

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS)**

**SALEM – 16**

**Reaccredited with 'B++' Grade by NAAC**

**(Affiliated to Periyar University)**



***DEPARTMENT OF STATISTICS***

**OUTCOME BASED SYLLABUS**

**B.Sc. Statistics**

**(For the students in the academic year 2022 – 23)**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM – 16**

**B.Sc. STATISTICS  
COURSE STRUCTURE UNDER CBCS  
(2022-25)**

**I SEMESTER**

Part	Course	Course Title	Code	Hrs./ Week	Credits
I	Tamil/Hindi/Sanskrit	Tamil /Hindi/ Sanskrit Paper- I	22ULTC1/ 22ULHC1/ 22ULSC1	6	3
II	English	Communicative English -I	22ULEC1	6	3
III	Core Course – I	Descriptive Statistics	22USTC1	4	4
III	Core Course – II	Correlation and Regression Analysis	22USTC2	4	4
III	Allied Course – I	Mathematics – I	22USTAC1	5	5
IV	Skill Based – I	Data analysis using Excel	22USTSQC1	2	2
III	Core Practical	Core Practical – I (extended to II Semester)	22USTQC1	2	-
V	Extension Activity	Group Project Based on Extension Activities	22UEXAC	1	1
<b>Total</b>				<b>30</b>	<b>22</b>
VI	Articulation and idea fixation skills				
	Physical Fitness Practice – 35 Hours per semester				
	Certificate Course in Statistical Methods – 100 hours per year				

**II SEMESTER**

Part	Course	Course Title	Code	Hrs./ Week	Credits
I	Tamil/Hindi/Sanskrit	Tamil /Hindi/ Sanskrit Paper- II	22ULTC2/ 22ULHC2/ 22ULSC2	6	3
II	English	Communicative English -II	22ULEC2	6	3
III	Core Course – III	Introduction to Probability theory	22USTC3	4	4
III	Core Course – IV	Distribution Theory	22USTC4	4	4
III	Allied Course – I	Mathematics – II	22USTAC2	5	5
IV	Skill Based – II	Data analysis using SPSS	22USTSQC2	2	2
III	Core Practical	Core Practical – I (extended from I Semester)	22USTQC1	1	2
IV	Environmental Studies	Environmental Studies	22UEVSC1	2	1
IV	Group Project for Environmental Studies		22UEVSPC	-	1
<b>Total</b>				<b>30</b>	<b>25</b>
	Articulation and Idea Fixation Skills – 1 Extra Credit				
	Physical Fitness Practice – 35 hours per Semester – 1 Extra Credit				
	Certificate Course in Yoga – 30 hours – 1 Extra Credit				
VI	Certificate Course in Statistical Methods - 100 hours per year - 2 Extra Credits				
	Extra credits are given for extra skills and courses qualified in MOOC/NPTEL				

**(2022- 25)**  
**SEMESTER– III**

S. No.	Title of Paper	Code	Hours per week	Credits
1.	Tamil – III	22ULTC3	6	3
2.	Communicative English -III	22ULEC3	6	3
3.	Core- V: Introduction to Real Analysis and Linear Algebra	22USTC5	4	4
4.	Core- VI: Sampling Theory	22USTC6	4	4
5.	Allied: ‘C’ Programming	22USTAC3	5	5
6.	Skill Based – III: Demographic Methods	22USTSC3	2	2
7.	Core Practical – II (extended to IV <sup>th</sup> Semester)	22USTQC2	1	-
8.	Non – Major Elective: Survey Methodology	22USTNEC1	2	2
	Articulation and Idea Fixation Skills – 1 Extra Credit			
	Certificate Course in Statistical Methods - 100 hours per year - 2 Extra Credits			
VI	Extra credits are given for extra skills and courses qualified in MOOC/NPTEL			
<b>TOTAL</b>			<b>30</b>	<b>23</b>

**SEMESTER– IV**

S. No.	Title of Paper	Code	Hours per Week	Credits
1.	Tamil – IV	22ULTC3	6	3
2.	Communicative English -IV	22ULEC3	6	3
3.	Core-VII: Applied Statistics	22USTC7	4	4
4.	Major Elective – I: Numerical Analysis	22USTEC1	4	4
5.	Allied: Practical - ‘C’ Programming	22USTAQC1	5	5
6.	Skill Based – IV : Data analysis using R	22USTSQC4	2	2
7.	Core Practical – II (extended from III <sup>rd</sup> Semester)	22USTQC2	1	2
8.	Non – Major Elective – II: Business Statistics	22USTNEC2	2	2
	Articulation and Idea Fixation Skills – 1 Extra Credit			
	Certificate Course in Statistical Methods - 100 hours per year - 2 Extra Credits			
VI	Extra credits are given for extra skills and courses qualified in MOOC/NPTEL			
<b>TOTAL</b>			<b>30</b>	<b>25</b>

**(2022-2025)**  
**SEMESTER – V**

S. No.	Title of Paper	Code	Hours per week	Credits
1.	Core – VIII: Theory of Estimation	22USTC8	6	4
2.	Core –IX : Design of Experiments	22USTC9	6	4
3.	Core – X : Operation Research - I	22USTC10	6	4
4.	Major Elective – II : Stochastic Processes	22USTEC2	5	5
5.	Core Practical : Core Practical – III	22USTQC3	4	3
6.	Non – Major Skill Based Subject – I	22USTNSC1	2	2
7.	Value Education (extended to Semester – VI)		1	
	<ul style="list-style-type: none"> <li>• Articulation and idea fixation skills – 6 Hours per semester ( out of college hours – I credit extra)</li> <li>• Life Skills Promotion – 2 Hours per semester ( out of college hours- 1 credit extra )</li> <li>• Physical Fitness Practice – 35 Hours per semester ( out of college hours - 1credit extra)</li> <li>• Certificate Course in Statistical Methods - 100 hours per year - 2 Extra Credits</li> <li>• Extra credits are given for extra skills and courses qualified in MOOC/NPTEL</li> </ul>			
	<b>TOTAL</b>		<b>30</b>	<b>19</b>

**SEMESTER – VI**

S.No.	Title of Paper	Code	Hours per week	Credits
1.	Core – XI: Testing of Hypothesis	22USTC11	6	4
2.	Core –XII : Statistical Quality Control	22USTC12	6	4
3.	Core – XI : Operations Research- II	22USTC13	6	4
4.	Group Project	22USTEC3	5	5
5.	Core Practical- IV : Core Practical- IV	22USTQC4	4	3
6.	Non – Major Skill Based Subject – II	22USTNSC2	2	2
7.	Value Education (extended from Semester – V)		1	2
	<ul style="list-style-type: none"> <li>• Articulation and idea fixation skills – 6 Hours per semester ( out of college hours – I credit extra)</li> <li>• Life Skills Promotion – 2 Hours per semester ( out of college hours- 1 credit extra)</li> <li>• Physical Fitness Practice – 35 Hours per semester ( out of college hours - 1credit extra)</li> <li>• Certificate Course in Statistical Methods - 100 hours per year - 2 Extra Credits</li> <li>• Extra credits are given for extra skills and courses qualified in MOOC/NPTEL</li> </ul>			
	<b>TOTAL</b>		<b>30</b>	<b>25</b>

**PAPER HANDLED FOR OTHER DEPARTMENTS**

***1. ALLIED FOR II B.Sc. COMPUTER SCIENCE***

<b>III Semester</b>	<b>Code</b>	<b>Hours/week</b>	<b>Credits</b>
Statistical Methods – I	22UCSAC3	5	5

**IV Semester**

Statistical Methods – II	22UCSAC4	5	5
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***2. NON – MAJOR ELECTIVES FOR II B. A. / B.Sc. / B.Com.***

**III Semester**

NME – I : Survey Methodology	22USTNEC1	2	2
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**IV Semester**

NME – II : Business Statistics	22USTNEC2	2	2
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***3. NON - MAJOR SKILL BASED FOR III B.A/B.Sc./ B.Com.***

**V Semester**

NMSB – I : Introduction to Lean Six Sigma	22USTNSC1	2	2
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**VI Semester**

NMSB – II: Vital Statistics	22USTNSC2`	2	2
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# DEPARTMENT OF STATISTICS

## Programme Title: B.Sc. Statistics

### Programme Educational Objectives:



To provide a degree for students to acquire high ability to combine and relate Statistics with other domains



To prepare the students to become leaders in their associated organisations with managing capabilities.

### Programme Outcomes:

On successful completion of the programme, the students will be able to

PO	PO Statement
Number	
•	Acquire the basic knowledge to continue and complete an advanced degree.
•	Prepare for lifelong learning and successful careers using their mathematical and statistical skills.
•	Apply their knowledge to retrieve, analyze and assimilate information.
•	Afford the opportunity to pursue studies in a discipline other than Statistics.
•	Develop oral and written communication skills that allow them to present the information effectively.

**Course Title** : DESCRIPTIVE STATISTICS  
**Course Code** : 22USTC1  
**Hours/Week** : 4 hours                      **Semester** : I

**Credit** : 4                      **Batch** : 2022- 2025

**Course Objective:**

The course aims to introduce the basic concepts in statistics and presentation of data.

**Syllabus**

**Unit – I:**    **No. of Hours : 12 hours**

Definition, scope and limitations of statistics – statistical survey – types of data – methods of collection – framing a questionnaire.

**Unit – II:**    **No. of Hours : 12 hours**

Frequency distribution – Classification & Tabulation of data – Characteristics – Graphs and diagrams – Bar diagram, Histogram and Pie diagram.

**Unit – III:**    **No. of Hours : 12 hours**

Measures of Central tendency – Arithmetic mean , Geometric mean, Harmonic mean, median and mode – Inter relationship between AM, GM and HM – Quantiles – Quartiles, Deciles and Percentiles.

**Unit – IV:**    **No. of Hours : 12 hours**

Measures of dispersion (absolute and relative) – Range, Quartile deviation, mean deviation, standard deviation and coefficient of variation – Interrelationship between QD, MD and SD.

**Unit – V:**    **No. of Hours : 12 hours**

Moments – raw moments, central moments – Measures of Skewness – Karl Pearson's coefficient of skewness – Bowley's coefficient of skewness – Measures of Kurtosis.

**Books for Study:**

R.S.N. Pillai & Bagavathi: Statistics.

S.P. Gupta : Statistical Methods.

**Books for Reference:**

D.C. Sancheti & V.K. Kapoor: Statistics.

**Web Resources:**

[https://www.fd.cvut.cz/departament/k611/PEDAGOG/THO\\_A/A\\_soubory/statistics\\_firstfive.pdf](https://www.fd.cvut.cz/departament/k611/PEDAGOG/THO_A/A_soubory/statistics_firstfive.pdf)

[http://www.mypolyuweb.hk/machanck/lectnotes/c1\\_des.pdf](http://www.mypolyuweb.hk/machanck/lectnotes/c1_des.pdf)

**Course Outcomes (CO):**

On completion of the course, students should be able to

**CO Number CO Statement**

1. **know** the basic concepts in sample surveys and data.
2. **illustrate** the knowledge of framing Questionnaire.
3. **calculate** the various descriptive measures.
4. organize, present and **analyse** the collected data.
5. **visualise** the distribution of data and interpret accordingly.

**Knowledge**

**Level**

**K1**

**K2**

**K3**

**K4**

**K5**

**Mapping of CO with PO & PSO:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	L	M	L	M		S	M	L		L	L	M
CO2	L		M	M	M	L	L	M		L	M	
CO3	L	S	L		M	M			M	S	M	L
CO4	M		S	M	M	L		M	S		M	S
CO5	L		M	L	L	M	S	M	S	L	S	S

**L – Low; M – Medium; S - Strong**



<b>Course Title</b>	<b>: CORRELATION &amp; REGRESSION ANALYSIS</b>		
<b>Course Code</b>	<b>: 22USTC2</b>		
<b>Hours/Week</b>	<b>: 4 hrs</b>	<b>Semester</b>	<b>II</b>
<b>Credit</b>	<b>: 4</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**The course aims to study the linear and average relationship between two and more than two variables.**

## **Syllabus**

**Unit – I :**

**No. of Hours : 12 hrs**

Curve fitting – Principle of Least squares – Fitting of first degree and second degree polynomial – Power curve & Exponential curve – Simple problems.

**Unit – II :** No. of Hours : 12 hrs

Correlation: Definition – Types of Correlation – Methods of studying Correlation – Scatter Diagram method – Karl Pearson's coefficient and Spearman's Rank correlation coefficient – Coefficient of concurrent deviation – Correlation for grouped bivariate data – Mathematical properties and interpretation of the coefficient of correlation.

**Unit – III :**

**No. of Hours : 12 hrs**

Regression – Definition, uses and its significance – Difference between correlation and regression – Regression equation of Y on X and X on Y – Regression equation for a grouped bivariate data – Mathematical properties of Regression coefficients.

**Unit – IV :**

**No. of Hours : 12 hrs**

Plane of Regression – Yule's notation – Derivation (only for three variables) – Properties of Residuals – Variance of the residual – Partial & Multiple correlation – Definition with example – Derivation – Simple problems.

**Unit – V:**

**No. of Hours : 12 hrs**

Case Study based on Correla

**Books for Study:**

R.S.N. Pillai & Mrs. Bagavathi: Statistics(Unit II & II).

S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics( Unit I, IV & V)

**Books for Reference:**

D.C. Sancheti & V.K. Kapoor: Statistics.

**Web Resources :**

<https://www.studocu.com/en/document/washington-state-university/statistical-methods-in-research-i/lecture-notes/lecture-notes-lecture-14-correlation-and-regression/776404/view>

[http://www.personal.kent.edu/~mshanker/personal/Classes/f06/ch13\\_F06.pdf](http://www.personal.kent.edu/~mshanker/personal/Classes/f06/ch13_F06.pdf)

## Course Outcomes (CO) :

On completion of the course, students should be able to

CO Number

CO Statement

Knowledge  
Level

1. **recall** the distribution and fitting of the data.
2. **describe** the relationship and the direction of association between two variable
3. **analyse** and predict the future outcomes.
4. **differentiate** correlation and regression.
5. **extend** the acquired knowledge to find relationship between more than two variables.

**K1**

**K2**

**K4**

**K5**

**K6**

## Mapping of CO with PO & PSO :

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	M	L	M	M	L	L	L	M		L		M
<b>CO2</b>	L		S	M	L	M	M	S	M	M	S	
<b>CO3</b>	M	L	S	S	M	S	S	M	L	S	M	S
<b>CO4</b>	M	S	M	M	L	L		S		L	S	L
<b>CO5</b>	L	L	M	L		M	M	S	L	M	M	S

**L – Low; M – Medium; S - Strong**

**Course Title : SKILL BASED- I: DATA ANALYSIS USING EXCEL**  
**Course Code : 22USTSQ1**  
**Hours/Week : 2 hrs**  
**Credit : 2**

**Semester : I**  
**Batch : 2022- 2025**

**Course Objective:**

**The course aims to provide data handling experience using MS- Excel**

**Syllabus**

**MS- EXCEL:**

1. Diagrammatic representation.
2. Measures of central tendency
3. Measures of dispersion.
4. Moments, Skewness and Kurtosis.
5. Histogram and Box plot
6. Karl Pearson's correlation – Rank correlation.
7. Multiple and partial correlation
8. construction of regression lines

**Course Outcomes (CO):**

**On completion of the course, students should be able to**

CO Number	CO Statement	Knowledge Level
	1. be <b>familiar</b> with presentation of Statistical output in MS – Excel software.	<b>K1</b>
	2. <b>understand</b> the basic working of MS – Excel .	<b>K1</b>
	3. enter, <b>organize</b> and save data in suitable way.	<b>K3</b>
	4. <b>conduct</b> descriptive and basic inferential statistics in software.	<b>K4</b>
	5. <b>create</b> and edit graphical displays of data.	<b>K5</b>

**Mapping of CO with PO & PSO:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	L	M	S	L		M	M	L	S	L	M	S
<b>CO2</b>	M	M	S	L	L	L	L	S	S	M	M	M
<b>CO3</b>	L	L	M	M		L	L	S	S	L	S	
<b>CO4</b>	M	M	S	M	M	S	L	S	S	M	M	S
<b>CO5</b>	L	L	S	M	L			M	M			

**L – Low; M – Medium; S - Strong**

**Course Title : PROBABILITY THEORY**  
**Course Code : 22USTC3**  
**Hours/Week : 4 hrs Semester II**

**Credit : 4 Batch : 2022- 2025**

**Course Objective:**

**To demonstrate the concepts of probability and the uses of probability theory in day-to-day life.**

**Syllabus**

**Unit – I : No. of Hours : 12 hrs**

Random experiment – Trial – Sample point – Sample space, Event – Types of Events – Definition of probability – Mathematical, Statistical and Axiomatic approach – Addition theorem – Conditional probability – Multiplication theorem – Baye's Theorem – Simple problems.

**Unit – II : No. of Hours : 12 hrs**

Concepts of random variable – Discrete random variable, Continuous random variable, Probability mass function, distribution function – Properties of Distribution function – Independence of random events and random variables – Pairwise independence and mutual independence – Simple problems. .

**Unit – III : No. of Hours : 12 hrs**

Mathematical expectation random variables – Properties of mathematical expectation – Moments – Raw moments, central moments – Measures of location and dispersion of random variables – Chrushev's inequality and its application – Simple problems.

**Unit – IV : No. of Hours : 12 hrs**

Moment generating function of a random variable – Properties and its uses – Cumulants – Characteristic functions – Properties of characteristic function – Simple examples – Inversion theorem(Statement only) – Weak law of large numbers – Simple problems.

**Unit – V: No. of Hours : 12 hrs**

Bivariate distribution – Distribution function of bivariate random variable and its properties – Probability mass and density function – Marginal and Conditional distributions – Conditional expectation – Covariance and correlation – Simple problems.

**Books for Study:**

R.S.N. Pillai & Bagavathi: Statistics.

**Books for Reference:**

Murray R. Spiegel : Probability and Statistics. (Schaum's Outline Series)  
Walpole, R. H. Myres, S.L. Myres & K .Ye: Probability and Statistics.

**Web Resources :**

<http://nptel.ac.in/downloads/111101004/>  
[http://www.math.ucsd.edu/~bdriver/280\\_06-07/Lecture\\_Notes/N16\\_2p.pdf](http://www.math.ucsd.edu/~bdriver/280_06-07/Lecture_Notes/N16_2p.pdf)

**Course Outcomes (CO) :**

On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
1.	<b>understand</b> the axiomatic formulation of modern probability theory and random variables.	<b>K2</b>
2.	<b>illustrate</b> probability models and function of random Variables	<b>K2</b>
3.	<b>evaluate</b> and <b>apply</b> moments, characteristic functions and random phenomenon.	<b>K3 , K4</b>
4.	<b>derive</b> the probability distributions relevant to functions of random variables	<b>K4</b>
5.	<b>convert</b> real-world problems into probability models.	<b>K6</b>

**Mapping of CO with PO & PSO:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	M	M	L		M	M	L	M		M	M	L
CO2	L		M	M	L	L	M	L	L	S	M	
CO3	L	M	M	M	S	S	L	M	M	M	L	L
CO4	M	L	M	M	L	L	M	L	L	L	M	S
CO5	S	M	S	M	S	L	S	S	M	M	S	M

**L – Low; M – Medium; S – Strong**

<b>Course Title</b>	<b>: DISTRIBUTION THEORY</b>		
<b>Course Code</b>	<b>: 22USTC4</b>		
<b>Hours/Week</b>	<b>: 4 hrs</b>	<b>Semester</b>	<b>: II</b>
<b>Credit</b>	<b>: 4</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**To illustrate the concepts of probability distributions and their applications to problems in diversified fields.**

**Syllabus**

**Unit – I :**

**No. of Hours : 12 hrs**

Bernoulli distribution : Definition only - Binomial distribution : Definition - Physical conditions for binomial distribution - Mean and variance - M.G.F. - Moments using M.G.F. - Additive property - Recurrence formulae for probabilities and moments - Fitting of binomial distribution - Simple problems.

**Unit – II :**

**No. of Hours : 12 hrs**

Poisson distribution : Definition - Conditions for binomial distribution to tend to Poisson distribution - Mean and variance - M.G.F. - Recurrence relation for probabilities and moments - Fitting of Poisson distribution - Simple problems - Exponential distribution : Definition - M.G.F. - Mean and variance using M.G.F. - Rectangular distribution : Definition - Mean and variance - M.G.F.

**Unit – III :**

**No. of Hours : 12 hrs**

Univariate normal distribution : Definition - M.G.F. - Additive property - Recurrence relation for the moments - Moments - p.d.f. and M.G.F. of a standard normal variate - Chief characteristics - Fitting of normal distribution by the area method - Simple problems.

**Unit – IV :**

**No. of Hours : 12hrs**

Gamma distribution : Definition - M.G.F. - Additive property - Mean and variance using M.G.F. - Beta distribution of first kind: Definition - Mean and variance - Beta distribution of second kind : Definition - Mean and variance - Definitions of Cauchy and standard Cauchy distributions.

**Unit – V:**

**No. of Hours : 12 hrs**

Chi-square distribution: Definition of chi-square statistic - Derivation of the p.d.f. - M.G.F. - Additive property - t-distribution : Definition of Student's t- Derivation of the p.d.f. - F distribution: Definition of F-statistic - Derivation of the p.d.f. -Relation between t and F distributions -Relation between F and chi-square distributions.

**Books for Study:**

S.C. Gupta & V.K. Kapoor : Fundamentals of Mathematical Statistics.

**Books for Reference:**

R.V. Hogg, Craig & A.T. Craig: Introduction to Mathematical Statistics.

A.M. Mood, P.A. Graybill & D.C. Boes : Introduction to the theory of Statistics.

Wilks. S.S. : Mathematical Statistics.

**Course Outcomes (CO) :****On completion of the course, students should be able to**

CO Number	CO Statement	Knowledge Level
1.	<b>recall</b> the basic properties of probability theory	<b>K1</b>
2.	<b>perform</b> calculations relating to probability distributions for discrete and continuous random Variables	<b>K3</b>
3.	<b>evaluate</b> and <b>interpret</b> various properties of both discrete and continuous distributions (i.e) mean, variance, M.G.F. etc.	<b>K3</b>
4.	<b>apply</b> distributions theory in real-life problems	<b>K4</b>
5.	<b>develop</b> complex mathematical reasoning	<b>K6</b>

**Mapping of CO with PO & PSO:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	L		M	M	L	M	M	S	L	L	M	
<b>CO2</b>	M	M	M	L	L	M	L	M	M	L		M
<b>CO3</b>	M	L	M	M	S	S		M		M	L	S
<b>CO4</b>	M	M	S	M	L	M	L	M	L	L	M	M
<b>CO5</b>	S	S	M	M	L	S	M		M	S	M	S

**L – Low; M – Medium; S - Strong**

Course Title : **SKILL BASED – II: Data analysis using SPSS**  
Course Code : **22USTSQC2**  
Hours/Week : **2 hrs** Semester **II**

Credit : **2** Batch : **2022- 2025**

**Course Objective:**

**The course aims to provide data handling experience using SPSS.**

**Syllabus**

**SPSS**

1. Ungrouped frequency data
2. Data validation – Transform, Sorting, Select case.
3. Importing data from Excel.
4. Diagrammatic representation.
5. Measures of Central tendency & dispersion.
6. Karl Pearson's correlation – Rank correlation
7. Simple linear regression.
8. Fitting of Distribution

**Books for Study:**

Stephen A. Sweet, and Karen Grace-Martin (2012): Data Analysis with SPSS: A First Course in Applied Statistics, Pearson, 4th Edition.

**Web Resources :**

<https://www.slideshare.net/davidmbwiga1990/spss-lecture-notes>  
<https://stats.idre.ucla.edu/spss/seminars/notes/>

**Course Outcomes (CO) :**

**On completion of the course, students should be able to**

CO Number	CO Statement	Knowledge Level
1.	be <b>familiar</b> with presentation of Statistical output in SPSS software.	<b>K1</b>
2.	<b>understand</b> the basic working of SPSS .	<b>K1</b>
3.	enter, <b>organize</b> and save data in suitable way.	<b>K3</b>
4.	<b>conduct</b> descriptive and basic inferential statistics in software.	<b>K4</b>
5.	<b>create</b> and edit graphical displays of data.	<b>K5</b>



### Mapping of CO with PO & PSO:

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	M	M	L		M	M	L	M		M	M	L
CO2	L		M	M	L	L	M	L	L	S	M	
CO3	L	M	M	M	S	S	L	M	M	M	L	L
CO4	M	L	M	M	L	L	M	L	L	L	M	S
CO5	S	M	S	M	S	L	S	S	M	M	S	M

**L – Low; M – Medium; S - Strong**

<b>Course Title</b>	<b>: CORE PRACTICAL – I</b>		
<b>Course Code</b>	<b>: 22USTQC1</b>		
<b>Hours/Week</b>	<b>: 3 hrs</b>	<b>Semester</b>	<b>II</b>
<b>Credit</b>	<b>: 2</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**To develop the skills in applying statistical tools in real life data.**

## **Syllabus**

### **DESCRIPTIVE STATISTICS:**

1. Construction of Univariate and Bivariate frequency tables.
2. Diagrammatic and Graphical representation of data.
3. Computation of Measures of Central tendency.
4. Computation of Measures of Dispersion.
5. Measures of Skewness and Kurtosis.

### **CORRELATION AND REGRESSION**

6. Computation of Simple correlation.
7. Computation of Regression Coefficients.
8. Construction of simple regression lines.

### **DISTRIBUTION THEORY**

9. Fitting of discrete distributions – Binomial, Poisson.
10. Fitting of Continuous distribution.

### **Books for Study:**

S.C. Gupta & V.K. Kapoor : Fundamentals of Applied Statistics.  
S.C. Gupta & V.K. Kapoor : Fundamentals of Mathematical Statistics.

### **Course Outcomes (CO) :**

**On completion of the course, students should be able to**

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
1.	<b>construct</b> the frequency table.	<b>K2</b>
2.	<b>draw</b> the diagram and graph based on the data.	<b>K3</b>
3.	<b>analyse</b> the central tendency dispersion of the data.	<b>K4</b>
4.	<b>understand</b> the differences between variables.	<b>K4</b>
5.	<b>form</b> the regression equations.	<b>K6</b>

### Mapping of CO with PO & PSO:

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	L	L	S	L	M	L	L	M		M	L	L
<b>CO2</b>		L	M	L				M		S	M	M
<b>CO3</b>	L	M	S	L	L		L	L		S	L	
<b>CO4</b>	L	L	M	L	L	L	L	S		L	M	L
<b>CO5</b>	L		M		L	M	L	M		L	M	L

**L – Low; M – Medium; S - Strong**

<b>Course Title</b>	<b>: Introduction to Real Analysis and Linear Algebra</b>		
<b>Course Code</b>	<b>: 22USTC5</b>		
<b>Hours/Week</b>	<b>: 4 hrs</b>	<b>Semester</b>	<b>III</b>
<b>Credits:</b>	<b>: 2</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**The course aims to introduce the basic concepts in real analysis and linear algebra**

**Syllabus**

**Unit – I : (Pg. no.:43-59)**

**No. of Hours : 12hrs**

Real numbers – order axioms – ordered field – Field axioms – least upper bound – greatest lower bound – Simple problems.

**Unit – II : (Pg. no.: 92-105)**

**No. of Hours : 12 hrs**

Sequences – Bounded and unbounded sequences – Convergent, divergent and oscillatory sequences – limit of a sequence – Monotonic sequence – Simple problems.

**Unit – III : (Pg. no.:139-170 & 197-216)**

**No. of Hours : 12 hrs**

Functions – Limit of a function – Continuity of a function – properties – Derivatives of a function – Rolle’s theorem – Mean value theorem.

**Unit – IV : (Pg. no.:35-59)**

**No. of Hours : 12hrs**

Vector space – linear combination of vectors – Linear dependence and Linear independence – Basis and dimension.

**Unit – V:(Pg. no.:129-151)**

**No. of Hours : 12 hrs**

Linear transformation – Properties – Range of linear transformation – Rank and Nullity of linear transformation..

**Books for Study:**

Bali. N.P. , golden Math Series Analysis (1984), Lakshmi Publication. (Unit – I to Unit - III)

Gupta . P. P.,& Sharma. S.K. , Linear Algebra (1982), S.Chand& Company (Unit – IV to Unit – V)

**Books for Reference:**

Vasishta. A. R. (2005), Matrices , Krishna Prakashan Mandir, New Delhi.

Kumerasan (2005) , Linear Algebra Geometric approach, Prentice Hall of India Pvt. Ltd.,

**Course Outcomes (CO) :**

On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
1.	<b>Understand</b> the basic concepts of Real number system	<b>K1</b>
2.	<b>Understand</b> the axioms and theorems on sequences.	<b>K1</b>
3.	<b>Solve</b> the limits for the function.	<b>K3</b>
4.	<b>Recall</b> the concepts of vector space.	<b>K4</b>
5.	<b>Evaluate</b> different concepts of linear Transformation	<b>K6</b>

**Mapping of COs with POs:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	L		M	M	L	M	M	S	L	L	M	
<b>CO2</b>	M	M	M	L	L	M	L	M	M	L		M
<b>CO3</b>	M	L	M	M	S	S		M		M		S
<b>CO4</b>	M	M	S	M	L	M	L	M	L	L	M	M
<b>CO5</b>	S	S	M	M	L	S	M		M	S	M	S

**L – Low; M – Medium; S - Strong**

<b>Course Title</b>	<b>: SAMPLING THEORY</b>		
<b>Course Code</b>	<b>: 22USTC6</b>		
<b>Hours/Week</b>	<b>: 4 hrs</b>	<b>Semester</b>	<b>: III</b>
<b>Credit</b>	<b>: 4</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**The course aims to equip students with different sampling techniques which are useful in conducting sample surveys.**

**Syllabus**

**Unit – I :**

**No. of Hours : 15 hrs**

Concept of sampling and population: Need for sampling – Design , Organization and execution of sample survey – Principle steps in sample surveys – preparation of Questionnaire and schedules – Pilot survey – Sampling and Non- Sampling Errors – Limitation of sampling.

**Unit – II :**

**No. of Hours : 15 hrs**

Methods of Sampling – Probability and Non- Probability Sampling – Limitation and advantages of Probability Sampling – Judgement Sampling – Quota Sampling – Convenience sampling – Merits and Demerits. .

**Unit – III :**

**No. of Hours : 15 hrs**

Simple random sampling: Definition – Methods of selecting a S.R.S. – Unbiased estimator of population mean and population mean square (in SRSWOR) – Variance of sample mean of SRSWOR – Comparison of SRSWOR with SRSWR – Merits and Limitation of S.R.S .

**Unit – IV :**

**No. of Hours : 15 hrs**

Stratified Random Sampling: Definition – Advantages – Unbiased estimator of population mean – Variance of the stratified mean – Proportional and optimum allocations of sample sizes – variance of sample mean under proportional and optimum allocation – Comparison of proportional allocation and Neyman’s allocation with S.R.S.

**Unit – V:**

**No. of Hours : 15 hrs**

Systematic sampling: Definition –  $i^{\text{th}}$  systematic sample – Variance of the mean of systematic sample using the mean square  $w^2$ - Comparison of systematic sampling with S.R.S.– Proving the result  $\text{var}(y_{st}) \leq \text{var}(y_{sys}) \leq \text{var}(y_n)_R$  when the population consists of a linear trend – Merits and Demerits of systematic sampling – NSSO, CSO and its functions.

**Books for Study:**

S.C. Gupta & V.K. Kapoor : Fundamentals of Applied Statistics.

**Books for Reference:**

Cochran W. G. : Sampling Techniques.  
Des Raj: Sampling Theory

**Web Resources:**

<http://nptel.ac.in/downloads/111104073/>  
<http://home.iitk.ac.in/~shalab/course1.htm>

**Course Outcomes (CO) :****On completion of the course, students should be able to**

CO Number	CO Statement	Knowledge Level
1.	<b>understand</b> the principles and theory of probability sampling.	<b>K1 &amp; K2</b>
2.	<b>understand</b> the concepts of bias and sampling variability and strategies for removing them.	<b>K1&amp;K2</b>
3.	<b>analyse</b> data from surveys using various sampling plans .	<b>K4</b>
4.	<b>access</b> the appropriateness of sampling plans	<b>K4</b>
5.	<b>evaluate</b> the different methodology to estimate population parameters for sampling plans.	<b>K5</b>

**Mapping of COs with POs:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	M		L	M	L	L	S		L	L		
CO2	L			S	L	M	M			M		
CO3		S	M			S	S	S			S	S
CO4				S		S		S		S	L	
CO5	M	M	S		S		S		S	S		S

**L – Low; M – Medium; S – Strong**

<b>Course Title</b>	<b>: SKILL BASED –III: DEMOGRAPHIC METHODS</b>		
<b>Course Code</b>	<b>: 22USTSC3</b>		
<b>Hours/Week</b>	<b>: 2 hrs</b>	<b>Semester</b>	<b>III</b>
<b>Credit</b>	<b>: 2</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**The course aims to study the applications of Statistics in the field of Health statistics.**

**Syllabus**

**Unit – I :(Pg. no.:9.2-9.5)**

**No. of Hours : 6 hrs**

Demography – definition, sources of demographic data – Population Census – Demography surveys – Registration method: vital registration – Population register and other administrative records, registrar

**Unit – II :(Pg. no.:9.6-9.13)**

**No. of Hours : 7 hrs**

Measurement of mortality: Crude death rate – Specific death rate – Age specific death rate – Infant mortality rate – Standardized death rate – Direct method of standardization – Indirect method of standardization – Simple problems.

**Unit – III :(Pg. no.:9.44-9.48)**

**No. of Hours : 6 hrs**

Measure of fertility: Crude birth rate – General fertility rate – Specific fertility rate – Age specific fertility rate – Total fertility rate – Simple problems..

**Unit – IV :(Pg. no.:9.51-9.62)**

**No. of Hours : 5 hrs**

Gross reproduction rate – Net reproduction rate – Simple problems.

**Unit – V:(Pg. no.:9.15-9.28)**

**No. of Hours : 6 hrs**

Life tables – Uses of life tables – Curate expectation of life and complete expectation of life – Central mortality – Description of a life table – Construction of a life table – Simple problems .

**Books for Study:**

S.C. Gupta & V.K. Kapoor : Fundamentals of Applied Statistics.

**Books for Reference:**

D. C. Sancheti & V.K .Kapoor: Statistics

S.P. Gupta: Statistical Methods.



**Course Outcomes (CO) :****On completion of the course, students should be able to**

CO Number	CO Statement	Knowledge Level
1.	be <b>familiar</b> with the source of vital statistics.	<b>K1 &amp; K2</b>
2.	<b>calculate</b> basic measures to evaluate vital statistics.	<b>K3</b>
3.	<b>determine</b> fertility and mortality rates.	<b>K4</b>
4.	<b>derive</b> information from the life tables.	<b>K5</b>
5.	<b>construct</b> life tables.	<b>K6</b>

**Mapping of COs with POs :**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	M	L	S		S	L						L
<b>CO2</b>		M	M	L	L	M		S		L	S	M
<b>CO3</b>	M	S	S	M	S	L	S	M		L	S	
<b>CO4</b>	S	S	S	S		M	S		S			S
<b>CO5</b>	S	S	M		M	L		M		M		S

**L – Low; M – Medium; S - Strong**

<b>Course Title</b>	<b>: APPLIED STATISTICS</b>		
<b>Course Code</b>	<b>: 22USTC7</b>		
<b>Hours/Week</b>	<b>: 4 hrs</b>	<b>Semester</b>	<b>: IV</b>
<b>Credit</b>	<b>: 4</b>	<b>Batch</b>	<b>: 2022- 2025</b>

### **Course Objective:**

**To learn application of Statistics in the economic field where Statistics plays significant role.**

**Note: Questions only on the topics mentioned.**

### **UNIT- I(Pg. no.:2.2-2.32)**

**No. of Hours :12hrs**

Concept of time series – Components of time series – Additive and multiplicative models of time series- resolving the components of time series – Trend – Methods of measuring trend – Method of least squares(Straight line and parabola) – Semi-average method – Method of moving averages – Simple problems.

### **UNIT- II(Pg. no.:2.41-2.57& 2.67-2.70)**

**No. of Hours :12hrs**

Seasonal variation – Methods of measuring seasonal variation – Simple average method – Ratio-to-trend method – Ratio –to-moving method- Link relative method- Cyclical variation- Measurement of cyclical variation- Random Component- Variate difference method- Simple problems.

### **UNIT- III (Pg. no.:3.2-3.16)**

**No. of Hours :12hrs**

Index numbers – Definition and importance – problems involved in the construction of index numbers – Types of index numbers – Simple aggregate method – Weighted aggregate method (Laspeyre's, Paasche's, Marshall-Edgeworth's and Dorbish-Bowley's index numbers)- Average of price relatives method- Simple problems.

### **UNIT- IV(Pg. no.: 3.17-3.59)**

**No. of Hours :12hrs**

Optimum tests of index numbers- Unit test – Time reversal test- Factor reversal test- Circular test- Wholesale price index number- Chain base index number- Conversion of fixed base index number into chain index number and vice versa- Uses of index numbers.

### **UNIT- V (Pg. no.: 3.17-3.59)3.29-3.60**

**No. of Hours : 12hrs**

Cost of living index numbers –Main steps in the construction of cost of living index numbers – Methods of constructing cost of living index numbers – Aggregate expenditure method- Family budget method – Simple problems – Index number of industrial production – Splicing and Base shifting – Deflating – Uses of cost of living index numbers – Limitations of index numbers.

### **Books for Study:**

Gupta S.C. and Kapoor V.K.: Fundamentals of Applied Statistics

### **Books for Reference:**

Goon A.M., Gupta M.K. and Das Gupta B. : Fundamentals of statistics, Volume II  
Gupta S.P.: Statistical Methods

**Course Outcomes (CO) :****On completion of the course, students should be able to**

CO Number	CO Statement	Knowledge Level
1.	be <b>familiar</b> with the concepts of time series	<b>K1</b>
2.	<b>forecast</b> the trends and seasonal variations	<b>K4</b>
3.	<b>Understand</b> the concepts of index numbers	<b>K1</b>
4.	<b>solve</b> various problems on index numbers	<b>K5</b>
5.	<b>Apply</b> the concepts of time series and index numbers in real life situation	<b>K3</b>

**Mapping of COs with POs :**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	M	L	S		S	L						L
<b>CO2</b>		M	M	L	L	M		S		L	S	M
<b>CO3</b>	M	S	S	M	S	L	S	M		L	S	
<b>CO4</b>	S	S	S	S		M	S		S			S
<b>CO5</b>	S	S	M		M	L		M		M		S

**L – Low; M – Medium; S - Strong**

<b>Course Title</b>	<b>: MAJOR ELECTIVE I: NUMERICAL ANALYSIS</b>		
<b>Course Code</b>	<b>: 22USTEC1</b>		
<b>Hours/Week</b>	<b>: 4 hrs</b>	<b>Semester</b>	<b>IV</b>
<b>Credit</b>	<b>: 4</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

The course aims to gain knowledge in Numerical Methods and develop skills for solving different kinds of numerical problems in Science, Engineering and Technology.

## **Syllabus**

**Unit – I : (No derivation)**

**No. of Hours : 15 hrs**

Defining the operators  $E$ ,  $\Delta$  and  $\nabla$  - Difference Table – Newton’s forward interpolation formula for equal intervals – Newton’s backward interpolation formula for equal intervals – Simple problems.

**Unit – II : (No derivation)**

**No. of Hours : 15 hrs**

Divided difference – Newton’s divided difference formula – Lagrange’s divided difference formula – Lagrange’s formula of interpolation – Simple problems.

**Unit – III : (No derivation)**

**No. of Hours : 15 hrs**

Central difference formulae of interpolation – Gauss forward, Gauss backward, Stirling’s and Bessel’s formulae – Simple problems.

**Unit – IV : (No derivation)**

**No. of Hours : 15 hrs**

Numerical differentiation – Newton’s forward, backward, Stirling’s, Newton’s divided difference formulae – Simple problems.

**Unit – V : (No derivation)**

**No. of Hours : 15 hrs**

Numerical integration – Trapezoidal rule – Weddle’s rule – Simpson’s 1/3rd and 3/8th rules – Simple problems.

**Books for Study:**

Balasubramanian P. & Others: Numerical Mathematics Vol. I & II.

Kandasamy, Thilagavathy and Gunavathy: Numerical Methods.

**Books for Reference:**

R.Gupta: Numerical Analysis.

S.S. Sastry: Introductory Methods of Numerical Analysis.

H.C. Sexena: Finite Differences and Numerical Analysis.

**Web Resources :**

<https://www.math.ust.hk/~machas/numerical-methods.pdf>

[https://pfortuny.net/uniovi/numerical\\_methods/notes.pdf](https://pfortuny.net/uniovi/numerical_methods/notes.pdf)

**Course Outcomes (CO) :****On completion of the course, students should be able to**

CO Number	CO Statement	Knowledge Level
1.	<b>aware</b> of using numerical methods in modern scientific computing.	<b>K2</b>
2.	<b>apply</b> numerical methods to obtain appropriate solution to mathematical problem.	<b>K3</b>
3.	<b>analysis</b> and <b>evaluate</b> the accuracy of common numerical methods.	<b>K4</b>
4.	<b>derive</b> numerical methods for various operator such as interpolation, differentiation, integration, etc.	<b>K6</b>

**Mapping of COs with POs :**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	S	L	L	S					L	M		
<b>CO2</b>		S	M	M		L	L					M
<b>CO3</b>		M	S	S	L			M				
<b>CO4</b>	L		S	S	L			M		S	L	M

**L – Low; M – Medium; S – Strong**

<b>Course Title</b>	<b>: SKILL BASED IV: DATA ANALYSIS USING R</b>		
<b>Course Code</b>	<b>: 22USTSQC</b>		
<b>Hours/Week</b>	<b>: 2 hrs</b>	<b>Semester</b>	<b>IV</b>
<b>Credit</b>	<b>: 2</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**The course aims to provide data handling experience using R.**

**Syllabus**

1. Data validation – Transform, Sorting, Select case.
2. Importing data from Excel.
3. Diagrammatic representation.
4. Measures of Central tendency & dispersion.
5. Karl Pearson's correlation – Rank correlation
6. Simple linear regression.
7. Fitting of Distribution

**Books for Study:**

Sandip Rakshit (2017), R Programming for Beginners, McGraw Hill Education; First edition.

**Course Outcomes (CO) :**

On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
1.	be <b>familiar</b> with presentation of Statistical output in R Programming.	<b>K1</b>
2.	<b>understand</b> the basic working of R	<b>K1</b>
3.	enter, <b>organize</b> and save data in suitable way.	<b>K3</b>
4.	<b>conduct</b> descriptive and basic inferential statistics.	<b>K4</b>
5.	<b>create</b> and edit graphical displays of data.	<b>K5</b>

**Mapping of COs with POs:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	S	S	L			L		M	S			
<b>CO2</b>		S	M	L					S	M	M	
<b>CO3</b>	L	S	S	L		L	S	M	S			S
<b>CO4</b>		S	S		M	M	S	S		S	S	S
<b>CO5</b>	M	S	S					S		M		S

**L – Low; M – Medium; S - Strong**

**Course Title : THEORY OF ESTIMATION**  
**Course Code : 22USTC8**  
**Hours/Week : 6 hrs**                      **Semester : V**  
**Credit : 4**                                      **Batch : 2022- 2025**

**Course Objective:**

**This course deals with fundamental concepts and techniques of statistical inference like estimation.**

**Syllabus**

**Unit – I :**

**No. of Hours : 18 hrs**

Point Estimation – Distinction between Estimator and Estimate – Properties of Estimators – Concept of Unbiasedness, consistency, Efficiency and Sufficiency – Statement of Neyman-Pearson Factorization theorem – Simple applications.

**Unit – II :**

**No. of Hours : 18 hrs**

Minimum Variance Unbiased Estimator (MVUE) – Uniqueness property of MVUE – Proof – Lower bound for variance of estimator – Regularity conditions – Cramar-Rao inequality – Statement and proof – Simple problems – Asymptotic efficiency

**Unit-III**

Sufficient statistic and its properties- concept of complete sufficient statistics- simple illustrations-Minimum Variance Bound Estimator (MVBE) - Concept of Blackwellisation- Statement and proof of Rao-Blackwell theorem.

**Unit-IV**

Methods of estimation- Maximum likelihood estimator (MLE) and their properties- Simple problems on MLE-Method of moments-Simple illustrations-Methods of minimum chi- square and modified minimum chi-square.

**Unit-V**

Interval estimation- Distinction between point estimation and interval estimation- Confidence interval and confidence limits-General procedure of obtaining confidence limits- Construction of confidence intervals for parameters of Binomial, Poisson and Normal distribution- Simple problems.

**Books for study**

Gupta S.C. & V. K. Kapoor : Fundamental of Mathematical Statistics.  
J. N. Kapur & H.C. Saxena : Mathematical Statistics.  
B. L. Agarwal : Programmed Statistics.

**Books for reference**

A. M. Mood, P.A. Graybill & D. c. Boes : Introduction to the theory of Statistics.  
H.C. Saxena and P.U. Surendran : Statistical Inference.  
S.S. Wilks : Mathematical Statistics.



**Course Outcomes (CO) :****On completion of the course, students should be able to****CO Number****CO Statement****Knowledge  
Level**

1. have **knowledge** about fundamental principles of statistical inference **K1**
2. **Explain** the notion of parametric model on point estimation **K2**
3. **demonstrate** computational skills to implement various statistical inferential approaches. **K2**
4. **explore** different methods of estimating the parameters **K4**
5. **construct** point and interval estimators. **K6**

**Mapping of COs with POs & PSOs:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	S	S	L		M	S	M	M		M	S	M
<b>CO2</b>	M	L			M	M	L			L	M	
<b>CO3</b>	S			L		M			M			
<b>CO4</b>	L		M		M	L		M		M		S
<b>CO5</b>	L		M			M		M				M

**L – Low; M – Medium; S - Strong**

<b>Course Title</b>	<b>: DESIGN OF EXPERIMENTS</b>		
<b>Course Code</b>	<b>: 22USTC9</b>		
<b>Hours/Week</b>	<b>: 6 hrs</b>	<b>Semester</b>	<b>V</b>
<b>Credit</b>	<b>: 4</b>	<b>Batch</b>	<b>: 2022- 2025</b>

#### **Course Objective:**

**The course aims to enhance the theoretical as well as practical skills about the various designing concepts in field experiments.**

### **Syllabus**

#### **Unit – I :**

**No. of Hours : 18 hrs**

Analysis of variance: One-way and two-way classification (without interaction) – Uniformity trials – Determination of shape and size of plots and blocks – Fundamental principles of design: bio Replication, Randomization and Local control techniques.

#### **Unit – II :**

**No. of Hours : 18 hrs**

C.R.D.-Definition, advantages , disadvantages and Statistical Analysis of C.R.D.-  
R.B.D.-Definition , advantages, disadvantages and its Statistical Analysis .

#### **Unit – III :**

**No. of Hours : 18 hrs**

Missing plot technique for R.B.D (one and two missing values)-Latin Square Design (LSD) - Definition, Standard Latin Square, Advantages, Disadvantages and its Statistical analysis- Missing plot technique- Estimation of missing value in LSD.

#### **Unit – IV :**

**No. of Hours : 18 hrs**

Factorial Experiments: Concept of main effects and interactions  $p \times q$ ,  $2^2, 2^3$  and  $2^n$  Factorial Experiment and their statistical analysis.

#### **Unit – V:**

**No. of Hours : 18 hrs**

Principles of confounding and Partial Confounding in  $2^3$  Factorial Experiment and their statistical analysis- Split- plot Design and Balanced Incomplete Block Design (Concept only).

#### **Books for Study:**

S.C. Gupta & V.K. Kapoor : Fundamentals of Applied Statistics.  
M. N. Das and N.C.: Design and Analysis of Experiments (Unit- V)

#### **Books for Reference:**

Goon Gupta and Das Gupta: Fundamentals of Statistics.  
D.D. v Joshi: Linear Estimation and Design of Experiments.

#### **Web Resources :**

<https://faculty.franklin.uga.edu/dhall/sites/faculty.franklin.uga.edu.dhall/files/STAT8200-Fall13-lec1.pdf>  
<http://nptel.ac.in/downloads/111104075>

**Course Outcomes (CO) :****On completion of the course, students should be able to**

CO Number	CO Statement	Knowledge Level
1.	critically <b>review</b> the concepts of experimental designs	<b>K1</b>
2.	<b>understand</b> the issues and principles of design of experiments	<b>K2</b>
3.	<b>recognize</b> appropriate design to be followed	<b>K3</b>
4.	<b>analysis</b> the data collected based on the designing principle used and its underlying assumptions.	<b>K4</b>
5.	<b>interpret</b> statistical results from an experiment and report them in non- technical language	<b>K5</b>

**Mapping of COs with POs & PSOs:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	M		S	M	M	M					M
CO2	S	L	M	M		S	M			L	M	S
CO3	M	S			M	S		L		S	L	M
CO4	L	M	L	L		M	L	M	M			
CO5	L				S	M	M	S	M			

**L – Low; M – Medium; S - Strong**

<b>Course Title</b>	<b>: OPERATIONS RESEARCH -I</b>		
<b>Course Code</b>	<b>: 22USTC10</b>		
<b>Hours/Week</b>	<b>: 6 hrs</b>	<b>Semester</b>	<b>V</b>
<b>Credit</b>	<b>: 4</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**This course introduces you to the fundamentals of Operations Research Models including linear programming and applications.**

**Syllabus**

**Unit – I :**

**No. of Hours : 18 hrs**

Origin - Nature of OR- Decision making- Models in OR- Phase of OR - Uses and Limitations of OR- LPP- Definition, Mathematical formulation of LPP- Graphical Method.

**Unit – II :**

**No. of Hours : 18 hrs**

General LPP- Canonical form & Standard form of LPP- Slack, Surplus & Artificial variable- Maximization- Minimization- Simplex method- Big-M method- Two phase method.

**Unit – III :**

**No. of Hours : 18 hrs**

Duality in LPP- Formulation of Dual LPP- Primal- Dual relationship- Solving LPP using Dual concepts- Dual simplex method.

**Unit – IV :**

**No. of Hours : 18 hrs**

Transportation problem- Balanced, Unbalanced T.P. - Initial basic feasible solution- North West Corner Rule- Row minima- Column minima- Matrix minima (LCM) - Vogel's approximation method- Optimum solution- MODI method.

**Unit – V:**

**No. of Hours : 18 hrs**

Assignment problem- Introduction- Balanced-Unbalanced- Maximization- Minimization- Hungarian method

**Books for Study:**

V. Sundaresan, K.S. Ganapathy and K .Ganesan: Resource Management Techniques.

**Books for Reference:**

Kanti Swarup, P.K. Gupta and Man Mohan: Operations Research.

V.K. Kapoor: Operations Research.

**Web Resources :**

<http://www.cs.toronto.edu/~stacho/public/IEOR4004-notes1.pdf>

<http://nptel.ac.in/courses/112106134/14>

**Course Outcomes (CO) :**

On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
1.	<b>define</b> and <b>formulate</b> linear programming problems	<b>K1 &amp; K3</b>
2.	<b>solve</b> linear programming problems using optimization methods.	<b>K3</b>
3.	<b>Solve</b> specialized programming problems like transportation and assignment problems.	<b>K3</b>
4.	<b>identify</b> best techniques to solve specific problems.	<b>K5</b>
5.	<b>develop</b> general understanding of operational research approach in decision making.	<b>K6</b>

**Mapping of COs with POs & PSOs:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	M		M		M	S				S		M
<b>CO2</b>		M	M	M	M	S		M	M	L	M	M
<b>CO3</b>	M			L		M		L	M		S	M
<b>CO4</b>	L	L	L	M	M	L				M	L	
<b>CO5</b>	L		M			M	M			S		S

**L – Low; M – Medium; S - Strong**

<b>Course Title</b>	<b>: MAJOR ELECTIVE II: STOCHASTIC PROCESSES</b>		
<b>Course Code</b>	<b>: 22USTEC2</b>		
<b>Hours/Week</b>	<b>: 5 hrs</b>	<b>Semester</b>	<b>V</b>
<b>Credit</b>	<b>: 5</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**To analyze the stochastic models and utilities**

**Syllabus**

**Unit – I:**

**No. of Hours : 15 hrs**

Stochastic processes – Definition - Classification of Stochastic processes – Examples of Stochastic processes.

**Unit – II:**

**No. of Hours : 15 hrs**

Markov Chains – Definition and examples – Higher transition probabilities – Chapman – Kolmogorov equation – Classification states.

**Unit – III:**

**No. of Hours : 15 hrs**

Poisson process – Poisson process and related distributions – Birth and death process.

**Unit – IV:**

**No. of Hours : 15 hrs**

Branching Process – Properties of generating functions of branching process.

**Unit – V:**

**No. of Hours : 15 hrs**

Stationary process like – Moving average – Autoregressive – Autoregressive moving average processes.

**Books for Study:**

Medhi, J. : Stochastic Processes

**Books for Reference:**

Karlin, S. And Taylor, H.M. : A First Course in Stochastic Processes  
Ross, S.M. : Stochastic Processes

**Web Resources :**

<https://people.richland.edu/james/lecture/m113/>

**Course Outcomes (CO) :**

On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
1.	<b>understand</b> basic concepts of Stochastic processes.	<b>K1</b>
2.	<b>implement</b> and <b>apply</b> appropriate stochastic models.	<b>K3</b>
3.	<b>calculate</b> transition probability matrix.	<b>K3</b>
4.	<b>communicate</b> stochastic models clearly, in verbal form, using appropriate statistical terminology.	<b>K4</b>

**Mapping of COs with POs & PSOs:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	S	S			M	S				M	S	
CO2	M	L	S		M	M	M	S	M	L	M	M
CO3	S		M	L		M	L	S	M	S		
CO4	L		M		M	L		M			S	S

**L – Low; M – Medium; S - Strong**

<b>Course Title</b>	<b>: TESTING OF HYPOTHESIS</b>		
<b>Course Code</b>	<b>: 22USTC11</b>		
<b>Hours/Week</b>	<b>: 6 hrs</b>	<b>Semester</b>	<b>VI</b>
<b>Credit</b>	<b>: 4</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**The course aims to enable students to gain insight in statistical inference using different methods of testing hypothesis.**

**Syllabus**

**Unit – I :**

**No. of Hours : 18 hrs**

Statistical Hypothesis- Simple, Composite, null and alternative hypothesis- Critical Regions-Types of errors- Level of Significance-Size and Power of the test-Most Powerful(MP) and Uniformly most powerful test(UMP) -Neyman-Pearson Lemma- Simple Problems.

**Unit – II :**

**No. of Hours : 18 hrs**

Sampling distribution of a statistic and its standard error-General procedure for testing of hypothesis-Test of Significance for large sample-Single proportion, Difference of proportions, Single mean, Difference of means Difference of standard deviation-Practical Problems.

**Unit – III :**

**No. of Hours : 18 hrs**

Small sample tests based on Student's t-Assumptions and Applications of Student's t test- General procedure for testing single mean, Difference of means and Paired t test- F- test for equality of two population variances- Practical problems.

**Unit – IV :**

**No. of Hours : 18 hrs**

Chi-square test Statistic-Applications-To test the goodness of fit, To test the independence of attributes (r x s contingency table) - Practical problems.

**Unit – V:**

**No. of Hours : 18 hrs**

Non-Parametric test- definition- advantages and disadvantages-Run test , Median test, Sign test-Mann –Whitney-Wilcoxon U test - Practical problems.

**Books for Study:**

S.C. Gupta & V.K. Kapoor : Fundamentals of Mathematical Statistics.

**Books for Reference:**

R.V. Hogg, Craig & A.T. Craig: Introduction to Mathematical Statistics.

V.K. Rohatgi: An Introduction to Probability theory and Mathematical Analysis.

**Web Resources:**

[http://www.stat.colostate.edu/~vollmer/stat307pdfs/LN7a\\_2017.pdf](http://www.stat.colostate.edu/~vollmer/stat307pdfs/LN7a_2017.pdf)

[http://nptel.ac.in/courses/103106120/LectureNotes/Lec6\\_1.pdf](http://nptel.ac.in/courses/103106120/LectureNotes/Lec6_1.pdf)



**Course Outcomes (CO) :**

On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
1.	<b>demonstrate</b> their understanding of mathematics in statistical inference	<b>K1</b>
2.	<b>check</b> the validity of each testing methods.	<b>K3</b>
3.	<b>associate</b> with the estimate to draw inference.	<b>K4</b>
4.	<b>derive</b> the distributional results needed for statistical inference	<b>K5</b>

**Mapping of COs with POs & PSOs:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	M			L		S						M
CO2		L	M		M			L	L	L	M	
CO3	M	M	L				M	M		M	M	
CO4	L		M	M	M	L				M		L

L – Low; M – Medium; S - Strong

<b>Course Title</b>	<b>: STATISTICAL QUALITY CONTROL</b>		
<b>Course Code</b>	<b>: 22USTC12</b>		
<b>Hours/Week</b>	<b>: 6 hrs</b>	<b>Semester</b>	<b>: VI</b>
<b>Credit</b>	<b>: 4</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**The course aims to educate students on the concepts of Statistical Quality Control with their applications in industries.**

**Syllabus**

**Unit – I :**

**No. of Hours : 18 hrs**

Statistical Quality Control – Need in industry and uses – Chance and assignable causes of variation – Definitions of process control and product control – theory of control charts – Specification and tolerance limits – Comparison of specification and tolerance limits – Modified control limits.

**Unit – II :**

**No. of Hours : 18 hrs**

Control charts for variables:  $\bar{X}$  and R charts – Construction and operation of  $\bar{X}$  and R charts – Criteria for detecting lack of control in  $\bar{X}$  and R charts – Control charts for attributes: p, np, c and u charts, their construction and analysis.

**Unit – III :**

**No. of Hours : 18 hrs**

Acceptance sampling by attributes: Producer's risk and consumer's risk – Concept of AQL, LTPD – Rectifying Inspection plan, AOQ, AOQL, OC curve (Concept only) – Single sampling plan – its OC, ASN and ATI curves (derivation not included).

**Unit – IV :**

**No. of Hours : 18 hrs**

Double sampling plans for attributes – its OC, ASN and ATI curves (derivations not included) – Comparison of single and double sampling plans.

**Unit – V:**

**No. of Hours : 18 hrs**

Sequential sampling plans for attributes – Expression for the OC and ASN of SPRT (derivation not included) – Continuous sampling plans for CSP-1, CSP-2 and CSP-3.

**Books for Study:**

S.C. Gupta & V.K. Kapoor : Fundamentals of Applied Statistics.  
R.C. Gupta: Statistical Quality Control

**Books for Reference:**

Douglas. C. Montgomery: Statistical Quality Control  
M. Mahajan: Statistical Quality Control

**Web Resources:**

[http://homepages.stmartin.edu/fac\\_staff/dstout/MEM650/lecture\\_notes.htm](http://homepages.stmartin.edu/fac_staff/dstout/MEM650/lecture_notes.htm)

**Course Outcomes (CO) :**

**On completion of the course, students should be able to**

CO Number	CO Statement	Knowledge Level
1.	<b>understand</b> the philosophy and basic concepts of quality improvement.	<b>K2</b>
2.	<b>demonstrate</b> use of methods of statistical process control.	<b>K2</b>
3.	<b>design</b> , use and <b>interpret</b> different control charts.	<b>K3 &amp; K5</b>
4.	<b>face</b> the real challenges in industries.	<b>K5</b>

**Mapping of COs with POs & PSOs:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	M	M	M			M					M	M
CO2	L	L	L	M	L	S	M	M		L		M
CO3	M			L	M	L	L	L	M	M	L	L
CO4			L	L	M	M			L	L		

**L – Low; M – Medium; S - Strong**

<b>Course Title</b>	<b>: OPERATIONS RESEARCH-II</b>		
<b>Course Code</b>	<b>: 22USTC13</b>		
<b>Hours/Week</b>	<b>: 6 hrs</b>	<b>Semester</b>	<b>VI</b>
<b>Credit</b>	<b>: 4</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

The course aims to provide the basic tools of Operations research in solving the management problems using mathematical approach for decision making.

**Syllabus**

**Unit – I :** **No. of Hours : 18 hrs**

Sequencing problem- Problems with n-jobs on two machines- problems with n-jobs on three machines- problems with n-jobs on m–machines- simple problems

**Unit – II :** **No. of Hours : 18 hrs**

Game Theory- Introduction- Two person zero sum game: - Maximin- Minimax principle- Game's with saddle point and without saddle point- Dominance property- Graphical solutions of  $2 \times n$  and  $m \times 2$  Games- simple problems.

**Unit – III :** **No. of Hours : 18 hrs**

Network analysis- Basic Concepts- Constraints in Network- Construction of network- Critical path method (CPM) - Program Evaluation Review Technique (PERT) – simple problems .

**Unit – IV :** **No. of Hours : 18 hrs**

Replacement problem- Replacement of items that deteriorate with time- Replacement of items whose maintenance cost increases with time & the value of money remains same during the period and the value of money also changes with time- selection of best machine amongst two- simple problems.

**Unit – V:** **No. of Hours : 18 hrs**

Decision theory- Introduction-Types of Decision Making Environment- Decision Making under uncertainty- Maximin criterion- Minimax criterion- Laplace criterion-Hurwitz criterion- Decision Making under risk-EMV-EOL-EVPI-Decision Tree Analysis (Concepts only) - simple problems.

**Books for Study:**

V. Sundaresan, K.S. Ganapathy and K.Ganesan: Resource Management Techniques.  
V.K. Kapoor: Operations Research.

**Books for Reference:**

Goel B. S. and Mittal S. K.: Operations Research.  
Kanti Swarup, P.K. Gupta and Man Mohan: Operations Research.

**Course Outcomes (CO) :**

On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
1.	<b>propose</b> the best strategy using decision making methods under uncertainty and game theory.	<b>K1</b>
2.	<b>formulate</b> and <b>solve</b> problems in the form of networks and graphs.	<b>K2 &amp; K3</b>
3.	<b>solve</b> problems logically, critically, analytically and creatively.	<b>K3</b>
4.	<b>use</b> CPM and PERT techniques to plan, schedule and control project activities.	<b>K4</b>
5.	<b>report</b> and <b>interpret</b> findings in scientific and concise manner.	<b>K5</b>

**Mapping of COs with POs & PSOs:**

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1		M	M	M	S	M				M	M	
CO2	L	L		M		L		M			L	S
CO3			L		M	M		M		S	L	M
CO4	M		M	L	L	S	S		M	M		
CO5	M	M				M			L			M

L – Low; M – Medium; S - Strong

<b>Course Title</b>	<b>: MAJOR ELECTIVE III: ACTUARIAL STATISTICS</b>		
<b>Course Code</b>	<b>: 22USTEC3</b>		
<b>Hours/Week</b>	<b>: 5 hrs</b>	<b>Semester</b>	<b>: VI</b>
<b>Credit</b>	<b>:5</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**The course aims to understand the applications of compound interest, annuity certain, premium calculations and the construction of life tables.**

**Syllabus**

**Unit – I :**

**No. of Hours : 15 hrs**

Simple interest, compound interest, nominal and effective rate of interest – Simple problems.

**Unit – II :**

**No. of Hours : 15 hrs**

Present value and accumulated value of a single payment with fixed interest rate or varying rate of interest during certain period – Varying payments during certain period with fixed or varying rate of interest – Simple problems.

**Unit – III :**

**No. of Hours : 15 hrs**

Annuities and its types – Present and accumulated value of an immediate annuity and with different period value of an annuity due and with deferment period – Simple problems.

**Unit – IV :**

**No. of Hours : 15 hrs**

Redemption of loan – sinking fund – Lender 's sinking fund – Simple problems – Probabilities of survival and death –  $p_x, q_x, {}_n p_x, {}_m q_x, {}_{m|n} q_x$  and  ${}_m | n q_x$  – Simple problems.

**Unit – V:**

**No. of Hours : 15 hrs**

Principle of life assurance – premium and its types (single, annual, yearly, half-yearly, quarterly) – Four basic types of assurance – Temporary, Whole life, Endowment and Pure Endowment.

**Books for Study:**

Mathematical Basis of Life Assurance – published by Insurance Institute of India, Bombay.

Applied Statistics by S.C. Gupta and V.K. Kapoor (for Unit-III)

**Web Resources :**

<http://www.stats.ox.ac.uk/~winkel/o13.pdf>

**Course Outcomes (CO) :**

**On completion of the course, students should be able to**

CO Number	CO Statement	Knowledge Level
1.	<b>recognize</b> the important role of statistical principles and their application in actuarial sciences.	<b>K1</b>
2.	<b>analyse</b> and interpret actuarial and statistical information	<b>K4</b>
3.	<b>justify</b> and <b>communicate</b> the necessary skills for dealing with organization teams and policy issues.	<b>K4</b>
4.	critically engage with and <b>evaluate</b> actuarial and statistical problems.	<b>K5</b>
5.	<b>develop</b> insight in insurance and financial markets.	<b>K6</b>

### Mapping of COs with POs & PSOs:

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
<b>CO1</b>	S		S	M	M	M		M		M	S	M
<b>CO2</b>	M	L				L				L		
<b>CO3</b>		M	M	L	L	M					L	
<b>CO4</b>	L			L		M		M	L			S
<b>CO5</b>	L	M	M		M	M	M	M	M	M		M

L – Low; M – Medium; S - Strong

<b>Course Title</b>	<b>: CORE PRACTICAL IV</b>		
<b>Course Code</b>	<b>: 22USTQC4</b>		
<b>Hours/Week</b>	<b>: 4 hrs</b>	<b>Semester</b>	<b>: VI</b>
<b>Credit</b>	<b>: 4</b>	<b>Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**The course aims to demonstrate the concepts of statistical inference and Statistical Quality Control with simple problems.**

**Syllabus**

**TESTING OF HYPOTHESIS**

- t-test for single mean, two means (independent and dependent samples) and correlation coefficient.
- F-test for variance.
- Chi-square test of homogeneity, goodness of fit and independence of attributes.

**STATISTICAL QUALITY CONTROL**

- Control charts for variables:  $\bar{X}$  and R charts.
- Control charts for attributes: p, np and c charts.

**Books for Study:**

R.C. Gupta: Statistical Quality Control

S.C. Gupta & V.K. Kapoor : Fundamentals of Mathematical Statistics

**Books for Reference:**

V.K. Rohatgi: An Introduction to Probability theory and Mathematical Analysis.

Douglas. C. Montgomery: Statistical Quality Control

**Web Resources :**

[http://www.stat.colostate.edu/~vollmer/stat307pdfs/LN7a\\_2017.pdf](http://www.stat.colostate.edu/~vollmer/stat307pdfs/LN7a_2017.pdf)

<https://www.wiley.com/college/sc/reid/chap6.pdf>



### Course Outcomes (CO) :

On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
1.	<b>understand</b> the concepts of testing of hypothesis and statistics used in industries.	<b>K1</b>
2.	<b>design</b> , use and <b>interpret</b> different control charts.	<b>K3 &amp; K5</b>
3.	<b>check</b> the validity of each testing methods.	<b>K4</b>
4.	<b>associate</b> with the estimate to draw inference.	<b>K5</b>
5.	<b>face</b> the real challenges in industries.	<b>K5</b>

### Mapping of COs with POs & PSOs:

CO	PO					PSO						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	M			L		S						M
CO2		L	M		M			L	L	L	M	
CO3	M	M	L				M	M		M	M	
CO4	L		M	M	M	L				M		L
CO5		L	M		M			L	L	L	M	

L – Low; M – Medium; S - Strong

<b>Course Title</b>	<b>: ALLIED: STATISTICAL METHODS – I</b>		
<b>Course Code</b>	<b>: 22UCSAC3</b>		
<b>Hours/Week</b>	<b>: 5 hrs</b>	<b>Semester</b>	<b>III</b>
<b>Credit</b>	<b>: 5</b>	<b>Batch</b>	<b>: 2022-2025</b>

**Course Objective:**

**The course aims to gain knowledge in basic Statistical Methods and their applications.**

**Syllabus**

**Unit – I :**

**No. of Hours : 15hrs**

Definition of Statistics – Uses and limitations of Statistics – Measures of Central tendency: Criteria of a good average – Mean, Median and Mode – Merits and Demerits – Simple problems.

**Unit – II :**

**No. of Hours : 15 hrs**

Measures of Dispersion: Criteria of a good measures of dispersion – Range – Quartile deviation – Standard deviation – Coefficient of Variation – Simple problems .

**Unit – III :**

**No. of Hours : 15 hrs**

**S k e w n e s s** – Types of skewness – Karl Pearson’s and Bowley’s coefficients of skewness – Simple problems – Definition of kurtosis – Fitting of linear and Quadratic equations..

**Unit – IV :**

**No. of Hours : 15 hrs**

Correlation: Types of correlation – Scatter diagram – Karl Pearson’s correlation coefficient for ungrouped data – Spearman’s rank correlation coefficient – Simple problems.

**Unit – V:**

**No. of Hours : 15 hrs**

Regression analysis: Uses of regression analysis – Regression coefficients – Regression equations for ungrouped data- Simple problems.

**Books for Study:**

R.S. N. Pillai & V. Bagavathi: Statistics.

**Books for Reference:**

D. N. Elhance, Veena Elhance & B.M. Aggarwal: Fundamentals of Statistics

S.P. Gupta: Statistical Methods.

DC. Sanchetti & V. K .Kapoor: Fundamentals of Statistics..

**Web Resources :**

[https://www.fd.cvut.cz/departament/k611/PEDAGOG/THO\\_A/A\\_soubory/statistics\\_firstfive.pdf](https://www.fd.cvut.cz/departament/k611/PEDAGOG/THO_A/A_soubory/statistics_firstfive.pdf)

**Course Outcomes (CO) :**

**On completion of the course, students should be able to**

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>1.</b>	<b>understand</b> the basic statistical methodologies	<b>K2</b>
<b>2.</b>	<b>apply</b> a range of statistical techniques based on theory and concepts.	<b>K3</b>
<b>3.</b>	<b>relate</b> statistics to real life problems.	<b>K3</b>
<b>4.</b>	<b>communicate</b> meaningfully and productively with others.	<b>K4</b>
<b>5.</b>	<b>fit</b> a linear model and show how much it is related	<b>K5</b>

<b>Course Title</b>	<b>: ALLIED: STATISTICAL METHODS – II</b>		
<b>Course Code</b>	<b>: 22UCSAC4</b>		
<b>Hours/Week</b>	<b>: 5 hrs</b>	<b>Semester</b>	<b>IV</b>
<b>Credit</b>	<b>: 5</b>	<b>Batch</b>	<b>: 2022-2025</b>

**Course Objective:**

**The course aims to learn about the common methods of sampling, testing of statistical hypothesis and analysis of variance.**

**Syllabus**

**Unit – I :**

**No. of Hours : 15 hrs**

Sampling: Definitions of population and sample – Census method – Merits of Sampling – Methods of Sampling: Simple random sampling – Stratified random sampling – Systematic sampling – Cluster sampling – Judgement sampling – Quota sampling – Convenience sampling.

**Unit – II :**

**No. of Hours : 15 hrs**

Null and alternative hypotheses – Type I and Type II errors – Critical region and acceptance region – Level of Significance – One –tailed and two-tailed tests – Sampling distribution and standard error – Procedure of testing of hypothesis – Large sample tests for single proportion, difference of two proportions, single mean and difference of two means – Simple problems.

**Unit – III :**

**No. of Hours : 15 hrs**

Assumptions in t-test – t-tests for single mean and difference of two means – Paired t- test and t- test for correlation coefficient – Simple problems. .

**Unit – IV :**

**No. of Hours : 15 hrs**

Contingency Table – 2x2 contingency table – Conditions for the validity of Chi-square test – Chi-square tests of homogeneity and independence of two attributes – Simple problems.

**Unit – V:**

**No. of Hours : 15 hrs**

Analysis of Variance – Definition and uses – ANOVA for one-way classification – ANOVA for two-way classification – Simple problems.

**Books for Study:**

S. P. Gupta: Elementary Statistical Methods.

**Books for Reference:**

S.C. Gupta and V.K. Kapoor: Fundamentals of Applied Statistics.

S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics..

**Web Resources :**

[https://www.fd.cvut.cz/department/k611/PEDAGOG/THO\\_A/A\\_soubory/statistics\\_firstfive.pdf](https://www.fd.cvut.cz/department/k611/PEDAGOG/THO_A/A_soubory/statistics_firstfive.pdf)

**Course Outcomes (CO) :**

**On completion of the course, students should be able to**

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
1.	<b>recall</b> different statistical methodologies.	<b>K1</b>
2.	<b>test</b> and <b>estimate</b> the parameters.	<b>K3</b>
3.	<b>examine</b> suitable statistical tools.	<b>K4</b>
4.	<b>conclude</b> with well-defined inference.	<b>K5</b>
5.	<b>integrate</b> theoretical concepts with real life problems.	<b>K6</b>

<b>Course Title</b>	<b>: NME – I : SURVEY METHODOLOGY</b>		
<b>Course Code</b>	<b>: 22USTNEC1</b>		
<b>Hours/Week</b>	<b>: 2 hrs</b>	<b>Semester</b>	<b>: III</b>
<b>Credit</b>	<b>: 2</b>	<b>Batch</b>	<b>: 2022-2025</b>

**Course Objective:**

**The course aims to illustrate the various methodologies in statistics.**

**Syllabus**

**Unit – I :**

**No. of Hours : 6 hrs**

Definition of Statistics – Statistical survey –Planning a statistical survey – Executing a Statistical survey.

**Unit – II:**

**No. of Hours : 6 hrs**

Census method and sampling – Methods of sampling: Simple random sampling – Stratified random sampling – Systematic sampling – Judgement sampling – Quota sampling – Convenience sampling. (Concepts only)

**Unit – III :**

**No. of Hours : 6 hrs**

Collection of Data: Primary and secondary data – Collection of primary data – Sources of secondary data – Framing a questionnaire.

**Unit – IV:**

**No. of Hours : 6 hrs**

Classification – Definition – Objectives, Rules and Types of Classification – Tabulation – Definition – Objectives, Rules and Types of Tabulation – Problems based on Tabulation.

**Unit – V:**

**No. of Hours : 6 hrs**

Simple bar diagram – Multiple bar diagram – Subdivided bar diagram – Pie diagram – Histogram – Time series graph.

**Books for Study:**

R.S.N. Pillai & Bagavathi: Statistics.

**Books for Reference:**

B. L. Agarwal: Programmed Statistics.

**Web Resources:**

[http://www.mypolyuweb.hk/machanck/lectnotes/c1\\_des.pdf](http://www.mypolyuweb.hk/machanck/lectnotes/c1_des.pdf)

**Course Outcomes (CO) :**

**On completion of the course, students should be able to**

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
1.	<b>know</b> the basic concepts in sample surveys and data.	<b>K1</b>
2.	<b>obtain</b> the knowledge of framing Questionnaire.	<b>K2</b>
3.	<b>organize</b> , manage and <b>present</b> the collected data .	<b>K3</b>
4.	<b>explore</b> the data in forms of tables, diagrams and graphs.	<b>K4</b>
5.	<b>visualise</b> the data collected and interpret.	<b>K5</b>

<b>Course Title</b>	<b>: NME – II: BUSINESS STATISTICS</b>		
<b>Course Code</b>	<b>: 22USTNEC2</b>		
<b>Hours/Week</b>	<b>: 2 hrs</b>	<b>Semester</b>	<b>IV</b>
<b>Credit</b>	<b>: 2</b>	<b>Batch</b>	<b>: 2022-2025</b>

**Course Objective:**

**To learn statistical techniques for business data analysis.**

*Note: Derivations are not included Questions – Only on the topics mentioned.*

**Unit – I**

**No of hours: 6 hrs**

Measures of Central tendency – Definition and its characteristics – Mean, Median, Mode- Simple problems.

**Unit – II**

**No of hours: 6 hrs**

Measures of Dispersion – Definition and its properties – Range, Quartile deviation, Standard deviation and Co-efficient of variation- Simple problems.

**Unit – III**

**No of hours: 6 hrs**

Correlation – Definition , its types and uses co-efficient of correlation for ungrouped data only – Rank correlation co-efficient (No repeated ranks) – Simple problems- Regression- Definition its types and uses – Simple problems.

**Unit – IV**

**No of hours: 6 hrs**

Time series – Definition and its uses – Components of Time series – Measurement of Trend by fitting a straight line and by the methods of moving average – Measurement of Seasonal variation by simple average method – Simple problems.

**Unit – V**

**No of hours: 6 hrs**

Index Number: Definition and its uses – classification of index number – problems involved in the construction of index numbers – Laspeyre’s, Paasche’s and Fisher’s Index Number – Simple problems- Cost of living index numbers (concept only).

**BOOKS FOR STUDY**

R.S.N. Pillai and Bagavatti: Statistics

P.R. Vital :Business Statistics

**BOOKS FOR REFERENCE**

B.L.Agarwal : Programmed Statistics.



**Course Outcomes (CO) :**

**On completion of the course, students should be able to**

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
1.	<b>apply</b> various statistical techniques related to business	<b>K1</b>
2.	<b>identify</b> the business data and present it precisely	<b>K2</b>
3.	<b>organize</b> and <b>summarize</b> the business data using descriptive statistics	<b>K3</b>
4.	<b>predict</b> the relevant relationship between business variables	<b>K5</b>

<b>Course Title</b>	<b>: NMSB –I: INRODUCTION TO LEAN SIX SIGMA</b>		
<b>Course Code</b>	<b>: 22USTNSC1</b>		
<b>Hours/Week</b>	<b>: 2 hrs</b>	<b>Semester</b>	<b>VI</b>
<b>Credit</b>	<b>: 2</b>	<b>Batch</b>	<b>: 2022-2025</b>

**Unit 1:**

Introduction to Lean Six Sigma, Overview of Lean and Six Sigma, Importance and benefits of Lean Six Sigma.

**Unit 2:**

Lean Fundamentals, Principles of Lean thinking, Identifying value-added and non-value-added activities.

**Unit 3:**

Six Sigma Fundamentals, Overview of DMAIC methodology, Overview of 5S methodology.

**Unit 4:**

Identifying improvement opportunities using Lean principles, Overview of continuous improvement practices like Kaizen.

**Unit 5:**

Project Management and Tools, Project selection and scoping, project case studies.

**References**

1. "The Lean Six Sigma Pocket Tool book: A Quick Reference Guide to 100 Tools for Improving Quality and Speed" by Michael L. George, John Maxey, David Row lands, and Malcolm Upton Publisher: McGraw-Hill Education, Year: 2004.
2. "Lean Six Sigma For Dummies" by John Morgan and Martin Brenig-Jones, Publisher: For Dummies, Year: 2012.
3. "Lean Six Sigma Demystified, Second Edition" by Jay Arthur, Publisher: McGraw-Hill Education, Year: 2010.
4. "The Six Sigma Handbook, Fifth Edition" by Thomas Pyzdek and Paul Keller, Publisher: McGraw-Hill Education, Year: 2018.

"Lean Six Sigma: Combining Six Sigma Quality with Lean Production Speed" by Michael L. George, Publisher: McGraw-Hill Education, Year: 2002

<b>Course Title</b>	<b>: NON MAJOR SKILL BASED –II: VITAL STATISTICS</b>		
<b>Course Code</b>	<b>: 22USTNSC2</b>		
<b>Hours/Week</b>	<b>: 2 hrs</b>	<b>Semester</b>	<b>: VI</b>
<b>Credit</b>	<b>: 2</b>	<b>25Batch</b>	<b>: 2022- 2025</b>

**Course Objective:**

**The course aims to study the applications of Statistics in the field of Health statistics.**

## **Syllabus**

**Unit – I :** **No. of Hours : 6 hrs**

Definition of Vital Statistics – Uses of Vital Statistics – Methods of obtaining Vital Statistics.

**Unit – II :** **No. of Hours : 7 hrs**

Measurement of mortality: Crude death rate – Specific death rate – Age specific death rate – Infant mortality rate – Standardized death rate – Direct method of standardization – Indirect method of standardization – Simple problems.

**Unit – III :** **No. of Hours : 6 hrs**

Measure of fertility: Crude birth rate – General fertility rate – Specific fertility rate – Age specific fertility rate – Total fertility rate – Simple problems..

**Unit – IV :** **No. of Hours : 5 hrs**

Gross reproduction rate – Net reproduction rate – Simple problems.

**Unit – V:** **No. of Hours : 6 hrs**

Life tables – Uses of life tables – Curate expectation of life and complete expectation of life – Central mortality – Description of a life table – Construction of a life table – Simple problems .

S.C. Gupta & V.K. Kapoor : Fundamentals of Applied Statistics.

**Books for Reference:**

D. C. Sancheti & V.K.Kapoor: Statistics

S.P. Gupta: Statistical Methods.

**Web Resources :**

<http://www.medicine.mcgill.ca/epidemiology/hanley/c609/Material/VitalStatisticsEoB.pdf>