name: B.A/B.Sc.**

<b>Course code</b> : STAOE101				
<b>Course Name</b> : Statistical Methods				
<b>Semester /Year</b> : I Sem/ Ist Year				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	2	0	0	2

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives:**

**The objectives of this course are:**

1. To summarize the data and to obtain its salient features from the mass of original data
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3. To understand the concepts of probability and its applications
4. To understand the concept of random variables and law of probability.

**Course Contents**

**Unit 1**

**Introduction** : Nature of Statistics ,Uses of Statistics, Statistics in relation to other disciplines, Concepts of a statistical population and sample from a population, quantitative and qualitative data, discrete and continuous data, Graphical representation of a frequency distribution: Histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods)

**Unit 2**



**Measures of Central tendency:** Mean, Median, Mode, Geometric Mean and Harmonic Mean; their properties Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation and their properties, Coefficient of variation, Moments, Skewness and Kurtosis.

**Unit 3**

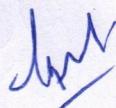
**Correlation and regression.** Karl Pearson coefficient of correlation, Lines of regression. Properties of correlation and regression.

**Unit 4**

**Estimation:** Parameter space, sample space, point estimation, requirement of a good estimator, Interval estimation. Testing of Hypothesis: Statistical Hypothesis, simple and composite hypothesis null and alternative hypotheses. Critical region. Two kind of errors, Tests of significance based of Chi-square, t and F test.



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1. Arun Kumar and Alka Chaudhary 2010. Descriptive Statistics, Krishna Prakash, 11, Shivaji Road, Meerut.
2. Goon, A.M., Gupta, K. and Dasgupta, B. (1991): Fundamentals of Statistics, Vol I, World Press, Calcutta

**Reference Books:**

1. R.V.Hogg, A.T.Craig and J.W.Mckean. 2005. Introduction to Mathematical Statistics (6th Ed.). Pearson Education,
2. A.M. Mood, F.A. Graybill and D.C. Boes. 2007. Introduction to the Theory of Statistics (3<sup>rd</sup> Ed.). Tata McGraw Hill Publication.

**Course outcomes (COs):**

**Upon successful completion of the course a student will be able to:**

CO1	Identify the fundamental of descriptive statistics and probability theory.
CO2	Explain the concept of descriptive statistics
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**CO-PO-PSO Mapping**

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CO2	3	2	1	-	-	1	1	-	1	1	1	1	2	1	1	-
CO3	3	2	2	1	1	1	2	1	1	2	2	3	3	2	2	1
CO4	2	3	2	1	-	1	2		1	1	2	2	3	2	1	1
CO5	3	3	3	-	-	1	2	1	2	1	-	-	2	2	1	-
CO6	2	2	2	2	1	2	2	2	2	2	2	3	2	3	2	-

**3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated**

**Examination Scheme:**

Components	I <sup>st</sup> internal (Assignment)	II <sup>nd</sup> Internal (Written Exam )	External (ESE)
Weightage (%)	15	15	70

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**Programme Name: B.A/B.Sc.**

<b>Course code</b>	: STAVC101			
<b>Course Name</b>	: Network Analysis & Theory of Sequencing			
<b>Semester /Year</b>	: I sem / I <sup>st</sup> Year			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

**L - Lecture T – Tutorial P – Practical C – Credit**

**Course Objectives:**

**The objectives of this course are:**

1. To understand the concepts and importance of theory of sequencing
2. To comprehend the process and steps of job sequencing.
3. To learn various strategies to enhance effective decision making in travelling salesman problem.

**Course Contents**

**Unit 1**

**Flows in networks:** Maximal flow, Shortest path and travelling salesman problem, Construction of minimal spanning tree and its applications.

**Unit 2**

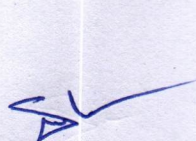
**Project management:** Project management through PERT/CPM, Updating of PERT Charts .Project Crashing,

**Unit 3**

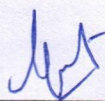
**Sequencing Problems:** Processing n jobs through two/three machines. General n/m jobs problem.

**Unit 4**

**Introduction Salesman problem:** Problems based on travelling, salesman problem.



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**Texts Book**

1. Sharma, S.D. Operation Research, Pragati Prakashan Meerut.
2. R.K. Ahuja T. L. Magnanti, B. Orlin. 1993. Network Flows-Theory, Algorithm and Applications, Prentice Hall,NJ,
3. J.D. Wist, F.K. Levy. (2007). A Management Guide to PERT/CPM (2nd Ed.). PHI.

**Reference Books**

1. G.Hadley. 1964. Non linear and Dynamic Programming, Addison-Wesley.
2. A. Ravindran, D.T. Phillips and James J. Solberg.2005. Operations Research-Principles and Practice. John Wiley and Sons.

**Course outcomes (COs):**

**Upon successful completion of the course a student will be able to:**

<b>CO1</b>	Identify the fundamentals of network Analysis.
<b>CO2</b>	Explain the concepts of theory of sequencing.
<b>CO3</b>	Apply the various strategies for solving travelling salesman problem.
<b>CO4</b>	Analyse major issues of network analysis.
<b>CO5</b>	Evaluate the importance of network analysis & theory of sequencing.
<b>CO6</b>	Develop the ability and skill of effective network analysis .

**CO-PO-PSO Mapping**

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO1 2	PS O1	PSO 2	PSO 3	PSO 4
CO1	3	1	1	1	1	1	2	1	1	1	1	1	3	2	-	-
CO2	3	2	1	-	1	1	1	-	1	1	1	1	2	1	-	-
CO3	3	2	2	1	1	1	2	1	1	2	2	3	3	2	1	-
CO4	2	3	2	1	1	1	2	-	1	1	2	2	3	2	-	-
CO5	3	3	2	1	1	1	2	1	2	1	-	-	2	2	-	-
CO6	2	2	2	2	1	1	2	2	2	2	2	3	2	3	1	-

**3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated**

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**Examination Scheme:**

<b>Components</b>	<b>I<sup>st</sup> internal (Assignment)</b>	<b>II<sup>nd</sup> Internal (Written Exam)</b>	<b>External (ESE)</b>
<b>Weightage (%)</b>	<b>15</b>	<b>15</b>	<b>70</b>

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**Programme Name: B.A/B.Sc.**

<b>Course code</b>	: STAMC201				
<b>Course Name</b>	: Probability Distribution				
<b>Semester /Year</b>	: II Sem/ Ist Year				
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		4	0	0	4

**L - Lecture T – Tutorial P – Practical C – Credit**

**Course Objectives:**

**The objectives of this course are:**

1. To understand the basic probability, concepts, theories, and will be able to apply this knowledge to day to day life.
2. To gain a reasonable knowledge of the concepts like expectation, probability distribution.
3. To learn about the fundamental principles and processes of random variables, its types and properties.
4. To differentiate between discrete probability distributions with their properties and Continuous probability distributions with their properties.

**Course Contents**

**Unit 1**

**Random variables:** Discrete and continuous random variables p.m.f, p.d.f. and c.d.f., illustrations and properties of random variables, joint, marginal and conditional p.m.f, p.d.f. and c.d.f., independence of variables, bivariate transformations with illustrations.

**Unit 2**

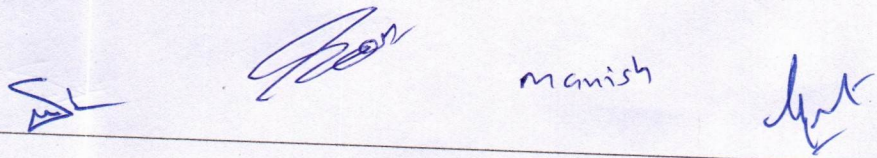
**Mathematical Expectation:** Generating Functions: Expectation of single and bivariate random variables and its properties.

**Unit 3**

**Moments and Cumulants, Moment generating function:** Cumulant generating function and characteristic function. Uniqueness and inversion theorems (without proof) along with applications, Conditional expectations.

**Unit 4**

**Distributions :** Binomial, Poisson, Geometric, negative binomial, Hyper geometric Normal, Uniform, Exponential, Beta and Gama distributions Statement and application of Chebychev's inequality, WLLN and SLLN, Central limit theorem (CLT). Fitting of various distribution

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**Text Books:**

1. Arun Kumar and Alka Chaudhary Probability Theory 2008 , Krishna Prakashan Media Pvt Ltd.
2. A.M .Goon, M.K.Gupta and B.Dasgupta (2003): An outline of Statistical Theory (Vol.I),4thEd., World Press, Kolkata.
3. S.C. Gupta and V.K. Kapoor (2007): Fundamentals of Mathematical Statistics 11thEd , Sultan Chand and Sons.

**Reference Book:**

1. R.V. Hogg, A.T. Craig, and J.W. McKean. (2005). Introduction to Mathematical Statistics, (6<sup>th</sup> Ed) Pearson Education.
2. A.M. Mood, F.A. Graybill and D.C. Boes. (2007). Introduction to the Theory of Statistics (3<sup>rd</sup>Ed.) Tata McGraw Hill Publication.

**Course outcomes (COs):**

Upon successful completion of the course a student will be able to:

CO1	Recognize the key probability concepts.
CO2	Explain the basic of probability and its distribution
CO3	Apply basic concepts of probability to self-analysis various probability distribution.
CO4	Analyse various techniques for fitting the distribution
CO5	Evaluate the probability concept and theories.
CO6	Develop critical analytical abilities.

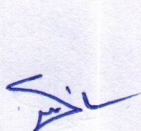
**CO-PO-PSO Mapping**

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO12	PSO1	PSO 2	PSO 3	PSO 4
CO1	3	1	1	-	-	1	2	1	1	1	1	1	3	2	1	-
CO2	3	2	1	-	-	1	1	-	1	1	1	1	2	1	1	-
CO3	3	2	2	1	1	1	2	1	1	2	2	3	3	2	2	1
CO4	2	3	2	1	-	1	2		1	1	2	2	3	2	1	1
CO5	3	3	3	-	-	1	2	1	2	1	-	-	2	2	1	-
CO6	2	2	2	2	1	2	2	2	2	2	2	3	2	3	2	-

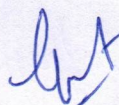
3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlate

**Examination Scheme:**

Components	I <sup>st</sup> internal (Assignment)	II <sup>nd</sup> Internal (Written Exam)	External (ESE)
Weightage(%)	15	15	70




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**Programme Name: B.A/B.Sc.**

<b>Course code</b>	: STAME201
<b>Course Name</b>	: Bivariate Probability Distribution
<b>Semester /Year</b>	: II Sem/ Ist Year
	<b>L T P C</b>
	4 0 0 4

**L - Lecture T – Tutorial P – Practical C – Credit**

**Course Objectives:**

**The objectives of this course are:**

- 1.To understand the basic probability, concepts, theories, and will be able to apply this knowledge to day to day life.
- 2.To gain a reasonable knowledge of the concepts like expectation, probability distribution.
- 3.To learn about the fundamental principles and processes of random variables, its types and properties.
4. To differentiate between discrete probability distributions with their properties and Continuous probability distributions with their properties.

**Course Contents**

**Unit 1**

**Random variables:** Discrete and continuous random variables p.m.f, p.d.f. and c.d.f., joint, marginal and conditional distribution, independence of variables, bivariate transformations with illustrations.

**Unit 2**

**Mathematical Expectation:** Generating Functions: Expectation of single and bivariate random variables and its properties.

**Unit 3**

**Moments and Cumulants, Moment generating function:** Cumulant generating function and characteristic function. Uniqueness and inversion theorems (without proof) along with applications, Conditional expectations.

**Unit 4**

**Distributions :** Binomial, Poisson, Geometric, negative binomial, Hypergeometric Normal, Uniform, Exponential, Beta and Gama distributions Statement and application of Chebychev's

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inequality, WLLN and SLLN, Central limit theorem (CLT). Fitting of various distribution

**Text Books:**

1. Arun Kumar and Alka Chaudhary Probability Theory 2008 , Krishna Prakashan Media Pvt Ltd.
2. A.M. Goon, M.K. Gupta and B. Dasgupta (2003): An outline of Statistical Theory (Vol.I), 4th Ed., World Press, Kolkata.
3. S.C. Gupta and V.K. Kapoor (2007): Fundamentals of Mathematical Statistics 11th Ed , Sultan Chand and Sons.

**Reference Book:**

1. R.V. Hogg, A.T. Craig, and J.W. McKean. (2005). Introduction to Mathematical Statistics, (6<sup>th</sup> Ed) Pearson Education.
2. A.M. Mood, F.A. Graybill and D.C. Boes. (2007). Introduction to the Theory of Statistics (3<sup>rd</sup> Ed.) Tata McGraw Hill Publication.

**Course outcomes (COs):**

**Upon successful completion of the course a student will be able to:**

CO1	Recognize the key probability concepts.
CO2	Explain the basic of probability and its distribution
CO3	Apply basic concepts of probability to self-analysis various probability distribution.
CO4	Analyse various techniques for fitting the distribution
CO5	Evaluate the probability concept and theories.
CO6	Develop critical analytical abilities.

**CO-PO-PSO Mapping**

Course	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO1 2	PS O1	PS O2	PSO 3	PSO 4
CO1	3	1	1	-	-	1	2	1	1	1	1	1	3	2	1	-
CO2	3	2	1	-	-	1	1	-	1	1	1	1	2	1	1	-
CO3	3	2	2	1	1	1	2	1	1	2	2	3	3	2	2	1
CO4	2	3	2	1	-	1	2		1	1	2	2	3	2	1	1
CO5	3	3	3	-	-	1	2	1	2	1	-	-	2	2	1	-
CO6	2	2	2	2	1	2	2	2	2	2	2	3	2	3	2	-

**3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated**

**Examination Scheme:**

Components	I <sup>st</sup> internal (Assignment)	II <sup>nd</sup> Internal (Written Exam)	External (ESE)
Weightage(%)	15	15	70

*[Handwritten signatures and marks]*

**Programme Name: B.A./B.Sc.**

<b>Course code</b> :	STAMC202 / STAME202			
<b>Course Name</b> :	Lab course based on MC101 / ME102			
<b>Semester /Year</b> :	II sem / Ist Year			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	2

**L - Lecture T – Tutorial P – Practical C – Credit**

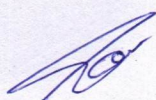
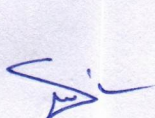
**Course Objectives:**

**The objectives of this course are:**

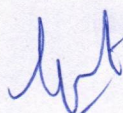
1. To analyse the distribution and its solution.
2. To study the various distribution and measures for analysis.
3. To enrich students' understanding of the influence of distribution in day to day life.
4. To assess the effect of knowledge of the result on the performance of individual for analysis the data.

**Course Contents**

1. Fitting of binomial distributions computing mean and variance
2. Fitting of binomial distributions computing mean and variance
3. Fitting of Poisson distributions for given  $\lambda$  and after estimating mean.
4. Fitting of negative binomial distribution
5. Fitting of Suitable distribution
6. Application Problems based on Binomial distribution
7. Application problems based on Poisson distribution
8. Application problems based on negative binomial distribution
9. Problems based on Area property of normal distribution
10. Fitting of normal distribution when parameters are given/ not given.



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**Text Books:**

1. A.M .Goon, M.K.Gupta and B.Dasgupta (2003): An outline of Statistical Theory (Vol.I),4thEd., World Press, Kolkata.
2. S.C. Gupta and V.K. Kapoor (2007): Fundamentals of Mathematical Statistics 11thEd , Sultan Chand and Sons.

**Reference Books:**

1. R.V. Hogg, A.T. Craig, and J.W. McKean. (2005). Introduction to Mathematical Statistics, (6th Ed) Pearson Education.
2. A.M. Mood, F.A. Graybill and D.C. Boes. (2007). Introduction to the Theory of Statistics (3rdEd.) Tata McGraw Hill Publication.
3. V.K. Rohtagi and A.K. Md. E. Saleh. (2009). An Introduction to Probability and Statistics, (2ndEd.) JohnWiley andSons.
4. S.A.Ross (2007). Introduction to Probability Models ( 9thEd. ). Academic Press.

**Course outcomes (COs):**

Upon successful completion of the course a student will be able to:

CO1	Remember the skill regarding analysis of data.
CO2	Apply the concepts of statistics through experiments.
CO3	Apply suitable technique for analysis data
CO4	Differentiate Quantitative and Qualitative data through practical's.
CO5	Evaluate the concepts of statistics through practical's
CO6	Develop basic tools and techniques for performing experiment

**CO-PO-PSO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	1	1	1	2	-	1	1	1	1	1	-	3	2
CO2	1	1	2	1	1	1	1	-	1	1	1	1	2	1	3	2
CO3	1	2	3	1	1	1	2	1	2	1	2	3	1	1	2	3
CO4	1	1	2	1	1	1	2	-	1	1	1	2	3	-	2	3
CO5	1	1	2	1	1	1	2	1	1	1	1	-	2	-	2	2
CO6	3	2	3	2	1	2	2	1	2	1	2	3	2	-	3	3

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

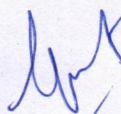
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**Examination Scheme:**

<b>Components</b>	<b>I<sup>st</sup> internal (Assignment)</b>	<b>II<sup>nd</sup> Internal (Written Exam )</b>	<b>External (ESE)</b>
<b>Weightage (%)</b>	<b>15</b>	<b>15</b>	<b>70</b>



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**Programme Name: B.A/B.Sc.**

<b>Course code</b> : STAOE201				
<b>Course Name</b> : Statistical Methods				
<b>Semester /Year</b> : II Sem/ Ist Year				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	2	0	0	2

L - Lecture T – Tutorial P – Practical C – Credit

**Course Objectives:**

**The objectives of this course are:**

1. To understand the basics concept of statistical inference
2. To drawing inference about the unknown population parameters based on random sample.
3. To gain understanding of estimation about the population using testing of hypothesis.
4. To understand the important tests which are using to draw valid conclusion

**Course Contents**

**Unit 1**

**Introduction** : Nature of Statistics ,Uses of Statistics, Statistics in relation to other disciplines, Concepts of a statistical population and sample from a population, quantitative and qualitative data, discrete and continuous data, Graphical representation of a frequency distribution.

**Unit 2**

**Measures of Central tendency:** Mean, Median, Mode, Geometric Mean and Harmonic Mean; their properties **Measures of Dispersion:** Range, Quartile Deviation, Mean Deviation, Standard Deviation and their properties, Coefficient of variation, Moments, Skewness and Kurtosis.

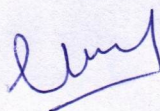
**Unit- 3**

**Correlation and regression.** Karl Pearson coefficient of correlation, Lines of regression. Properties of correlation and regression.

**Unit 4**

**Estimation:** Parameter space, sample space, point estimation, requirement of a good estimator, Interval estimation. **Testing of Hypothesis:** Statistical Hypothesis, simple and composite hypothesis null and alternative hypotheses. Critical region. Two kind of errors, Tests of significance based of Chi-square, t and F test

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**Text Books:**

1. Arun Kumar and Alka Chaudhary 2010. Statistical Inference, Krishna Prakash, 11, Shivaji Road, Meerut.
2. S.C.Gupta and V.K. Kapoor. 2007. Fundamentals of Mathematical Statistics (11<sup>th</sup> Ed.) Sultan Chand and Sons.

**Reference Books:**

1. R.V.Hogg,A.T.CraigandJ.W.Mckean. 2005. Introduction to Mathematical Statistics (6<sup>th</sup>Ed.). Pearson Education,
2. A.M. Mood,F.A. Graybill and D.C.Boes. 2007. Introduction to the Theory of Statistics (3<sup>rd</sup> Ed.). Tata McGraw Hill Publication.

**Course outcomes (COs):**

**Upon successful completion of the course a student will be able to:**

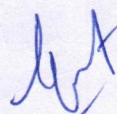
<b>CO1</b>	Identify fundamental concepts of Point estimation. Properties of estimators and mean square error, Minimum variance unbiased estimators, Rao
<b>CO2</b>	Recognize the Large sample test, Use of central limit theorem to obtain large sample tests for binomial proportions and means of populations, etc., Related confidence intervals.
<b>CO3</b>	Apply the different methods of estimations. Estimating point estimators using different methods. Construction of confidence interval for parameters of different distributions
<b>CO4</b>	Analysis practical utility of various test of significance based on t, F and chi square test.
<b>CO5</b>	Evaluate the various tests based on hypothesis.
<b>CO6</b>	Develop an understanding of the hypothesis in relation to the social world

**CO-PO-PSO Mapping**

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO1 2	PS O1	PSO 2	PSO 3	PSO 4
CO1	3	1	1	-	-	1	2	1	1	1	1	1	3	2	1	-
CO2	3	2	1	-	-	1	1	-	1	1	1	1	2	1	1	-
CO3	3	2	2	1	1	1	2	1	1	2	2	3	3	2	2	1
CO4	2	3	2	1	-	1	2		1	1	2	2	3	2	1	1
CO5	3	3	3	-	-	1	2	1	2	1	-	-	2	2	1	-
CO6	2	2	2	2	1	2	2	2	2	2	2	3	2	3	2	-


**3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated**

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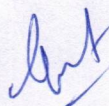


**Examination Scheme:**

<b>Components</b>	<b>I<sup>st</sup> internal (Assignment)</b>	<b>II<sup>nd</sup> Internal (Written Exam )</b>	<b>External (ESE)</b>
<b>Weightage (%)</b>	<b>15</b>	<b>15</b>	<b>70</b>

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**Programme Name: B.A./B.Sc.**

<b>Course code</b>	: STAVC201			
<b>Course Name</b>	: Understanding Probability and Statistics Through Practical's			
<b>Semester /Year</b>	: II <sup>nd</sup> sem / I <sup>st</sup> Year			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

**L - Lecture T – Tutorial P – Practical C – Credit**

**Course Objectives:**

**The objectives of this course are:**

1. To Learn the concepts and analysis of data in excel sheet
2. To analysis various fitting of data by using excel sheet.
3. To analysis correlation, tests based on t, F and Chi square test on excel sheet.

**Course Contents**

**Unit 1**

Fitting of Binomial, Poisson, Negative Binomial, Normal Distributions

**Unit 2**

Applications of Chi-square, t and F Distributions.

**Unit 3**

Calculation of correlation coefficient, Rank Correlation

**Unit 4**

Fitting of polynomials and regression curves,  
Selecting a simple random samplings random number tables.

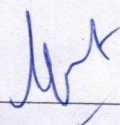
**Text Books :**

1. Robert V.Hogg, Joseph W.McKean and Allen T.Craig. 2007. Introduction to Mathematical Statistics, Pearson Education, Asia.
2. Irwin Miller and Marylees Miller, John E. Friends. 2006. Mathematical Statistics with Applications (7thEd.)Pearson Education, Asia.

**Reference Book :**

1. Sheldon Ross. 2007. Introduction to Probability Models, 9th Ed., Academic Press, Indian Reprint

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**Course outcomes (COs):**

Upon successful completion of the course a student will be able to:

CO1	Identify the basic concepts of statistics and probability through practicals on a computer by using excel
CO2	Explain the concept of Fitting of Binomial, Poisson, Negative Binomial and normal distribution through practicals on a computer by using excel.
CO3	Apply Chi- Square t and F distribution through practicals on excel
CO4	Analyse correlation coefficient through practicals on computer by using excel.
CO5	Evaluate the different methods and theories of probability
CO6	Formulate the different strategies to deal with data analysis.

**CO-PO-PSO Mapping**

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO1 2	PS O1	PSO 2	PSO 3	PSO 4
CO1	3	1	1	1	1	1	2	1	1	1	1	1	3	2	-	-
CO2	3	2	1	-	1	1	1	-	1	1	1	1	2	1	-	-
CO3	3	2	2	1	1	1	2	1	1	2	2	3	3	2	1	-
CO4	2	3	2	1	1	1	2	-	1	1	2	2	3	2	-	-
CO5	3	3	2	1	1	1	2	1	2	1	-	-	2	2	-	-
CO6	2	2	2	2	1	1	2	2	2	2	2	3	2	3	1	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

**Examination Scheme:**

Components	I <sup>st</sup> internal (Assignment)	II <sup>nd</sup> Internal (Written Exam)	External (ESE)
Weightage (%)	15	15	70

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