GOVERNMENT ARTS COLLEGE (AUTONOMOUS) COIMBATORE 641 018

DEPARTMENT OF STATISTICS



B. Sc STATISTICS Syllabus (with effect from 2023 – 24)

GOVERNMENT ARTS COLLEGE, COIMBATORE 641 018 B. Sc. STATISTICS (CBCS PATTERN)

(For the students admitted from the academic year 2023-2024 and onwards)

Scheme of Examination

Part	Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext- Min.	Total Pass Mark	Credits
		Semester - 1							
Ι	23TAM11L	Part–I :Language: Tamil I	6	25	75	100	30	40	3
II	23ENG12L	Part–II: English I	6	25	75	100	30	40	3
III	23BST13C	Core I : Descriptive Statistics	5	25	75	100	30	40	4
III		Core Practical – I: Statistics Practical – I (Using MS Excel)	3	-	-	-	-	-	-
III	23BST14A	Allied – 1: Mathematics for Statistics - I	8	25	75	100	30	40	5
IV	23ENV1GE	Value Education – Environmental Studies	2	25	75	100	30	40	2
		Semester – 11							
Ι	23TAM21L	Part–I: Language:Tamil II	6	25	75	100	30	40	3
II	23ENG22L	Part–II: English II	4	25	75	100	30	40	2
III	23BST23C	Core II: Probability and Random variables	5	25	75	100	30	40	4
III	23BST24P	Core Practical – I: Statistics Practical – I (Using MS Excel)	3	40	60	100	24	40	4
III	23BST25A	Allied – 2: Mathematics for Statistics - II	8	25	75	100	30	40	4
IV	23VAL2GE	Value Education – Gandhian Thoughts	2	25	75	100	30	40	2
IV	23NMN2AL	Naan Mudhalvan Scheme- Skill Course : Overview of English Language Communication	2	25	75	100	30	40	2

Part	Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext-Min.	Total Pass Mark	Credits
		Semester – III							
*I	23TAM31L	*Part–I: Language: Tamil III	6	25	75	100	30	40	3
II	23ENG32L	* Part–II: English III	6	25	75	100	30	40	3
III	23BST33C	Core III: Probability Distributions	6	25	75	100	30	40	4
III	23BST34A	Allied – 3: Programming in 'C'	5	25	75	100	30	40	4
III		Core Practical – II: Statistics Practical – II (Using C Language)	2	-	-	-	-	-	-
IV	23BST35S	Skill Based Subject–I: Indian Official Statistics	3	25	75	100	30	40	2
IV	23NMN3AL	Naan Mudhalvan Scheme- Skill Course : Aptitude Skills for Employability	2	25	75	100	30	40	2
		Semester – IV							
I*	23TAM41L	* Part–I: Language: Tamil IV	6	25	75	100	30	40	3
Π	23ENG42L	*Part–II: English IV	6	25	75	100	30	40	3
III	23BST43C	Core IV: Basic Sampling Theory	5	25	75	100	30	40	4
III	23BST44P	Core Practical – II: Statistics Practical – II (Using C Language)	3	40	60	100	24	40	3
III	23BST45A	Allied – 4: Numerical Analysis	5	25	75	100	30	40	4
IV	23BST46S	Skill Based Subject–II: Elements of Actuarial Statistics	3	25	75	100	30	40	3
IV	23NMN4AL	Naan Mudhalvan Scheme- Skill Course : Employability Skills	2	25	75	100	30	40	2
V	23EXA4GE	<pre>@Extension Activities: NCC/NSS/SPORTS/YRC</pre>	-	-	-	-	-	-	1

Part	Sub Code	Title of the Paper	Hrs (wk)	Inter nal	Exte rnal	Total Mar	Ext-	Total Pass	Cred its
		Semester – V							
III	23BST51C	Core V : Statistical Estimation Theory	5	25	75	100	30	40	4
III	23BST52C	Core VI: Statistical Quality Control	5	25	75	100	30	40	4

III	23BST53C	Core VII: Elements of Econometrics	4	25	75	100	30	40	3
III	23BST54C	Core VIII: AOS: Elements of Operations Research	5	25	75	100	30	40	3
III		Core Practical – III: Statistics Practical – III (Using Scientific Calculator)	2	-	-	-	-	-	-
IV	23BST55S	Skill Based Subject – III: Educational and Psychological Statistics	4	25	75	100	30	40	3
IV	23BST5EL	Non-Major Elective Paper – I:	3	25	75	100	30	40	2
IV	23NMN5AL	Naan Mudhalvan Scheme- Skill Course : Computational Intelligence for Employability	2	25	75	100	30	40	2
		Semester – VI							
III	23BST61C	Core IX: Testing Statistical Hypothesis	6	25	75	100	30	40	4
III	23BST62C	Core X: Design of Experiments	6	25	75	100	30	40	4
III	23BST63C	Core XI:AOS: Applied Statistics	5	25	75	100	30	40	3
III	23BST64P	Core Practical – III: Statistics Practical – III (Using Scientific Calculator)	3	40	60	100	24	40	3
III	23BST65P	Core Practical – IV: Statistics Practical – IV (Using SPSS)	2	40	60	100	24	40	4
III	23BST66V	Project & Viva – Voce	-	25	75	100	30	40	15
IV	23BST67S	Skill Based Subject–IV: Demographic methods	3	25	75	100	30	40	3
IV	23BST6EL	Non-Major Elective Paper – II:	3	25	75	100	30	40	2
IV	23NMN6AL	Naan Mudhalvan Scheme- Skill Course : Advanced Data Analytics using Python	2	25	75	100	30	40	2
		Total/Credits	180			4100			140

*Courses offered with four semester Language Papers @ No External Examinations. Only Continuous Internal Assessment (CIA)

Year		Sem.	Subject Code	Title of the Paper	Hours/ Week
202 on	3-2024 wards	Ι	23BST13C	CORE PAPER I – DESCRIPTIVE STATISTICS	5
COU	URSE L	EVEL (OUTCOMES:		
On t	he succe	ssful co	mpletion of the c	course, students will be able to:	
1	Design	the bas	ics of data collec	ction and organization of data	
2	Apply	he theo	ry and application	ons of statistics	
3	Present	the dat	a through diagra	ms and graphs	
4	Explair Kurtosi	n the sta .s	tistical concepts	of Measures of central tendency, Dispersion, Skewn	ness and
5	Calcula Measur	te and i es of Sl	nterpret the varion kewness	ous Measures of central tendency, Measures of disp	ersion and
6	Analyz	e and in	terpret the relation	ionship between variables using correlation	
7	Estima	te the va	alues using regre	ssion analysis	

Statistics – Definition – Origin - Scope and Limitations – Collection of data - Primary and Secondary data – Classification and Tabulation of Statistical Data - Formulation of Frequency Distributions - Diagrammatic Representation - One Dimensional and Two Dimensional Diagrams – Box plots - Graphical Representation – Histogram - Frequency Polygon - Frequency Curve and Ogives.

Unit - II

Measures of Central Tendency - Characteristics of a Good Average - Arithmetic Mean, Median, Mode - Geometric Mean and Harmonic Mean - Weighted Arithmetic Mean – Merits and Demerits - Trimmed mean.

Unit – III

Absolute and Relative Measures of Dispersion – Range - Quartile Deviation - Mean Deviation - Standard Deviation and Co-efficient of Variation - Merits and Demerits .

Measures of Skewness - Karl-Pearson's Co-efficient of Skewness - Bowley's Co-efficient of Skewness.

Kurtosis (concept only)

Unit – IV

Correlation - Types of Correlation - Uses - Properties - Scatter Diagram – Karl Pearson's coefficient of Correlation - Spearman's Rank Correlation - Concurrent Deviation Method of Correlation – Properties of Correlation coefficient.

Unit - V

Regression Analysis - Regression Equations - Properties of Regression Co-efficients - Simple problems - comparison of correlation and regression.

PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

RE	FERENCES:
1	S.C. Gupta and V.K. Kapoor (2002).Fundamentals of Mathematical Statistics, 11 th thoroughly Revised Edition, Reprint 2013, Sultan Chand & Sons Publishers, New Delhi.
2	S.P.Gupta (2012). Statistical Methods, 42 nd Revised Edition, Sultan Chand & Sons Publishers, New Delhi.
FU	RTHER READING:
1	B.L. Agarwal (2009). Programmed Statistics, 2 nd Edition, New Age International Publishers, New Delhi.
2	Goon, A.M., Gupta, M. K., Dasgupta, B. (2016). Fundamentals of Statistics, Vol. I, World Press, Kolkata, India
3	R.S.N. Pillai and V. Bagavathi (1984). Statistics – Theory and Practice, Reprint 1999, S. Chand & Sons Company Ltd, New Delhi.
RE	LATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.investopedia.com/terms/d/descriptive_statistics.asp
2	https://youtu.be/mk8tOD0t8M0
3	https://youtu.be/MXaJ7sa7q-8

				С	ourse Lev	vel Outcon	nes (CLO)	
			1	2	3	4	5	6	7
	1	Disciplinary Knowledge		✓	~	~	~	~	\checkmark
(0	2	Communication Skills		\checkmark		\checkmark	\checkmark	\checkmark	\checkmark
s (PL	3	Critical Thinking	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark
come	4	Research related Skills			\checkmark		\checkmark	\checkmark	\checkmark
el Out	5	Analytical Reasoning		\checkmark			\checkmark	\checkmark	\checkmark
ı Leve	6	Problem Solving	\checkmark						
ogran	7	Team Work			\checkmark	\checkmark	\checkmark		
\Pr	8	Moral and Ethical	✓			~	~		
	9	Awareness Multi Cultural Competence	✓			✓	✓		

Y	ear	Sem.	Subject Code	Title of the Paper	Hours/ Week					
202 onv	3-2024 wards	II	23BST23C	CORE PAPER II: PROBABILITY AND RANDOM VARIABLES	5					
COU	URSE L	EVEL	OUTCOMES:							
On the successful completion of the course, students will be able to:										
1	Explain the concept of probability, basic terminologies and the application of addition and multiplication theorems.									
2	Analyze the basics of conditional probability and the related theorems									
3	Summarize the concept of random variables and its related terminologies. Evaluate various									
4	Explain combin	n mathemation of	matical expectat	ion and its properties related to variance, covariance les.	and linear					
5	Calcula Discus	te mon s the cur	nent generating mulants, charact	function and explain its limitations along with peristic functions and its properties.	properties.					
6	Demonstrate the concept of convergence in probability, bivariate distributions, marginal and conditional distributions.									
7	Analyz expecta	e the in ations	dependence of r	andom variables, deriving moments, marginal and c	onditional					

Probability - Basic terminology - Sample space - Classification of events - Mathematical, Statistical and Axiomatic definition of probability - Theorems on Probability -Addition and Multiplication theorems for two events - Conditional Probability - Baye's theorem - Boole's inequality - Simple problems.

Unit - II

Random variables - Distribution function - Properties (without proof) - Discrete and Continuous Random Variables - Probability Mass function - Probability density function - Measures of central tendency for continuous random variable - Mean, Median, Mode, Dispersion and moments - simple problems.

Unit – III

Mathematical Expectation - Expected value of function of a random variable - Properties of Expectations - Properties of variance - covariance - Linear combination of Random Variables - simple problems.

Unit – IV

Moment Generating Function and Cumulants - Limitations - Properties of MGF - Uniqueness theorem (statement only) - Cumulants – Properties (without proof).

Characteristics Function - Properties (without proof) - T Chebychev's inequality - Convergence in probability - Weak law of large number - Concept of Central limit theorem - De Moivre's Theorem (Statement only).

Unit - V

Bivariate Distributions - Concept of Bivariate Distributions - Marginal and Conditional Distributions - Independence of Random Variables - Moments of Bivariate probability distributions - Marginal and Conditional expectations - Conditional variance.

PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

REFERENCES:

1	R.V. Hogg and A.H. Craig (2012).	Introduction to Mathematical	Statistics, Seventh	Edition,
1	Pearson Education.			

2 S.C. Gupta and V.K. Kapoor (2002).Fundamentals of Mathematical Statistics, 11th thoroughly Revised Edition, Reprint 2013, Sultan Chand & Sons Publishers, New Delhi.

FURTHER READING:

1 J.N. Kapoor and H.C. Saxena (2011). Mathematical Statistics, Sultan Chand & Sons, New Delhi.

RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]

- 1 https://nptel.ac.in/courses/111/102/111102111/
- 2 https://nptel.ac.in/courses/111/104/111104146/

				С	ourse Lev	vel Outcor	nes (CLO)	
			1	2	3	4	5	6	7
comes (PLO)	1	Disciplinary Knowledge	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		
	2	Communication Skills	~	\checkmark	~				\checkmark
	3	Critical Thinking	\checkmark	\checkmark	✓				
	4	Research related Skills		\checkmark	\checkmark	\checkmark		\checkmark	
el Out	5	Analytical Reasoning			\checkmark	\checkmark	\checkmark		
n Leve	6	Problem Solving	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		
ogran	7	Team Work	\checkmark	\checkmark	\checkmark				\checkmark
\Pr	8	Moral and Ethical Awareness	~	✓	~				
	9	Multicultural Competence		✓	✓	✓		✓	

YearSem.Subject CodeTitle of the Paper		Hours/ Week		
)23-)24 vards	II	23BST24P	CORE PRACTICAL – I: STATISTICS PRACTICAL – I (Using MS Excel)	3
be succ		completion of th	e course, students will be able to:	
Evola	vin the t	beery through p	ractical oriented training	
Derfo	rm the	basic operations	of Excel software	
Apply	the so	of two for various		
Com	y the su	tistical massures		
Derfo	rm stati	istical data analy	sis	
Com	nite pro	bability conditi	onal probability and probabilities using Baye's theo	rem
Com	uto Ev	postation maan	and variance	
Com	Jule Ex	pectation, mean		
1 Form	ation o	f Frequency Dis	tribution	
) Form	ation o	f Diagrams - Ba	n Diagrams Pie Diagram	
2. Form	ation o	f Graphs Freque	an Diagrams, The Diagram	
1 Calci	ilation	of Measures of (Central Tendency - Mean Median Mode Geometric	c Mean
and H	Harmon	ic Mean	central rendency - Wean, Wedian, Wode, Ocometrik	e ivicali,
5. Calci	ulation	of Quartiles and	Percentiles	
5. Calc	ulation	of Measures of	Dispersion- Range, Quartiles Deviation, Mean Devi	ation,
Stan	dard De	eviation and Var	iance.	
7. Calc	ulation	of Coefficient o	f Skewness and Kurtosis.	
B. Corr	elation	- Scatter Diagra	m - Calculation of Correlation Coefficients	
9. Regi	ression	- Finding Regre	ssion Coefficients and Formation of Regression Line	es.
0. Calc	ulation	Probability		
1. Calc	ulation	of Conditional p	probability	
2. Solv	e probl	ems under Baye	s' theorem	
3. Expe	ectation	n - mean and vari	ance	
DAGO	GY ST	RATEGIES		
• Lec	turing	and Hands-on tra	aining	
• Lat	• Exper	iments		
• Qu	estionin	ng		
• Cla	ss Test	ill Droatian		
 Qui Pro 	ız & Dî viding	feedback		
	23- 224 vards URSE 1 he succ Expla Perfo Apply Comp Perfo Comp Perfo Comp Perfo Comp Perfo Comp Calco Stan Calco Stan Calco Stan Calco Stan Calco Calco Calco Calco Calco </td <th>23- 024 II vards URSE LEVEI he successful Explain the t Perform the Apply the so Compute sta Perform stati Compute pro Compute pro Compute pro Compute pro Compute Ex 1. Formation o 2. Formation o 3. Formation o 4. Calculation and Harmon 5. Calculation 6. Calculation 7. Calculation 8. Correlation 9. Regression 0. Calculation 1. Calculation 2. Solve probl 3. Expectation 9. Regression 0. Calculation 1. Calculation 2. Solve probl 3. Expectation 9. Lecturing Lab Exper Quiz & Dr Providing</th> <td>CodeQ23- Q24II23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsIII23BST24PVardsIII23BST24PVardsIII23BST24PPerform the basic ompletion of the Explain the theory through probability Compute statistical measuresPerform statistical measuresPerform statistical data analy Compute probability, conditi Compute probability, conditi Compute Expectation, mean1. Formation of Frequency Dist 2. Formation of Diagrams - Ba3. Formation of Graphs - Frequency 4. Calculation of Measures of I Standard Deviation and Var5. Calculation of Measures of I Standard Deviation and Var6. Calculation of Coefficient o7. Calculation of Conditional p9. Regression - Finding Regres0. Calculation of Conditional p2. Solve problems under Bayes3. Expectation - mean and variPAGOGY STRATEGIES• Lecturing and Hands-on tra• Aub Experiments• Quiz & Drill Practice• Providing feedback</td> <td>Code Code 223- 224 II 23BST24P CORE PRACTICAL – I: STATISTICS PRACTICAL – I (Using MS Excel) URSE LEVEL OUTCOMES: PRACTICAL – I (Using MS Excel) the successful completion of the course, students will be able to: Explain the theory through practical oriented training Perform the basic operations of Excel software Apply the software for various applications Compute statistical measures using software Perform statistical data analysis Compute probability, conditional probability and probabilities using Baye's theo Compute Expectation, mean and variance 1. Formation of Frequency Distribution. 2. Formation of Graphs - Frequency Polygon, Frequency Curve and Ogive Curves. 4. Calculation of Measures of Central Tendency - Mean, Median, Mode, Geometric and Harmonic Mean 5. Calculation of Quartiles and Percentiles 5. Calculation of Coefficient of Skewness and Kurtosis. 8. Correlation - Scatter Diagram - Calculation of Correlation Coefficients 9. Regression - Finding Regression Coefficients and Formation of Regression Lin 0. Calculation of Conditional probability 1. Calculation of Conditional probability 2. Calculation of Coefficient of Skewness and Kurtosis. 8. Correlation - Scatter Diagram - Calculation of Corefficie</td>	23- 024 II vards URSE LEVEI he successful Explain the t Perform the Apply the so Compute sta Perform stati Compute pro Compute pro Compute pro Compute pro Compute Ex 1. Formation o 2. Formation o 3. Formation o 4. Calculation and Harmon 5. Calculation 6. Calculation 7. Calculation 8. Correlation 9. Regression 0. Calculation 1. Calculation 2. Solve probl 3. Expectation 9. Regression 0. Calculation 1. Calculation 2. Solve probl 3. Expectation 9. Lecturing Lab Exper Quiz & Dr Providing	CodeQ23- Q24II23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsII23BST24PVardsIII23BST24PVardsIII23BST24PVardsIII23BST24PPerform the basic ompletion of the Explain the theory through probability Compute statistical measuresPerform statistical measuresPerform statistical data analy Compute probability, conditi Compute probability, conditi Compute Expectation, mean1. Formation of Frequency Dist 2. Formation of Diagrams - Ba3. Formation of Graphs - Frequency 4. Calculation of Measures of I Standard Deviation and Var5. Calculation of Measures of I Standard Deviation and Var6. Calculation of Coefficient o7. Calculation of Conditional p9. Regression - Finding Regres0. Calculation of Conditional p2. Solve problems under Bayes3. Expectation - mean and variPAGOGY STRATEGIES• Lecturing and Hands-on tra• Aub Experiments• Quiz & Drill Practice• Providing feedback	Code Code 223- 224 II 23BST24P CORE PRACTICAL – I: STATISTICS PRACTICAL – I (Using MS Excel) URSE LEVEL OUTCOMES: PRACTICAL – I (Using MS Excel) the successful completion of the course, students will be able to: Explain the theory through practical oriented training Perform the basic operations of Excel software Apply the software for various applications Compute statistical measures using software Perform statistical data analysis Compute probability, conditional probability and probabilities using Baye's theo Compute Expectation, mean and variance 1. Formation of Frequency Distribution. 2. Formation of Graphs - Frequency Polygon, Frequency Curve and Ogive Curves. 4. Calculation of Measures of Central Tendency - Mean, Median, Mode, Geometric and Harmonic Mean 5. Calculation of Quartiles and Percentiles 5. Calculation of Coefficient of Skewness and Kurtosis. 8. Correlation - Scatter Diagram - Calculation of Correlation Coefficients 9. Regression - Finding Regression Coefficients and Formation of Regression Lin 0. Calculation of Conditional probability 1. Calculation of Conditional probability 2. Calculation of Coefficient of Skewness and Kurtosis. 8. Correlation - Scatter Diagram - Calculation of Corefficie

REFERENCES:

- 1 S.P. Gupta (2012). Statistical Methods, 42nd Revised Edition, Sultan Chand & Sons Publishers, New Delhi.
- 2 R.V. Hogg and A.H. Craig (2012). Introduction to Mathematical Statistics, Seventh Edition, Pearson Education.

FURTHER READING:

1 Brian W. Sloboda (2020) - EXCEL for Statistical Analysis, University of Phoenix, Arizona, USA.

RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]

- 1 <u>https://www.udemy.com/basic-excel/promo</u>
- 2 <u>https://www.linkedin.com/learning/excel</u>
- 3 <u>https://www.udemy.com/course/statistics-using-excel</u>

				С	ourse Lev	el Outcon	nes (CLO)	
			1	2	3	4	5	6	7
(0	1	Disciplinary Knowledge	~	\checkmark	~	~	\checkmark		
	2	Communication Skills	\checkmark	\checkmark	\checkmark				\checkmark
s (PL	3	Critical Thinking	\checkmark	\checkmark	\checkmark		\checkmark		\checkmark
come	4	Research related Skills		\checkmark	\checkmark	\checkmark		\checkmark	
el Out	5	Analytical Reasoning			\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
n Leve	6	Problem Solving	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		
ogran	7	Team Work	\checkmark	\checkmark	\checkmark				\checkmark
Pre	8	Moral and Ethical							
		Awareness							
	9	Multicultural							
	,	Competence							

Year		Sem.	Subject Code	Title of the Paper	Hours/ Week				
2023-2024 onwards		TTT	22DST22C	CORE PAPER III –	6				
		111	23881330	PROBABILITY DISTRIBUTIONS	0				
COU	URSE L	EVEL	OUTCOMES	:					
On t	he succe	ssful co	mpletion of th	e course, students will be able to:					
1	1 Explain the concept of Bernoulli, Binomial, Hypergeometric distribution and discuss it								
1	propert	ies, use	s and moments	s. Deduce the cumulants and characteristic function					
2	Estima	te the Po	oisson distribu	tion, Negative Binomial and its related constants					
3	Identify the limiting cases of the distributions. Examine the lack of memory of Geometric								
5	distribu	distribution							
4	Define	Define and discuss Normal distribution - mean, median, mode, M.G.F, Cumulants, Mean							
•	deviation	deviation, Characteristic function							
5	Write t	he Rect	angular distrib	ution and its moments					
6	Outline	the Ex	ponential, Beta	a and Gamma distribution and Analyze the property of	lack of				
0	memor	У							
7	Summa	rize the	e concept of same	mpling distributions such as t, F and Chi-square. Deter	rmine the				
/	density	functio	ons and analyzi	ng their relationships					

Discrete Distributions - Concept of theoretical probability distributions - Discrete distributions -Bernoulli, Binomial - Properties and uses - Moments - Recurrence relation for moments - Mode -MGF - Additive property - Characteristic function - Cumulants - Fitting of Binomial distribution.

Unit - II

Discrete Distributions - Poisson distribution - Properties - Moments - Mode - Recurrence relation for moments - MGF - Characteristic function - Cumulants - Additive property- Fitting of Poisson distribution. Hypergeometric distribution - Mean and variance - Factorial moments - Approximation to Binomial distribution. Negative Binomial Distribution - Deductions - MGF - Cumulants - Poisson as limiting case of the Negative binomial distribution - Geometric distribution - Lack of Memory -Moments - MGF.

Unit – III

Continuous Distributions - Rectangular distribution - Moments - MGF - Characteristic Function - Normal distribution - Chief Characteristics - Mode - Median - MGF - Cumulants - Moments - Linear combination of independent Normal variate - Area property - Simple problems.

Unit – IV

Continuous Distributions - Exponential Distribution - MGF- Moments - Lack of memory. Gamma distribution - MGF - Cumulants - Additive property. Beta distribution (first kind and second kind) - Moments.

Unit - V

Sampling Distributions - Population – Sample - Concept of sampling distribution - Chi-square - Derivation of density - Additive property - Definition – Student's t - Derivation of density – Definition of F variate – Derivation of density – Relationship between t, F and Chi-square Distributions.

PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

REFERENCES:

- 1
 S.C. Gupta and V.K.Kapoor (2012). Fundamentals Of Mathematical Statistics, 11 th edition, Sultan Chand & Sons, New Delhi.

 2
 D.V. Human Let M. Gui (2012). Literature for the statistic of the statis
- 2 R.V. Hogg and A.H. Craig (2012). Introduction to Mathematical Statistics, Fifth Edition, Pearson Education .

FURTHER READING:

- 1 J.N. Kapoor and H.C. Saxena (2011). Mathematical Statistics, Sultan Chand & Sons, New Delhi,.
- 2 V.K. Rohatgi and A.K.M.E Saleh. An Introduction to Probability and Statistics, Third Edition, John Wiley & Sons, NewYork.

RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]

1 <u>https://swayamprabha.gov.in/index.php/Syllabus/detail/10774</u>

- 2 <u>https://nptel.ac.in/courses/111/105/111105041/</u>
- 3 https://nptel.ac.in/courses/111/104/111104146/

			Course Level Outcomes (CLO)								
			1	2	3	4	5	6	7		
(0	1	Disciplinary Knowledge	\checkmark	\checkmark		~	\checkmark	\checkmark	\checkmark		
	2	Communication Skills	\checkmark	~	\checkmark		\checkmark		\checkmark		
s (PL	3	Critical Thinking	\checkmark	~		~	\checkmark	\checkmark	\checkmark		
tcome	4	Research related Skills	\checkmark	~	✓		\checkmark	\checkmark	\checkmark		
el Out	5	Analytical Reasoning	\checkmark	✓	✓	✓		✓	✓		
n Lev	6	Problem Solving	✓	✓		✓	✓	✓	✓		
ogran	7	Team Work	\checkmark		✓	✓	\checkmark	✓	✓		
\Pr	8	Moral and Ethical									
	Ŭ	Awareness									
	0	Multicultural									
	צ	Competence									

Year	Sem. Subject Code		Title of the Paper	Hours/ Week		
2023-2024	тт	32DST24	ALLIED PAPER III -	5		
onwards	111	23B8134A	PROGRAMMING IN 'C'	5		

COU	COURSE LEVEL OUTCOMES:						
On t	On the successful completion of the course, students will be able to:						
1	Explain the basic concepts and Structure of C Language						
2	Discuss the concept of Looping						
3	Apply decision making statements						
4	Describe the concept of arrays and its applications in Statistics						
5	Point out the Parameters, functions and Pointers in Data Analytics						
6	Describe Cyber Crime and Cyber Threat.						
7	Develop computing skills for Statistics and Data Analytics						

Introduction To C - Overview of C - Importance of C-Structure Of C Program-Programming Style – Process of Executing a C Program- Constants - Variables - Data Types - Character Set - C Tokens - Keywords – Identifiers - Declaration of Variables - Assigning Values to Variables -Symbolic Constants.

Unit - II

Operators and Expression - Arithmetic Operator-Relational Operator - Logical Operators-Assignment Operators - Conditional Operators-Increment and Decrement Operators - Library Function - Managing Input and Output Statements: Single Character Input- getchar() Functionputchar() function - Scanf() function - Output functions - printf() function - gets() and puts() function.

Unit – III

Decision Making and Branching - Decision Making with if Statement – if – else Statement - Nesting if-else Statement – Switch Statement - Break - Continue Statement - Looping and Branching Using While Statement - Do-While Statement - For Loop Statement - Syntax and Simple Examples.

Unit – IV

Arrays - One Dimensional Arrays -Declaration - Initialization - Two Dimensional Arrays - Syntax - Initialization (Concepts only) Simple Programs - Mean - Median - Standard Deviation - Correlation.

Unit - V

User Defined Functions - Need – Multi-Function Program - Elements Of User Defined Functions - Definition Of Functions - Function Calls - Return Types – Declaration - Category Of Functions -Function Program To Sort An Array Of Integers. Cyber Crime – Definition – Characteristics of Cyber Crime – Tools of Cyber Crime – Identity Theft – International convention on Cyber Crime – Cyber Security (Theory Only)

PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

REFERENCES:

- E. Balagurusamy (2009). Programming in ANSI C, Tata McGraw-Hill, New Delhi. 1
- 2 Clay Wilson (2020). https://ndupress.ndu.edu/ - CHAPTER 18 - Cyber Crime

FURTHER READING:

- Herbert Scheldt (2012). The C Complete Reference. 1
- 2 https://ndupress.ndu.edu/ -

RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.] https://nptel.ac.in/courses/106/105/106105171/ 1

				C	ourse Lev	el Outcon	nes (CLO))	
		-	1	2	3	4	5	6	7
(0	1	Disciplinary Knowledge	\checkmark	~	~	\checkmark	~	\checkmark	\checkmark
	2	Communication Skills	\checkmark						
s (PL	3	Critical Thinking	\checkmark						
comes	4	Research related Skills	\checkmark	\checkmark	\checkmark	\checkmark	~	\checkmark	\checkmark
el Out	5	Analytical Reasoning	\checkmark	\checkmark	\checkmark	\checkmark	~	\checkmark	\checkmark
ı Leve	6	Problem Solving	\checkmark						
Program	7	Team Work	\checkmark						
	8	Moral and Ethical Awareness							
	9	Multicultural Competence							

Year	Sem.	Subject Code	Title of the Paper	Hours/ Week
2023-2024 Onwards	III	23BST35S	Skill Based Subject – I: INDIAN OFFICIAL STATISTICS	3

COURSE LEVEL OUTCOMES:

On the successful completion of the course, student will be able to

- 1 Describe the Statistical System in India
- 2 Apply the fundamentals of measurement in official statistics
- 3 Apply appropriate methods for presenting and preparing commentaries on official statistics
- 4 Evaluate the methods for data collection, analysis and interpretation of health, social and economic problems
- 5 Recognize the limitations that arise from measurement and processes of statistical production
- 6 Execute the tasks in agricultural and economic statistics
- 7 Evaluate the Official Index Numbers

UNIT-I

Statistical System in India - Central and State Government Organizations - Functions of Central Statistical Organization (CSO) - National Sample Survey Organization (NSSO) - Organization of large scale sample surveys - General and special data dissemination systems.

UNIT –II

Official Statistics – Meaning - Present official statistical system in India- methods of collection – limitations - reliability Principal publications containing data on the topics such as population – agriculture - industry – trade – prices – labour – employment - transport and communications - Banking and finance.

UNIT –III

National Income – Measures of national income - Income expenditure and production approaches - Applications in various sectors in India - Measurement of income inequality - Gini's coefficient - Lorenz curves - Application of Pareto - Lognormal as income distribution.

UNIT – IV

Agricultural and Social Statistics - System of Collection of Agricultural Statistics - Crop forecasting and estimation – Productivity - fragmentation of holdings - Support prices - Buffer stocks - Impact of irrigation projects.

Statistics related to industries - foreign trade - Balance of payment - Inflation - Social statistics.

UNIT – V

Official Index Numbers - Price Index Numbers- Construction – Uses – Limitations - Tests for index numbers - Chain base Index Number - Consumer Price Index - Index of Industrial Production – Construction of index numbers - uses.

PEDAGOGY STRATERGIES:

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing Feedback

REFERENCES:

- 1 Allen R. G. D. (1975). Index Numbers in Theory and Practice, Macmillan.
- 2 C. S. O. (1990). Basic Statistics Relating to the Indian Economy.
- 3 C.S.O. (1995). Statistical System in India.
- 4 C. S. O. (1999). Guide to Official Statistics.
- 5 Mukhopadhyay, P. (2011). Applied Statistics, Second Edition, Books & Allied Ltd, India.

FURTHER READING:

- 1 Bhaduri, A. (1990). Macroeconomics: The Dynamics of Commodity Production, Macmillan India Limited, New Delhi.
- 2 Branson, W. H. (1992). Macroeconomic Theory and Policy, Third Edition, Harper Collins Publishers India (P) Ltd., New Delhi.
- 3 Goon A. M., Gupta M. K., and Dasgupta. B. (2001). Fundamentals of Statistics, Vol. 2, World Press, India.
- 4 Panse, V. G. (1964). Estimation of Crop Yields (FAO), Food and Agriculture Organization of the United Nations.

RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]

- https://www.classcentral.com/course/swayam-macro-economics-19942
- https://www.classcentral.com/course/swayam-economics-of-health-and-health-care-14023

			Course Level Outcomes (CLO)							
			1	2	3	4	5	6	7	
tcomes (PLO)	1	Disciplinary Knowledge	\checkmark	\checkmark	✓	~	\checkmark	~	\checkmark	
	2	Analytical Reasoning		~	~	~		~	\checkmark	
	3	Research related Skills	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
	4	Scientific Reasoning			~	~		~	\checkmark	
vel Oı	5	Information/Digital Literacy		~	~	~		~	\checkmark	
m Le	6	Problem Solving		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
Progra	7	Cooperation/ Team Work			\checkmark	\checkmark		\checkmark	\checkmark	
	8	Moral and Ethical Awareness			\checkmark		\checkmark	\checkmark		
	9	Self-Directed Learning			✓		\checkmark	\checkmark		

Year	Sem.	Subject Code	Title of the Paper	Hours/ Week
2023-2024	137	22BST/2C	CORE PAPER IV –	5
onwards	1 V	23051450	BASIC SAMPLING THEORY	

COURSE LEVEL OUTCOMES:

On the successful completion of the course, students will be able to:

1 Explain the method of designing, organizing and executing a sample survey.

- 2 Summarize the various types of Simple random sampling and its practical usage.
- 3 Explain Stratified random sampling and its applications.
- 4 Describe the method of selecting a Systematic sample and its efficiency.
- 5 Summarize the Cluster sampling in detail.
- 6 Explain the significance of Two stage sampling method and its uses.
- 7 Discuss the significance of the Sample survey and its applications in real life situations.

Unit - I

Sample Survey - Concept of Population and Sample – Census and Sample surveys – Merits and Limitations of Sampling technique – Design, Organization and Execution of Sample Survey – Principal Steps in Sample Surveys – Principles of Sample survey - Preparation of Questionnaire and Schedules – Pilot Survey – Sampling and Non-Sampling Errors

Unit - II

Simple Random Sampling - Selection of Simple Random Sample – Merits and Drawbacks of Simple Random Sampling – Simple Random Sampling With and Without Replacement – Unbiased Estimate of Mean and Variance – Simple Random Sampling of Attributes – Estimation of mean and variance - Determination of sample size.

Unit – III

Stratified Random Sampling - Concept and Advantages of Stratification – Principal advantages of Stratified Random Sampling - Unbiased Estimate of the Mean and Variance – Proportional and Optimum Allocation – Neyman's Allocation - Comparison of Stratified and Simple Random Sampling.

Unit – IV

Systematic Random Sampling - Concept, Merits and Demerits of Systematic Sampling - Estimation of the Mean and Variance – Comparison of Simple, Stratified and Systematic Sampling – Population with Linear Trend - Circular Systematic sampling.

Unit - V

Cluster Sampling - Introduction – Equal Cluster Sampling – Estimation of mean and its variance – Relative efficiency of Cluster sampling.

Two-stage Sampling - Introduction – Two-stage sampling with equal First-stage units with respect to Simple Random Sampling –Estimation of the Mean and its Variance.

PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

REFERENCES: Daroga Singh, F.S. Chaudhary (2018) – Theory and Analysis of Sample Survey Designs, New 1 Age International (P) Limited, Publishers, New Delhi. S.C. Gupta and V.K. Kapoor (2015). Fundamentals of Applied Statistics, 4th Edition, Sultan 2 Chand & Sons, New Delhi. **FURTHER READING:** William. G. Cochran (2011). Sampling Techniques, Wiley India (P) Limited, New Delhi. 1 Des Raj (1978). Sampling Theory, Tata-McGraw Hill, New Delhi. 2 Sukhatme, P.V., and Sukhatme, B.V. (1970). Sampling Theory of Surveys with Applications, 3 1970, Asia Publishing House, New Delhi. **RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]** https://nptel.ac.in/courses/111/104/111104073/ 1 https://nptel.ac.in/content/storage2/courses/111104073/Module14/Lecture42.pdf 2 https://www.mooc-list.com/tags/sampling-methods 3

			Course Level Outcomes (CLO)							
			1	2	3	4	5	6	7	
0)	1	Disciplinary Knowledge	\checkmark	\checkmark	~	\checkmark	\checkmark	\checkmark	~	
	2	Communication Skills	\checkmark	~	~		~			
s (PL	3	Critical Thinking	\checkmark		~		\checkmark	\checkmark		
come	4	Research related Skills	\checkmark	~	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
el Out	5	Analytical Reasoning				✓	\checkmark	\checkmark	\checkmark	
ı Lev	6	Problem Solving			~	✓	\checkmark	\checkmark		
Program	7	Team Work	\checkmark	~	~	\checkmark		\checkmark		
	8	Moral and Ethical	\checkmark	\checkmark			\checkmark	\checkmark		
		Awareness								
	9	Multicultural Competence					\checkmark	\checkmark	\checkmark	

Ŋ	Year	Sem.	Subject Code	Title of the Paper	Hours/ Week				
202	3-2024	IV	23BST///P	CORE PRACTICAL -II – STATISTICS	3				
on	wards	1 V	25051441	PRACTICAL –II (Using 'C' Language)	5				
CO	URSE L	EVEL	OUTCOMES:						
On t	Un the successful completion of the course, students will be able to:								
1	I Explain the theory through practical oriented training 2 D 3 D								
2	2 Perform the basic operations of C Language								
3		the C L	anguage for Dat						
4	Compu	te Mod	el fitting by dev	eloning programs					
6	Perform	n Comr	utations for Ind	ex numbers					
7	Develo	n comp	utation skills for	r Statistics and Data Analytics					
LIS	T OF EX	VERI	MENTS						
	1 C Prc	aram ta	find factorial o	f n numbers					
-	$\frac{1}{2}$ C pro	oram to	find Binomial	Coefficient nc.					
	$\frac{2}{2}$								
-	3. C pro	gram to	Arrange Data 1	n Ascending and Descending order Using Bubble So	ort.				
4	4. C pro	gram to	o find the Value	of Mean and Standard Deviation for raw data.					
-	5. C Pro	ogram to	o find the Coeffi	cient of Variations for two groups.					
(6. C Pro	ogram to	o determine Med	lian and Mode for raw data.					
	7. C Pro	ogram to	o find Skewness	and Kurtosis.					
8	8. C pro	gram to	Calculate Corr	elation Coefficient.					
9	9. C pro	gram to	o determine the 1	egression equations.					
	10. C pro	gram to	Calculate Cum	ulative Probabilities of Binomial Distribution.					
	11. C pro	gram to	Calculate Cum	ulative Probabilities of Poisson Distribution.					
	12. C pro	gram to	solve the simul	taneous equations by Gauss Jacobi Methods.					
-	13. C pro	gram to	o find the roots of	f equation by Newton Raphson Method.					
-	14. C pro	gram to	o fit a Linear Tre	end by the Method of Least Squares.					
	15. C pro	gram to	o find the sum of	f the series $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{n}$.					
	16. C pro	gram fo	or Fitting Expon	ential Curve $Y = ab^x$					
-	17. C pro	gram fo	or Fitting Expon	ential Curve $y = ax^b$					
	18. C Pro	ogram to	o determine the	coots of the quadratic equation of the form $ax^2 + bx$	+ c = 0.				

19. C Program to Interpolate using Trapezoidal rule.							
20. C Program to Interpolate using Simpson's 1/3 rd rule.							
PEDAGOGY STRATEGIES							
• Lecturing and Hands-on training							
Lab Experiments							
• Questioning							
Class Test							
Quiz & Drill Practice							
Providing feedback							
REFERENCES:							
1 E. Balagurusamy (2009). Programming in ANSI C, Tata McC	raw-Hill, New Delhi.						
2 Clay Wilson (2020). <u>https://ndupress.ndu.edu/</u> - CHAPTER 13	8 - Cyber Crime						
FURTHER READING:							
1 Herbert Scheldt (2012). The C Complete Reference.							

2 https://ndupress.ndu.edu/ -

RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]

1 https://nptel.ac.in/courses/106/105/106105171/

			Course Level Outcomes (CLO)							
			1	2	3	4	5	6	7	
0)	1	Disciplinary Knowledge	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
	2	Communication Skills	\checkmark	~	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
s (PL	3	Critical Thinking	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
tcome	4	Research related Skills								
el Out	5	Analytical Reasoning	✓	✓	✓	\checkmark	✓	✓	✓	
n Lev	6	Problem Solving	✓	✓	✓	\checkmark	✓	✓	✓	
ogran	7	Team Work	\checkmark	✓	\checkmark	\checkmark	\checkmark	✓	\checkmark	
Pre	8	Moral and Ethical								
		Awareness								
	9	Multicultural								
	,	Competence								

Year 2023-2024 onwards		Sem.	Subject Code	Title of the Paper	Hours/ Week 5					
		IV	23BST45A	ALLIED PAPER IV – NUMERICAL ANALYSIS						
COU	URSE L	EVEL (OUTCOMES:							
On t	he succe	ssful co	mpletion of the c	course, students will be able to:						
1	Analyze the data and predict the future values using curve fitting.									
2	Summa	arize the	finite difference	es and explain the operators and its relationships						
3	Interpo	late the	missing values u	sing Newton's Forward and Backward difference f	ormula.					

- 4 Interpolate the central difference using Gauss Forward, Backward, Stirling's and Bessel's formula.
- 5 Apply interpolation for unequal intervals by Newton's divided difference formula, Lagrange's and Inverse interpolation formula
- 6 Compute the numerical differentiation using Newton's Forward and Newton's Backward
- 7 Compute the Derivative using Stirling's Formula using Trapezoidal, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule computing integration.

Curve Fitting - Principle of least squares - fitting the curves of the form Y = a + bx, $Y = a + bx + cx^2$ and curves transformable to the above form. Fitting an exponential curve $Y = ax^b$, $Y = ab^x$

Unit - II

Interpolation with Equal Intervals - Finite Differences - Operators – Forward and Backward Difference Operators – Operator E and their basic Properties (without proof) - Interpolation with Equal Intervals - Newton's Forward and Backward Difference Formulae – Simple Problems – Equidistant Terms with One or More Missing Values .

Unit – III

Central Difference Interpolation - Central Difference Interpolation Formula – Gauss Forward Interpolation Formula – Gauss Backward Interpolation Formula – Stirling's Formula – Bessel's formula – Simple problems

Unit – IV

Interpolation with Unequal intervals – Divided Difference and their properties (without proof) – Newton Divided Difference Formula – Lagrange's Formula – simple problems – Inverse Interpolation using Lagrange's formula.

Unit - V

Numerical Differentiation - Newton's Forward and Newton's Backward difference formula to compute the derivative – Derivative using Stirling's formula (Upto Second order only). **Numerical Integration** - Trapezoidal Rule, Simpson's 1/3rd and 3/8th rules, Weddle's Rule

PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

REFERENCES:

1	P. Kandasamy, K.Thilagavathy and K.Gunavathi (2016)- Numerical Methods, S.Chand
	Company Ltd, New Delhi.
2	S.S. Sastry (2012) Introductory Methods of Numerical Analysis, DHI Learning Dut Ltd

2 S.S. Sastry (2012). Introductory Methods of Numerical Analysis, PHI Learning Pvt Ltd

FURTHER READING:

- 1 G. Shanker Rao. Numerical Analysis, New Age International (P) Ltd, Publishers, New Delhi
- ² V. Rajaraman (2018). Computer Oriented Numerical Methods, PHI Learning Pvt. Ltd.
- 3 M. Shanthakumar (1987). Computer based Numerical analysis, Khanna Publishers, New Delhi.

RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]

- 1 https://nptel.ac.in/courses/127/106/127106019/
- 2 <u>https://nptel.ac.in/courses/111/106/111106101/</u>
- 3 <u>https://nptel.ac.in/courses/111/107/111107062/</u>

			Course Level Outcomes (CLO)							
		-	1	2	3	4	5	6	7	
(0	1	Disciplinary Knowledge	\checkmark	\checkmark	\checkmark	\checkmark	✓	\checkmark	\checkmark	
	2	Communication Skills	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		
s (PL	3	Critical Thinking	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
I Outcome	4	Research related Skills								
	5	Analytical Reasoning	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
n Leve	6	Problem Solving	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
Program	7	Team Work								
	8	Moral and Ethical								
		Awareness								
	9	Multicultural Competence								

Veen	Sam	Subject	Title of the Depar	Hours/
rear	Sem.	Code	The of the Paper	Week

2023-2024 Onwards		137	22DST465	SKILL BASED ELECTIVE PAPER II -	2					
		IV	23851405	ELEMENTS OF ACTUARIAL STATISTICS	3					
Cou	rse Lev	el Outc	omes:							
On t	he succe	essful co	ompletion of th	e course, student will be able to:						
1	1 Describe and analyze the impact of Finance events on Simple Interest, Compound interest									
2	2 Explain the Present value concept									
3	Calculate Annuities and identify its types. Explain Financial interest, social and financial issues of Actuarial Statistics									
4	Demor fund –	strate th Lender	e procedures of 's sinking fund	developing and implementing of Redemption of loan – Si l in Actuarial Statistics	nking					
5	Descri	be the pr	inciple of Life	assurance and premium relate to types of endowments						
6	Explai	n the pro	cedures in Finar	ncial Sectors						
7	Compu	te the in	terests involved	in Actuarial Statistics						
Unit	:1									
Mat	hematio	c Finan	ce - Simple Int	erest - Compound interest - nominal and effective rate	of interest					
- De	finition	– Simpl	e problem							
Unit	:2									
durin - Sin	ng certaing pro	in perio blems.	d – Varying pa	yments during certain period with fixed or varying rate	of interest of interest					
Unit	:3									
Ann	uities –	types -	- Present and a	accumulated value of an Immediate Annuity and with	n different					
perio	od value	of an A	Annuity due and	d with different periods – Simple problems.						
Unit	:4									
Red	emption	n of loa	$\mathbf{n} - \mathbf{Sinking}_{\mathbf{r}}$	und – Lender's sinking fund – Simple problems- Pr	obabilities					
surv	val and	death p	$p_x, q_x, p_x, p_x, m q$	x_x and $m_n q_x - Simple$ problems.						
Prin basic • H • I • A • C	ciple of c types of PEDAG Lecturing Assignme Classroon Question Seminar Class Tes Quiz & E Providing	Clife as of assura OGY ST g ent m Discus ing st Drill Prac g Feedba	surance – Pre ance – Tempora TRATERGIES: ssion	mium and its types (single, annual, half yearly, quarter ary, Whole life, Endowment and Pure Endowment.	ly) – Four					

REFERENCES:

1	Mathematical Basis of Life Assurance (2015). Published by Insurance Institute of India,								
	Bombay.								
2	S.C. Gupta and V.K. Kapoor (2015). Fundamentals of Applied Statistics, Sultan Chand & Sons,								
	New Delhi.								
FU	URTHER READINGS:								
1	PA. Navaneetham (2014) - Business Mathematics and Statistics, Jai Publishers, Trichy.								
2	CT- 5 Indian institute of Actuarial Statistics.								
RE	LATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]								
1	https://www.edx.org/course/introduction-to-actuarial-science								
2	https://www.iiap.res.in/astrostat/School08/PennStateSchool08_LecNotes.pdf								
3	https://www.annuityfyi.com/types-of-annuities/								
4	http://www.math.utk.edu/~kbonee/123/2.3-2.4-problems-sol.pdf								
5	https://www.ifs.org.mo/Document/Insurrance%20Manual/English/Life%20Ins.%20Examination.pdf								

			Course Level Outcomes (CLO)								
			1	2	3	4	5	6	7		
	1	Disciplinary Knowledge	~	\checkmark	\checkmark	\checkmark	\checkmark	~	\checkmark		
(0)	2	Analytical Reasoning	~	\checkmark	\checkmark	\checkmark			\checkmark		
el Outcomes (PI	3	Research related Skills									
	4	Scientific Reasoning									
	5	Information/Digital Literacy	\checkmark	\checkmark		\checkmark		~	\checkmark		
m Le	6	Problem Solving	~	\checkmark	\checkmark		\checkmark		\checkmark		
Prograi	7	Cooperation/ Team Work	\checkmark	\checkmark		\checkmark		\checkmark			
	8	Moral and Ethical Awareness	\checkmark	\checkmark		\checkmark		\checkmark			
	9	Self-Directed Learning	~	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		

Year	Sem.	Subject	Title of the Paper	Hours/
	Sem.	Code	The of the Laper	Week

2023-2024 onwards		2024 rds V 23BST51C		CORE PAPER V – STATISTICAL ESTIMATION THEORY					
COU	JRSE L	EVEL	OUTCOMES:						
On the	he succe	ssful co	ompletion of the	course, students will be able to:					
1	Point out the basic concepts of Population, Sample and explain the Characteristics of estimators								
2	Analyz	e the co	oncept of unbiase	edness and consistency with examples					
3	Compu	te the e	fficiency of estin	mators and describe its essential concepts					
4	Identify	the m	inimum variance	e estimators with its examples					
5	Discuss	s the su	fficiency with its	s related theorems					
6	Identify	the m	ethods of estima	tions					
7	Identify the possible intervals of the estimators with examples								

Statistical Inference - Basic Concepts - Population, Sample, Statistic, Parameter, Parameter Space **Point estimation** - Meaning – Characteristics of estimators – Unbiasedness – Simple problems -Consistency – Invariance Property of consistent estimator – Sufficient condition for consistency -Simple problems.

Unit - II

Efficiency - Efficient Estimators - Simple problems - Most Efficient Estimator - Simple problems - Minimum Variance Unbiased Estimators - Uniqueness of MVUE - Theorems on MVUE.

Unit – III

Sufficiency – Neymann Factorization theorem – Cramer-Rao Inequality – Assumptions -Conditions for equality - Minimum Variance Bound Estimator – Simple problems based on Normal, Exponential and Cauchy distributions - Rao-Blackwell Theorem.

Unit - IV

Methods of Estimation - Method of Maximum Likelihood - Properties of MLE (Without Proof)-Simple theorems - Methods of Minimum variance -Method of moments - Simple Examples.

Unit - V

Interval Estimation - Confidence interval and Confidence limits - Simple problems based on Normal distribution and Uniform distribution - Confidence intervals for Large samples - Simple problems based on Poisson distribution and Exponential distributions.

PEDAGOGY STRATEGIES

- Lecturing
- Assignment

- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

RE	FERENCES:								
1	S.C. Gupta and V.K. Kapoor (2015). Fundamentals of Applied Statistics, 4 th Edition, Sultan Chand & Sons, New Delhi.								
2	A.M. Goon, M.K. Gupta, B. Dasgupta - An Outline of Statistical Theory Vol. II, World Press.								
FU	RTHER READING:								
1	C.W. Snedecor, and W.G.Cochran (1991) - Statistical Methods, Eight reprint, Wiley International.								
2	P.G. Hoel (2012). Introduction to Mathematical Statistics, Wiley International.								
RE	LATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]								
1	https://swayamprabha.gov.in/index.php/Syllabus/detail/1077								
2	https://nptel.ac.in/courses/111/105/111105041/								

Course Level Outcomes (CLO)

			1	2	3	4	5	6	7
0	1	Disciplinary Knowledge	✓	~	~	~	~	\checkmark	\checkmark
	2	Communication Skills	~	\checkmark		\checkmark		\checkmark	
s (PL)	3	Critical Thinking	\checkmark	✓		✓		\checkmark	
tcome	4	Research related Skills							
el Out	5	Analytical Reasoning	✓	✓	✓	✓	✓	\checkmark	✓
n Lev	6	Problem Solving	✓	✓	✓	✓	✓	\checkmark	✓
Program	7	Team Work	✓	✓	✓			\checkmark	
	8	Moral and Ethical							
		Awareness							
	9	Multicultural Competence							

Veer	Sem.	Subject	Title of the Donor	Hours/
rear		Code	The of the Paper	Week

2023-2024 onwards		V	23BST52C	CORE PAPER VI – STATISTICAL QUALITY CONTROL	5
COURSE LEVEL OUTCOMES:					
On the successful completion of the course, students will be able to:					
1	List out the basis of control charts and Construct control charts for attributes and variables				
2	Interpret the results from the control charts				
3	Explain the basic concepts of acceptance sampling plans				
4	Describe the role of Acceptance Sampling in modern quality control systems				
5	Discuss the advantages and disadvantages of Acceptance Sampling				
6	Point out the major types of Acceptance sampling procedures and explain the uses of Single, Double and Sequential sampling plans				
7	Determine the Operating Characteristic (OC), AOQ, ATI and ASN curves for Single,				
	Double and Sequential sampling plans for Attribute				
8	Discuss the effects of sampling plan parameters on sampling plan performance				
Unit - I					
Quality – meaning - concepts – Quality of design – Quality of conformance – Quality of					
Statistical Quality Control – Meaning – Basic concepts of SOC – Uses – Causes of variation –					
Process Control – Basis of Control Charts – Uses of control charts - 3 sigma control limits.					
Unit - II					
Control Charts - Criteria for deducting lack of control - Control Charts for Variables – \overline{x} and R					
Charts - Control Chart for attributes - p and np charts - Control Charts for number of defects - c					
Charts (for fixed and varying sample size) – Comparison of attribute and variable control charts.					
Unit	– III				
Product Control - Acceptance Sampling – Meaning – Applications in Industry - Producer's Risk and Consumer's Risk - Definitions of AQL, IQL, LQL - Measures of performance - Concept of OC Function - Type A and Type B OC curves – OC Functions Based on Hyper-geometric, Binomial and Poisson distributions - Attribute Sampling Plans – Designing a Sampling Plan.					

Unit – IV

Single Sampling Plans - Designing a Sampling Plan - Determination of the parameters in Single Sampling Plans - OC, AOQ, ASN and ATI functions of SSP.

Double Sampling Plans for attributes - Operating Procedures - Conditions of Applications - OC, AOQ, ASN and ATI functions – Advantages – Disadvantages.

Unit - V
Sequential Sampling Plan for Attributes – Wald's Sequential Probability Ratio Test – Operating Procedure - OC Curve – ASN Function – Five Points on OC Curve – Five Points on ASN. **INDUSTRIAL VISIT**

PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

REFERENCES: 1 S.C. Gupta and V.K. Kapoor- Fundamentals of Applied Statistics, 4th Edition 2015, Sultan Chand & Sons, New Delhi. 2 M. Mahajan - Statistical Quality Control, 2009, Dhanpat Rai & Co (P) Ltd, Delhi, 2009.

FURTHER READING:

- 1 E.L.Grant and R.S. LeavenWorth. Statistical Quality Control, McGraw Hill.
- 2 Duncan, A. J. (2003). Quality Control and Industrial Statistics, Irwin-Illinois, US.
- 3 Montgomery, D. C. (2009). Introduction to Statistical Quality Control, Sixth Edition, Wiley India, New Delhi

RE	LATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]
1	http://bmepedia.weebly.com/uploads/2/6/6/8/26683759/unit_4_quality_control.pdf
2	https://nptel.ac.in/courses/116/102/116102019/

37

			Course Level Outcomes (CLO)						
			1	2	3	4	5	6	7
	1	Disciplinary Knowledge	\checkmark	~	\checkmark	\checkmark	\checkmark	\checkmark	✓
(0	2	Communication Skills	\checkmark	~	~	\checkmark	\checkmark	\checkmark	
s (PL	3	Critical Thinking	\checkmark	\checkmark	✓		\checkmark	\checkmark	
come	4	Research related Skills	\checkmark	~	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
el Out	5	Analytical Reasoning	\checkmark	✓					\checkmark
ı Lev	6	Problem Solving	\checkmark	\checkmark					\checkmark
Progran	7	Team Work	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark
	8	Moral and Ethical	✓			\checkmark	~	✓	~
		Awareness Multicultural							
	9	Competence							

Y	Year S		Subject Code	Title of the Paper	Hours/ Week	
202 onv	2023-2024 onwards		23BST53C	CORE PAPER VII – ELEMENTS OF ECONOMETRICS	4	
COU	URSE L	EVEL	OUTCOMES:			
On t	he succe	ssful co	mpletion of the c	course, students will be able to:		
1	Explain the need and assumptions of Econometric models					
2	2 Discuss the Linear regression model and the significance of Least square estimation					
3	Analyze the Multiple regression model and the practical applications of the model in real life situations					

- 4 Summarize the methods of detecting Multicollinearity and remove it from the model
- 5 Explain Auto correlation and to analyze the problems related to Auto correlated variables
- 6 Describe the techniques of fitting and computing the Econometric models
- 7 Illustrate the uses of Econometric models in predicting the future values

Unit - I

Econometrics – Nature, Definition and Scope of Econometrics – Relationship between economic theory, Mathematics and Statistics – Model building in Econometrics – Goals of Econometrics – Limitations and Divisions of Econometrics.

Unit - II

Simple Linear Regression Model – Error Term in Econometric Models – Reasons for introducing error term in the econometric model - Statistical Assumptions in Linear Model - Least Square Estimation- Gauss-Markov theorem - Properties of Least Square Estimation - Testing of Parameters of the Model - Estimation of Error Variance - Simple Problems.

Unit – III

Multiple Regression Model – Model with two explanatory variables – Derivation of normal equations - Measure of goodness of fit –Adjusted co-efficient of multiple determinations – Testing of significance of individual regression co-efficients.

Unit – IV

Multicollinearity – Consequences of perfect and imperfect Multicollinearity - Detection of Multicollinearity – Auxiliary regressions - Variance Inflation Factor and its relation – Solution to the problem of Multicollinearity.

Unit - V

Autocorrelation - Pure and Impure serial correlation – Autocorrelation by omitted variable and incorrect functional form – Visual inspection – Positive and Negative Autocorrelation – Consequences and sources of Autocorrelation - Durbin-Watson Test.

PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

REFERENCES:

1	K. Dhanasekaran (2011). Econometrics, 2 nd Edition, Vrinda Publications (P) Ltd,
1	Delhi -110 091
\mathbf{r}	A. Koutsoyiannis (2004). Theory of Econometrics, 2 nd Edition, Palgrave Publishers Limited,
Ζ	Replica Press Private Limited, India.

FURTHER READING:

1	S.P. Singh, Anil. K Parshar and H.P. Singh (1999). Econometrics and Mathematical
1	Economics, 7th Edition, S.Chand & Company Ltd, New Delhi – 110 055.
2	Johnston. J. (1997). Econometric Methods, McGraw-Hill International Editions.

3 Dawn C. Porter, Sangeetha Gunasekar, and Damodar N. Gujarati (2004). Basic Econometrics, 5th Edition, McGraw-Hill Inc.,

RF	RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]					
1	https://www.youtube.com/watch?v=6I1WPKkNgoQ					
2	https://cbpbu.ac.in/userfiles/file/2020/STUDY_MAT/ECO/1.pdf					
3	https://sites.google.com/site/econometricsacademy/masters-econometrics/simple-regression- model					

			Course Level Outcomes (CLO)						
			1	2	3	4	5	6	7
	1	Disciplinary Knowledge	\checkmark	~	\checkmark	\checkmark	\checkmark	\checkmark	✓
(0	2	Communication Skills	\checkmark	~	✓	\checkmark	~	\checkmark	\checkmark
s (PL	3	Critical Thinking	\checkmark	\checkmark				✓	\checkmark
come	4	Research related Skills	\checkmark		\checkmark	\checkmark		\checkmark	\checkmark
el Out	5	Analytical Reasoning	\checkmark	✓			✓		✓
Program Leve	6	Problem Solving	\checkmark	✓	✓	\checkmark	✓	✓	✓
	7	Team Work			✓		\checkmark	✓	\checkmark
	8	Moral and Ethical Awareness	\checkmark	\checkmark			✓	\checkmark	\checkmark
	9	Multicultural Competence							

Year		Sem.	Subject Code	Title of the Paper	Hours/ Week		
2023-2024 onwards		V	23BST54C	CORE PAPER VIII – AOS – ELEMENTS OF OPERATIONS RESEARCH	5		
COU	URSE L	EVEL	OUTCOMES:				
On t	he succe	ssful co	mpletion of the	course, students will be able to:			
1	Point out the Definition, Scope, Uses and Limitations of Operations Research and solve Linear Programming Problem by Graphical and Simpley methods						
	Find th	e Optin	um Solution in	Transportation problem by using NWC, LCM, VAM	[and		
2	² MODI method						
3	Solve t	he Assig	gnment problem	ns by Hungarian method			
4	Solve problems on Inventory Control in Purchasing and Manufacturing Models with No						
4	⁺ Shortages						
5	5 Explain the Replacement problems arises in different situations						
6	Solve the Sequencing problems in industries						
7	Explain the theory of Games and solve it						

Unit - I

Operations Research - Definition – Scope – Uses – Linear Programming Problem – Formulation of LPP – Solution by Graphical Method - Canonical and Standard Form of LPP – Maximization and Minimization Problems – Simplex Method.

Unit - II

Transportation Problem – Definition - Balanced and Unbalanced Transportation Problem – Initial Basic Feasible Solution – North West Corner Rule, Least Cost Method and Vogel's Approximation Method – Optimum solution by MODI method

Unit – III

Assignment Problem – Definition - Balanced and Unbalanced Assignment Problem – Maximization and Minimization Problems – Hungarian Method – Difference between Transportation and Assignment problems.

Inventory Control – Introduction – Types of Inventory – Reasons for maintaining inventory – Costs associated with Inventories - Factors affecting Inventory control – Purchasing and Manufacturing models with no Shortages.

Unit – IV

Replacement Problems – Introduction – Replacement of items that deteriorates gradually - Replacement policy when Value of Money does not Change with Time.

Sequencing Problem – Introduction – Basic terms - Problems with n-jobs through Two Machines – Problems with n- jobs on Three Machines.

Unit - V

Game Theory – Introduction – Two-Person Zero-Sum Games – Concept of Pure and Mixed Strategies – Games With and Without Saddle Points – Solving 2×2 Games – Graphic Solution of m x 2 and 2 x n Games.

PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

RE	FERENCES:
1	Kanti Swarup, P.K. Gupta and Manmohan (2009). Operations Research, Fourteenth
1	Thoroughly Revised Edition, Sultan Chand & Sons, New Delhi.
2	Prof. V. Sundaresan, K.S. Ganapathy Subramanian and K. Ganesan (2000). Resource
2	Management Techniques, A.R. Publications, Tamil Nadu, New Revised Edition.
FU	RTHER READING:
1	Hamdy A. Taha. (2017). Operations Research - An Introduction, 10th Edition, Prentice Hall
1	of India.
2	J.K. Sharma (2007). Operations Research - Theory & Applications, Macmillan India Ltd, Third
2	Edition.
RE	LATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://nptel.ac.in/courses/111/107/111107128/
2	https://nptel.ac.in/courses/112/106/112106134/
3	https://onlinecourses.swayam2.ac.in/cec20_ma10/preview

			Course Level Outcomes (CLO)						
			1	2	3	4	5	6	7
	1	Disciplinary Knowledge	\checkmark	\checkmark	\checkmark	~	\checkmark	~	\checkmark
(0)	2	Analytical Reasoning	~	~	\checkmark	~	~	~	\checkmark
les (P]	3	Research related Skills	~	~	\checkmark	\checkmark	\checkmark	~	\checkmark
utcom	4	Scientific Reasoning	~	~	\checkmark	\checkmark	\checkmark	~	\checkmark
Program Level Ou	5	Information/Digital Literacy					\checkmark	\checkmark	\checkmark
	6	Problem Solving	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
	7	Cooperation/ Team Work							
	8	Moral and Ethical Awareness	~	~	\checkmark				
	9	Self-Directed Learning							

Year	Sem.Subject CodeTitle of the PaperHours/Week						
2023-2024 onwards	-2024 ards V 23BST55S		SKILL BASED SUBJECT III - EDUCATIONAL AND PSYCHOLOGICAL STATISTICS	4			
COURSE L	EVEL C	DUTCOMES:					
On the succe	ssful cor	npletion of the co	ourse, students will be able to:				
1	Discuss the various concepts of Correlation (Biserial, Point biserial, Tetrachoric r, Phi coefficient and contingency coefficient) with the corresponding computations						
2	Compute Z-score, Standard score, Normalized and T-scores for ungrouped and grouped data						
3	Explain scaling of rankings and scaling of ratings with examples						
4	4 Explain the basics of reliability and different methods of determining test reliability						
5	5 Identify the effect of test length and effect of different ranges on testing reliability of a test						
6	6 Explain the basics, types, estimation of validity and also the effect on validity by lengthening a test						
7	Discuss the concepts Mental Age and Intelligent Quotient (IQ) with simple calculation						

Unit - I

Correlation - Biserial correlation - Standard deviation of Biserial Correlation – Point Biserial correlation – Comparison of Biserial and Point Biserial correlation – Tetrachoric r – Calculation. The Phi (Φ) co-efficient – Significance of Phi ((Φ) – Comparison of Phi and Tetrachoric r. The contingency coefficient (c) - Simple Problems - Curvilinear or Non-Linear relationship.

Unit - II

Partial and Multiple Correlation - Correlation ratio - Intra-class correlation - Partial and Multiple correlation - Definition- Formula for three variables - Simple problems - Properties of multiple correlation co-efficient – Limitations to the use of partial and multiple correlation.

Unit – III

Scaling of Scores on a Test - Scaling procedures - Introduction - Scaling individual test item in terms of difficulty – Scaling of scores on a test - Z or σ scores - Standard scores - Normalized scores - T-scores for ungrouped and grouped data - Percentile score - Scaling of rankings in terms of Normal Probability curve - scaling of ratings in terms of Normal Probability curve.

Unit – IV

Reliability - Reliability of test scores - Definition of Reliability - Index of Reliability - Methods for determining test reliability - Test-Retest Method - Alternate or Parallel Forms Method - Split Half method - Effect of test length on the reliability of the test - Effect of different ranges on the reliability of the test.

Unit - V

Validity - Validity of test scores - Estimation of Validity - Types of Validity - Validity and Test Length - Comparison between Reliability and Validity.

Intelligence Tests - Mental Age - Intelligence Quotient.

PEDAGOGY STRATEGIES

- Lecturing
- Classroom Discussion
- Assignment
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

REFERENCES:

1	Gupta, S.C. and Kapoor, V.K. (2019). Fundamentals of Applied Statistics,
1	Sultan Chand and Sons, 4th thoroughly revised edition, New Delhi.
2	Henry. E. Garrett (2014). Statistics in Psychology and Education, Surject
2	Publications, Fourth Indian Reprint.

FURTHER READING:

1	Gupta, S.C. and Kapoor, V.K (2017). Fundamentals of Mathematical
1	Statistics, Sultan Chand and Sons, 11 th Revised Edition.
2	Guilford, J.P. (1986). Fundamental Statistics in Psychology and Education, Mc

² Graw Hill

REL ATED	ONLINE CONTENTS MOOC SWAVAM NPTEL Wabsites atc.]
RELATED	OILINE CONTENTS [MOOC, SWATAN, II TEL, Websites etc.]
1	https://nptel.ac.in/noc/courses/noc21/SEM1/noc21-hs49/
2	https://labs.la.utexas.edu/gilden/files/2016/05/Statistics-Text.pdf
3	https://www.youtube.com/watch?v=W9yiUlBlRjg
4	https://www.youtube.com/watch?v=jgzph9118vk

			Course Level Outcomes (CLO)						
			1	2	3	4	5	6	7
	1	Disciplinary Knowledge	~	\checkmark	✓	~	~	✓	\checkmark
(0)	2	Analytical Reasoning	~	~			~	~	\checkmark
les (P]	3	Research related Skills	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
utcom	4	Scientific Reasoning	~	~	~	~	~	~	~
vel Oı	5	Information/Digital Literacy							
m Le	6	Problem Solving	✓	~			✓	~	~
Progra	7	Cooperation/ Team Work	✓	✓			✓	\checkmark	\checkmark
	8	Moral and Ethical Awareness	\checkmark		\checkmark	\checkmark			\checkmark
	9	Self-Directed Learning	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark	

Year		Sem. Subject Code		Title of the Paper	Hours/ Week					
2023-2024		V	23BST5FL	NON MAJOR ELECTIVE - I	3					
on	wards	•	250515EL	BASIC STATISTICS – I	5					
COU	URSE L	EVEL	OUTCOMES:							
On t	he succe	ssful co	mpletion of the	course, students will be able to:						
1	Explain	the bas	sic concepts in S	Statistics and develop the skills in collection and						
1	presentation of data									
2	Calcula	te vario	ous Measures of	f Statistics						
3	Compu	te variou	us problems throu	1gh Statistical Methods						
4	Apply	the cond	cept of Spread an	nd Dispersion Measures						
5	Differe	ntiate tl	ne concept of Sy	mmetry and Skewness						
6	Outline	the con	ncept of Peaked	ness and Kurtosis						
7	Explain	the app	plication of Stati	istics in Various fields						

Unit – I

Basic Statistics – Introduction – Definition - Functions of Statistics – Scope - Uses - Limitations of Statistics – Collection of data – Primary and Secondary data – Methods of collecting Primary data – Classification of data - Tabulation of data - Formation of Frequency Distribution.

Unit - II

Diagrams and Graphs – Bar diagrams – Multiple Bar diagram – Box Plot - Pie diagram – Graphs of frequency distribution – Histogram - Frequency polygon - Frequency curve - Ogive curves - Merits - Demerits.

Unit – III

Measures of Central Tendency - Requisites of a good average – Raw Data – Frequency Data – Continuous Data - Arithmetic Mean, Median, Mode, Geometric Mean and Harmonic Mean – Merits and Demerits.

Unit – IV

Measures of Dispersion - Absolute and Relative Measures – Range, Quartile Deviation, Mean Deviation, Median Deviation, Standard Deviation and Co-efficient of Variation – Simple problems.

Unit - V

Skewness - Definition - Characteristics of Skewness - Measures of Skewness - Types - Karl-Pearson's Co-efficient of Skewness - Bowley's Co-efficient of Skewness - Simple Problems. **Kurtosis** - Types of Kurtosis - Characteristics of Kurtosis (Concept only)

PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

REFERENCES:

1	Navanitham, P.A. (2008). Business Mathematics and Statistics, Jai Publishers, Trichy.
2	Pillai, R.S.N and V. Bagavathi (1999). Statistics – Theory and Practice, S.Chand & Sons
	Company Ltd, New Delni.

FURTHER READING:

1	S.C. Gupta and V.K. Kapoor (2015). Fundamentals of Applied Statistics, 4 th Edition, Sultan						
1	Chand & Sons, New Delhi.						
2	Vittal P.R Business Statistics, Margham Publications, Chennai.						
RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]							
1	https://nptel.ac.in/courses/110/107/110107114/						

			Course Level Outcomes (CLO)						
			1	2	3	4	5	6	7
	1	Disciplinary Knowledge	✓	✓	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
(0)	2	Analytical Reasoning		~	\checkmark	\checkmark	\checkmark	\checkmark	
les (P)	3	Self-directed Learning	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
utcom	4	Reflective Thinking	✓	~	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
vel Oı	5	Information/Digital Literacy		✓	\checkmark		\checkmark	\checkmark	
m Le	6	Problem Solving	✓	~	\checkmark	\checkmark	\checkmark	\checkmark	
rograi	7	Cooperation/Team Work	✓	~	\checkmark	\checkmark	\checkmark	\checkmark	
đ	8	Moral and Ethical Awareness			\checkmark	\checkmark	\checkmark	\checkmark	
	9	Lifelong learning	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark

Year		Sem.Subject CodeTitle of the Paper		Hours/Week					
2023-2024		VI	23BST61C	CORE PAPER IX - TESTING	6				
Onw	vards			STATISTICAL HYPOTHESIS	-				
COURSE LEVEL OUTCOMES:									
On t	he succe	essful co	mpletion of th	ne course, student will be able to:					
1	Discus	ss testing	of statistical	hypothesis					
2	Explain	n the proc	edures for Like	elihood Ratio Test and tests based on normal Population	ion				
3	Discus	s the test	of significance	for Large and small sample tests					
4	Explain	n the proc	edures of F-to	est and Chi-Square Test					
5	Descril	be Non-P	arametric Tes	sts on one Sample and Two Sample Problems					
6	Apply	Mann-W	hitney 'U' Te	est, Kolmogorov's Smirnov One Sample Test and K	ruskal Wallis				
	Test								
7	7 Apply testing of hypothesis to different distributions								
	1								

UNIT - I

Testing of Hypothesis - Statistical Hypothesis - Simple and Composite Hypothesis, Null and Alternative Hypothesis - Two Types of Errors - Critical Region - Level of significance and Power of a Test - Most Powerful Test - Uniformly Most Powerful Tests - Neyman-Pearson Lemma.

UNIT - II

Tests Based on NP lemma - Likelihood Ratio test – Definition - Test for Single Mean, Two Means, Single Variance and Two Variance for normal population.

UNIT - III

Tests of Significance - Large Sample Tests - Mean, difference of two Means, Single proportion, difference of Two proportions. Small Sample Tests - t-test for single Mean, difference of two Means, Paired t-test – Test of Correlation Co-efficient

UNIT - IV

F-test for variances - Contingency Tables - Yate's correction – Chi-Square Test - Test for Goodness of Fit and Independence of Attributes.

UNIT - V

Non-Parametric Tests – Introduction - Advantages and Disadvantages - Sign test, Run test, Median test and Mann-Whitney 'U' test (One Sample and Two Sample Problems) - Kolmogorov's Smirnov One Sample Test - Kruskal Wallis Test.

PEDAGOGY STRATERGIES:

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing Feedback

REFERENCES:

- 1 S.C. Gupta, and V.K. Kapoor (2012). Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 11th Revised Edition.
- 2 Hogg R.V and Craig A.G. Introduction to Mathematical Statistics

FURTHER READING:

- 1 Snedecor, G.W and Cochran W. G. Statistical Methods (Oxford and IBH)
- 2 Lehmann, E.L. (1986). Testing Statistical Hypothesis (2nd Edition), Springer New York.

RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]

- 1 https://math.ucdenver.edu/~ssantori/MATH2830SP13/Math2830-Chapter-08
- 2 https://www.cse.iitk.ac.in/users/nsrivast/HCC/lec07-09.pdf
- 3 http://www2.univet.hu/users/jfodor/biomath/Biomath12

			Course Level Outcomes (CLO)						
			1	2	3	4	5	6	7
	1	Disciplinary Knowledge	\checkmark	\checkmark	~	~	\checkmark	\checkmark	\checkmark
(0	2	Communication Skills	\checkmark	~	~	~			
s (PL	3	Critical Thinking	\checkmark	~	~	~			
come	4	Research related Skills	\checkmark	~	~	~	\checkmark	\checkmark	\checkmark
el Out	5	Analytical Reasoning	✓	~	✓	✓	\checkmark	✓	✓
n Lev	6	Problem Solving	✓	✓	✓	✓	~	✓	✓
ogran	7	Team Work	\checkmark	~	✓				✓
\Pr	0	Moral and							
	ð	Awareness							
	0	Multicultural							
	y	Competence							

Year		r Sem. Subject Code		Title of the Paper	Hours/ Week					
2023-2024 onwards		D24 dsVI23BST62CCORE PAPER X - DESIGN OF EXPERIMENTS		CORE PAPER X – DESIGN OF EXPERIMENTS	6					
~~~~										
COU	JRSE L	EVEL (	OUTCOMES:							
On t	he succe	ssful co	mpletion of the	course, students will be able to:						
1	Explain the theoretical aspects of Linear models, Analysis of Variance and Design of Experiments									
2	Discuss	s the fur	ndamental princi	iples of experimentation						
3	Analyz	e and in	terpret one-way	and two – way ANOVA						
4	Outline	the typ	e of Design of e	experiments with its advantages and disadvantages						
5	5 Analyze and interpret Completely Randomized Design, Randomized Block Design and Latin Square Design									
6	Discuss	s the bas	sics of Factorial	experiments with its design						
7	Analyz	e and ap	oply Factorial ex	speriments						
8	Explair	the ne	ed of concept of	f confounding						

#### Unit - I

**ANOVA** - Definition – Assumptions – Importance – Linear Models – Fixed Effect Model – Random Effect Model – One-way ANOVA for Fixed Effect Model – Least Square Estimates of Parameters and the Variances - Sum of squares – Two-way ANOVA for Fixed Effect Model - Least Square Estimates of Parameters and the Variances – Sum of squares.

#### Unit - II

**Design of Experiments** - Fundamentals – Terminology in design of Experimental design – Experimental Error – Principles of Experimental Design – Size and Shape of the Plots. **Completely Randomized Design (CRD)** - Concept - Layout - Statistical Analysis - Advantages and Disadvantages.

#### Unit – III

**Randomized Block Design (RBD)** – Application of RBD - Layout – Statistical Analysis of RBD for observation per experimental unit– Advantages and Disadvantages – Efficiency of RBD over CRD – Estimation of one Missing value and its ANOVA in RBD – Estimation of Two missing values in RBD

#### Unit – IV

**Latin Square Design (LSD)** – Layout of LSD – Standard Latin Square - Statistical Analysis of LSD for one observation per experimental unit.– Advantages and Disadvantages – Least Square Estimates – Estimation of one Missing Value in LSD - Efficiency of LSD over CRD and RBD.

### Unit - V

**Factorial Experiments** – Advantages and Limitations –  $2^2$  Factorial Design – Statistical Analysis of  $2^2$  Design – Yates method of Computing Factorial Totals –  $2^3$  Factorial Design – Statistical Analysis of  $2^3$  Design – Confounding - Partial and Complete Confounding .

#### **PEDAGOGY STRATEGIES**

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

RE	FERENCES:					
1 S.C. Gupta and V.K. Kapoor (2015). Fundamentals of Applied Statistics, 4 th Edition, Su						
1	Chand & Sons, New Delhi.					
2	R. Pannerselvam (2012). Design and Analysis of Experiments, Prentice Hall of India, New					
2	Delhi.					
FU	RTHER READING:					
1	Montgomery. Design and Analysis of Experiments, Wiley India Pvt. Ltd, 5 th Edition,					
2	Das M.N. and Giri N.C. (2011). Design and Analysis of Experiments, New Age International					
2	Private Ltd., New Delhi					
3	Cochran W.G. and Cox G.M. (1992). Experimental Designs, Second Edition, John Wiley &					
5	Sons, New York.					
RE	LATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]					
1	https://nptel.ac.in/courses/110/105/110105087/					

				<b>Course Level Outcomes (CLO)</b>					
			1	2	3	4	5	6	7
	1	Disciplinary Knowledge	$\checkmark$	$\checkmark$	$\checkmark$	~	~	$\checkmark$	✓
0	2	Communication Skills	$\checkmark$	~	~	~	~	~	✓
s (PL	3	Critical Thinking				✓	$\checkmark$	$\checkmark$	$\checkmark$
come	4	Research related Skills	$\checkmark$	~	$\checkmark$	~	$\checkmark$	$\checkmark$	$\checkmark$
el Out	5	Analytical Reasoning				✓	$\checkmark$	$\checkmark$	✓
n Lev	6	Problem Solving				✓	$\checkmark$	$\checkmark$	✓
ogran	7	Team Work							
$\mathbf{Pr}$	8	Moral and Ethical							
		Awareness							
	9	Multicultural							
	7	Competence							

Year		Sem.	Subject Code	Title of the Paper	Hours/ Week	
2023-2024 onwards		VI	I23BST63CCORE PAPER XI – AOS – APPLIED STATISTICS		5	
COU	URSE LI	EVEL (	OUTCOMES:			
On t	he succe	ssful co	mpletion of the	course, students will be able to:		
1	Discuss	s the co	ncept of Time so	eries and its components		
2	Analyz	e and in	terpret the Tren	id values		
3	3 Forecast the values using trend analysis					
4	4 Differentiate the concepts of ARMA and ARIMA models					
5	Explain the concept and uses of Index Numbers					
6	Analyze and interpret the Weighted index numbers					

# UNIT - I

7

Time Series - Definition- Components of Time Series - Uses - Measurement of Trend: Graphical Method - Semi-Average Method - Method of Moving Averages - Merits and Demerits - Method of Least Squares in fitting a linear trend.

Discuss the various measurements and scaling techniques

#### UNIT - II

Seasonal Variation – Measurement of Seasonal Variations - Method of Simple Averages, Ratio-to-Trend Method, Ratio-to-Moving Average Method and Link Relative Method – Cyclical Variations and Random Variations (Concepts only) - Concept of ARMA and ARIMA models.

#### UNIT – III

Index numbers - Meaning - Definition - Uses and Types – Price Index numbers – Un-weighted Index Numbers – Simple aggregative method – Simple average of Price relative method -Weighted Index Numbers – Weighted Aggregative Price Index - Laspeyre's Price Index, Paasche's Price Index, Dorbish & Bowley's Price Index, Marshall Edgeworth Price Index and Fisher's Index Number - Weighted Average of Price Relatives Method.

#### $\mathbf{UNIT} - \mathbf{IV}$

Criteria of a Good Index Number : Unit Test, Time Reversal Test, Factor Reversal Test and Circular Test – Construction of Fixed Base and Chain Base Index Numbers - Cost of Living Index Numbers – Uses – Construction - Aggregate Expenditure and Family Budget Methods

#### $\mathbf{UNIT} - \mathbf{V}$

Measurement and Scaling techniques - Categorical variables - Data types - Metric, Interval and Ratio data. Non-Metric data – Nominal and Ordinal data. Scales of measurement - Comparative scale, Paired comparison scale, Rank order scale, Constant sum scale, Non-comparative scale -Continuous rating scale, Itemized rating scale - Likert scale and Guttmann scale

#### PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

#### **REFERENCES:**

S.C. Curte and V.K. Kanager (2015). Fundamentals of Applied Statistics. 4th Edition.	Sultan
$1 \begin{bmatrix} S.C. Gupta and V.K. Kapoor (2015). Fundamentals of Applied Statistics, 4th Edition, S$	
Chand & Sons, New Delhi.	
2 S.P.Gupta (2012). Statistical Methods, Sultan Chand & Sons, New Delhi, 42 nd revised	Edition.
S.K. Mangal (2009). Statistics in Psychology and Education, Second Edition, PHI Lea	rning
Private Limited, New Delhi.	

### **FURTHER READING:**

1	Croxton and Cowden - Applied General Statistics, Prentice - Hall of India (Private) Ltd, New
1	Delhi.

2 B.L. Agarwal – Programmed Statistics, New Age International, Chennai

# **RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]**

1	https://www.glidashara.not/ujimishral	many mont and cooling toophicus
1	IIIIDS.//WWW.SIIUESIIAIE.IIEI/UIIIIISIIIAI	/measurement-and-scaring-techniques

2 https://www.stat.berkeley.edu/~bartlett/courses/153-fall2010/lectures/1.pdf

			Course Level Outcomes (CLO)						
			1	2	3	4	5	6	7
s (PLO)	1	Disciplinary Knowledge	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	~	$\checkmark$
	2	Communication Skills	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			
	3	Critical Thinking	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		
come	4	Research related Skills	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			
el Out	5	Analytical Reasoning	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			
ı Leve	6	Problem Solving	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
ogran	7	Team Work	$\checkmark$	$\checkmark$			$\checkmark$	$\checkmark$	
$\Pr_0$	0	Moral and							
	o	Awareness							
	9	Multicultural Competence							

Veen	Sem.	Subject	Tidle of the Domen	Hours/
Year		Code	The of the Paper	Week

202	2 2024			CORE PRACTICAL III –						
202	3-2024 words	VI	23BST64P	STATISTICS PRACTICAL – III	3					
OII	onwarus		(Using Scientific Calculator)							
COU	URSE L	EVEL	OUTCOMES:							
On t	he succe	ssful co	mpletion of the	course, students will be able to:						
	Estimate the parameters using method of moments and MLE. Analyze the data using									
1	appropriate Large and small sample test. Ensuring the Goodness of fit and Independence of									
	attribut	es using	g Chi – Square 7	Test. Verify the data using Non – Parametric Tests.						
2	Ensure	the Goo	odness of fit and	Independence of attributes using Chi – Square Test.	Verify the					
2	data usi	ing Nor	n – Parametric T	ests						
3	Analyz	e the da	ta using CRD, I	RBD and LSD. Estimate the missing values in RBD a	and LSD.					
	Frame	the con	trol charts using	g p, np, c, $\overline{x}$ and R charts. Verify the process is und	ler control					
4	practica	ally								
	Draw th	he OC,	ASN, ATT, AO	Q curves and analyze the data using Single sampling	g plan and					
	Frame	the I PP	performances and solving the	m Identify the transportation cost using various me	thods and					
5.	analyze	the op	timal solution. I	Determine the optimal assignment using Hungarian m	nethod.					
6	Identify	y the du	ration to replace	the parts. Identify the optimal strategies in Game the	eory.					
-	Measur	e the t	rend and identit	fy the seasonal variations. Calculate the index num	ber using					
/	various	metho	ds.		-					
	1									
Stat	istical In	ferenc	e							
1	l. Estim	ation of	f Parameters of	Distribution by the Method of Moments						
2	2. Estim	ation of	f Parameters by	the Method of Maximum Likelihood						
3	3. Testir	ng of hy	pothesis-Large	Sample Tests- Test for Mean – Difference of Mean.	Proportion					
	- Diff	erence	of proportion. Si	mall sample tests - Test for mean - Difference of mea	n – Paired					
4	1 Chi –	Square	Test - Test for (	Goodness of Fit and Independence of Attributes						
4	5. Non -	- Param	etric Tests – Si	gn test - Run Test - Median Test - Mann-Whitney 'U	J' Test -					
	Kolm	ogorov	's Smirnov One	Sample Test - Kruskal Wallis Test						
		U		1						
Desi	gn of Ex	perime	ents							
6	5. Analy	sis of C	CRD							
7	7. Analy	sis of F	RBD							
8	3. Analy	sis of I	LSD Layouts							
9	). Missi	ng Plot	Techniques in I	(BD						
]	10. Missi	ng Plot	Techniques in	LSD						

# **Statistical Quality Control**

11. Control Charts for Attributes - p, np and c charts

- 12. Control Charts for Variables  $\overline{\mathbf{X}}$  and R charts
- 13. Single Sampling Plan for attributes OC, ASN, ATI and AOQ Curves.

#### **Operations Research**

- 14. Linear Programming Problem Formation of LPP- Graphical Method Simplex Method
- 15. Transportation Problem North West Corner Rule Least Cost Method VAM Method
- 16. Optimal Solution by MODI Method
- 17. Assignment Problem Hungarian Algorithm
- 18. Replacement Problems
- 19. Sequencing problems Problems with n jobs on three machines
- 20. Game theory Games without saddle point Solving 2x2 games Graphic Solution of 2 x n and m x 2 Games.

#### **Time Series**

- 21. Measurement of Trend Graphical Method Semi-Average Method Method of Moving Averages
- 22. Measurement of Seasonal Variations Method of Simple Averages, Ratio-to-Trend Method, Ratio-to-Moving Average Method and Link Relative Method
- 23. Index numbers Un-weighted Index Numbers Simple aggregative method Simple average of Price relative method
- 24. Weighted Index Numbers – Laspeyre's Price Index Paasche's Price Index Dorbish & Bowley's Price Index Marshall Edgeworth Price Index Fisher's Index Number.
- 25. Time Reversal Test and Factor Reversal Test

# **PEDAGOGY STRATEGIES**

- Lecturing and Hands-on training
- Lab Experiments
- Questioning
- Class Test
- Quiz & Drill Practice
- Providing feedback

#### **REFERENCES:**

1	S.C. Gupta, and V.K. Kapoor (2012). Fundamentals of Mathematical Statistics, 11 th Revised
	Edition, Sultan Chand & Sons, New Delhi.
r	S.C. Gupta and V.K. Kapoor (2015). Fundamentals of Applied Statistics, 4th Edition, Sultan
2	Chand & Sons, New Delhi.
2	P.K. Kanti Swarup, Gupta and Manmohan (1980). Operations Research, Sultan Chand & Sons,
5	New Delhi.
4	S.P.Gupta (2012). Statistical Methods, 42 nd revised Edition, Sultan Chand & Sons, New Delhi.
5	M. Mahajan (2009) - Statistical Quality Control, Dhanpat Rai & Co (P) Ltd, New Delhi.

	A.M. Goon, M.K. Gunta and B. Dasgunta (1980). An Outline of Statistical Theory Vol II
6	A.M. Oboli, M.K.Oupia and D. Dasgupta (1969). All Outline of Statistical Theory-Vol.II,
	World Press, Calcutta.
FU	RTHER READING:
1	P.A. Navanitham (2008) - Business Mathematics and Statistics, Jai Publishers, Trichy.
2	Prof. V. Sundaresan, K.S. Ganapathy Subramanian and K. Ganesan (2000). Resource
2	Management Techniques, New Revised Edition, A.R. Publications, Tamil Nadu.
2	P. K. Gupta and Manmohan - Problems in Operations Research, Sultan Chand & Sons, New
5	Delhi.
RE	LATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://nptel.ac.in/courses/111/102/111102111/
2	https://nptel.ac.in/courses/111/104/111104032/
3	https://nptel.ac.in/courses/111/105/111105043/
4	https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=34
5	https://nptel.ac.in/courses/110/105/110105087/
6	https://nptel.ac.in/courses/112/106/112106134/

			Course Level Outcomes (CLO)						
			1	2	3	4	5	6	7
am Level Outcomes (PLO)	1	Disciplinary Knowledge	~	$\checkmark$	~	~	✓	~	$\checkmark$
	2	Communication Skills	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
	3	Critical Thinking							
come	4	Research related Skills							
el Out	5	Analytical Reasoning	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
n Leve	6	Problem Solving	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
ogran	7	Team Work			$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Pro	8	Moral and Ethical Awareness							
	9	Multicultural Competence							

Year	Sem.	Subject Code	Title of the Paper	Hours/ Week
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202	2023-2024			CORE PRACTICAL IV –				
onv	wards	VI	23BST65P	STATISTICS PRACTICAL – IV (Using SPSS)	2			
COU	URSE L	EVEL	<b>OUTCOMES:</b>					
On t	he succe	ssful co	mpletion of the	course, students will be able to:				
1	Design	a quest	ionnaire and co	llect the data				
2	Demon	strate th	ne method of cre	eating and formatting a data file in SPSS.				
3	3 Handle and transform the data in SPSS							
4	4 Draw various diagrams for the created data set using SPSS.							
5	Analyz	e the U	nivariate and Bi	variate data set				
6	Analyz	e Paran	netric and Non p	parametric statistical tests				
7	Analyz	e a big	data set and solv	ve the complicated problems using various statistical	concepts			
	-	-						
1. Ci	reating, H	Editing	and Managing I	Data Files				
2. Di	iagramm	atic Re	presentation – S	imple, Multiple, Sub-divided and Percentage bar diag	grams			
3. Pi	e diagrai	n, Scatt	ter diagram, Box	x plots, Histogram and Frequency table				
4. D	escriptiv	e Statis	tics – Mean, Me	edian, Mode and S.D				
5. Sk	kewness	and Ku	rtosis					
6. Co	orrelation	n – Karl	l Pearson's and	Spearman's Rank correlation				
7. Re	egressior	n – Simj	ple Regression a	analysis				
8.Te	sting of l	Hypoth	esis – Parametri	c tests – One sample 't' test – Two sample 't' test – P	'aired 't'			
Te	st an Dana			ala K. C. taat Many Whitney U. taat Wilcower Ciana	d Douls			
9. IN	on- Parai st – Krus	hetric i kal Wa	ests – One samp Ilis test	ble K-S test - Mann-whitney O test – whotoxon Signe	eu Rank			
10.0	Chi-squar	re test –	- Test for indepe	endence of attributes – Test for goodness of fit				
11. A	Analysis	of Vari	ance - One way	ANOVA – Two way ANOVA				
			5	5				
I	PEDAG	OGY S'	TRATEGIES					
	• Lectu	iring an	d Hands-on trai	ning				
	• Lab I	Experin	nents					
•	<ul> <li>Ques</li> </ul>	tioning						
•	<ul> <li>Class</li> </ul>	Test						
	• Quiz	& Drill	Practice					
	• Provi	ding fe	edback					
DEL								
KEF	EKENC	ES:						
1	Jeremy J	. Foster	c (2001). Data a	nalysis using SPSS for windows - New edition, Versi	ons			
	8-10 Sag	ge publi	cations, London	] w. CDCC for Windows Stor by Charles Dist. Dist.	Douling			
2	2 Kindersely (India) Pvt. Limited (Pearson Education), New Delhi.							

FU	RTHER READING:
1	Clifford E. Lunneborg (2000) - Data analysis by resampling: concepts and applications - Dusbury Thompson learning, Australia.
RF	ELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://nptel.ac.in/courses/110/107/110107113/
2	https://nptel.ac.in/courses/110/105/110105060/
3	https://nptel.ac.in/courses/111/104/111104098/

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			<b>Course Level Outcomes (CLO)</b>							
			1	2	3	4	5	6	7	
	1	Disciplinary Knowledge	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	✓	$\checkmark$	
(0	2	Communication Skills	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
s (PL	3	Critical Thinking	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
come	4	Research related Skills	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
el Out	5	Analytical Reasoning	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
n Leve	6	Problem Solving	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
Progran	7	Team Work	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
	8	Moral and Ethical								
	U	Awareness								
	9	Multicultural Competence								

Year	Sem.	Subject Code	Title of the Paper	Hours/ Week
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2023-2024 onwards	VI	23BST67S	SKILL BASED SUBJECT IV - DEMOGRAPHIC METHODS	3

#### **COURSE LEVEL OUTCOMES:**

On the successful completion of the course, students will be able to:

1 Explain the basics of demography and the sources of demographic data

2 Discuss the uses and applications of demography in various fields

- 3 Explain the concept fertility and calculate its measures CBR, GFR, TFR, ASFR, GRR and NRR
- 4 Summarize the concept mortality and calculate its measures CDR, ASDR, SDR and IMR.
- 5 Calculate and construct the life table and discuss its uses and functions
- 6 Discuss about migration and its types in real life situations
- 7 Describe various types, importance and methods for estimation of population projection.

#### Unit - I

**Demography** - Definition - Importance of Demographic data – Sources of Demographic data – Population Census – Uses - Registration method - Vital Registration - Population Register -Records - Sample surveys - International publications - Demography in Sociology, Economics and Health planning.

#### Unit - II

**Fertility measurements** - Rates and Ratios – Fertility – Factors affecting Fertility – Fertility Measures - Crude Birth Rate (CBR), General, Specific and Total Fertility Rates – Growth Rates - Gross Reproduction Rate (GRR) - Net Reproduction Rate (NRR) - Simple Problems.

#### Unit – III

**Mortality Measurements -** Mortality – Mortality Measures - Crude Death Rate (CDR), Age, Sex and Cause Specific Death Rates - Standardized Death Rate - Infant Mortality Rate - Simple Problems.

#### Unit – IV

**Life Table** – Assumptions - Description of various columns of a Life table –Relationship between life table functions - Construction of a Life table - Uses of a Life table - Simple Problems. **Migration** - Definition – Types of Migration - Effects of Migration.

Unit - V

**Population Projection** – Types - Methods of population projection – Importance - limitations – Population estimates and projection – Mathematical Method – Arithmetic Method and Geometric Method - Growth Component Method – Logistic curve – Basic ideas of Stationary and Stable population.

#### PEDAGOGY STRATEGIES

- Lecturing
- Classroom Discussion

- Questioning
- Seminar
- Assignment
- Class Test
- Quiz & Drill Practice
- Providing feedback

#### **REFERENCES:**

1	Jhingan M.L, Bhatt B.K and Desai J.N. (2003). Demography, Vrinda Publications (P) Ltd,
	Delhi, 2nd Revised Edition.
2	Gupta S.C. and Kapoor V.K. (2019). Fundamentals of Applied Statistics, Sultan Chand
2	& Sons, New Delhi, 4th thoroughly revised edition.

#### **FURTHER READING:**

1	Mishra D.E (2001). An Introduction to the Study of Population, South India publishers,
•	Madras.

2 Goon, A.M, Gupta, M.K and Das Gupta (2009). Fundamentals of Statistics, Vol II (World Press).

#### Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

- 1 https://nptel.ac.in/courses/109/104/109104045/
- 2 https://swayam.gov.in/nd1_noc19_hs39/preview
- 3 https://nptel.ac.in/courses/109/104/109104150/
- 4 <u>http://www.ru.ac.bd/wp-</u>
- ontent/uploads/sites/25/2019/03/402_10_00_Lundquist_Demography.pdf
- 5 https://www.youtube.com/watch?v=51eqdcSg0Pw

			Course Level Outcomes (CLO)							
			1	2	3	4	5	6	7	
	1	Disciplinary Knowledge	~	✓	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
(0)	2	Analytical Reasoning	✓	$\checkmark$	$\checkmark$	~	$\checkmark$	$\checkmark$	$\checkmark$	
es (PI	3	Research related Skills					$\checkmark$	$\checkmark$	$\checkmark$	
itcom	4	Scientific Reasoning					$\checkmark$	$\checkmark$	$\checkmark$	
Program Level Ot	5	Information/Digital Literacy	✓	✓	~	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
	6	Problem Solving			$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
	7	Cooperation/ Team Work	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
	8	Moral and Ethical Awareness	~	$\checkmark$			$\checkmark$	$\checkmark$	$\checkmark$	
	9	Self-Directed Learning	~	~				$\checkmark$	$\checkmark$	

Year	Sem.	Subject Code	Title of the Paper	Hours/ Week
2023-2024 onwards	VI	23BST6EL	NON MAJOR ELECTIVE II - BASIC STATISTICS – II	3

|--|

On the successful completion of the course, students will be able to:

- 1 Explain the study of relationship between two variables
- 2 Convert qualitative data into ranks and calculate the rank correlation.
- 3 Discuss the applications of Time Series and its Components
- 4 Compute Index numbers
- 5 Discuss the concept of cost of living index
- 6 Apply index numbers in real life situations
- 7 Demonstrate the applications of Time Series in Forecasting

#### Unit - I

**Correlation** – Meaning – Scatter diagram – Karl Pearson's Correlation Coefficient – Merits and Demerits - Rank Correlation – Spearman's Rank Correlation Coefficient – Merits and Demerits – Concurrent Deviation Method – Simple Problems.

#### Unit - II

**Regression** – Meaning - Uses – Applications - Regression Equation Y on X – Regression Equation X on Y – Properties – Determination of Correlation using Regression Coefficients – Forecasting - Simple Problems.

#### Unit – III

**Time Series** – Uses – Components of Time Series – Measurement of Trend –Graphical method-Semi Average Method - Moving Average Method - Method of Least Squares – Simple Problems.

#### Unit – IV

**Index Numbers** – Uses – Characteristics – Price Index Numbers - Construction of Weighted Index Numbers – Laspeyre's, Paasches and Fisher's Index Numbers – Cost of Living Index - Simple Problems.

#### Unit - V

Sampling Techniques – Census Survey – Merits and Demerits - Sample Survey – Merits and Demerits – Principles of Sampling – Methods of Sampling – Simple Random Sampling – Non-Random Sampling Methods – Snow Ball Sampling – Quota Sampling - Merits and Demerits – Sampling Error (Concepts Only).

#### **PEDAGOGY STRATEGIES**

- Lecturing
- Assignment
- Classroom Discussion
- Questioning

- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

#### **REFERENCES:**

- 1 Navanitham, P.A. (2008). Business Mathematics and Statistics, Jai Publishers, Trichy.
- 2 S.C. Gupta and V.K. Kapoor (2015). Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.

#### **FURTHER READING:**

1	Pillai, R.S.N and V. Bagavathi (1999). Statistics – Theory and Practice, S.Chand & Sons Company Ltd, New Delhi.
2	Vittal P.R. Business Statistics, Margham Publications, Chennai.

#### **RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]** 1 https://nptel.ac.in/courses/110/107/110107114/

<b>Course Level Outcomes (CLO)</b>

			1	2	3	4	5	6	7
	1	Disciplinary Knowledge	$\checkmark$	~	~	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
(0)	2	Analytical Reasoning	✓	✓	✓	✓	✓	$\checkmark$	$\checkmark$
es (P]	3	Self-directed Learning	$\checkmark$	$\checkmark$			$\checkmark$	$\checkmark$	$\checkmark$
Program Level Outcom	4	Reflective Thinking	$\checkmark$	~		~		$\checkmark$	~
	5	Information/Digital Literacy	$\checkmark$	~	~	~	~	$\checkmark$	~
	6	Problem Solving	$\checkmark$	~	~	~	~	$\checkmark$	~
	7	Cooperation/Team Work	$\checkmark$	~	~	~	~	$\checkmark$	~
	8	Moral and Ethical Awareness		$\checkmark$	$\checkmark$	✓			
	9	Lifelong learning			~	~	~	$\checkmark$	

# **ALLIED PAPERS** (Offered to other Departments)

GOVERNMENT ARTS COLLEGE, COIMBATORE 641 018 B. Sc. STATISTICS (OBE PATTERN)

(For the students admitted from the academic year 2023-2024 and onwards)
Part	Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext- Min.	Total Pass Mark	Credits
	1	Semester – 1	Γ						
III	23BGE14A	Statistics – I	8	25	75	100	30	40	
III	23BCS16A	Statistics and Numerical Methods	6	25	75	100	30	40	
III	23BCA15A	Business Mathematics	6	25	75	100	30	40	
III	23BBA15A	Statistics for Management – I	6	25	75	100	30	40	
		Semester – II							
III	23BGE24A	8	25	75	100	30	40		
III	23BIT25A	6	25	75	100	30	40		
III	23BBA25A	Statistics for Management – II	6	25	75	100	30	40	
	1	Semester – II	[	1					
III	23BPS34A	Statistics – I	6	25	75	100	30	40	
III	23BCA36A	Statistics for Business	4	25	75	100	30	40	
	Γ	Semester – IV	7	[					
III	23BPS44A	Statistics – II	6	25	75	100	30	40	
III	23BCO45A /23BIB46A	Business Statistics	4	25	75	100	30	40	

# Scheme of Examination for Allied Papers offered to Other Departments

Year	Title of the PaperHouWe	em. Subject Code	Year
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2023-2 onwai	2023-24 onwardsI23BGE14AI B.Sc., GEOGRAPHY – Allied – I: STATISTICS – I									
COU	COURSE LEVEL OUTCOMES:									
On the	e succes	sful o	completion of th	e course, student will be able to:						
1.	Discus	ss the	scope and nece	ssity of Statistics						
2.	Tabula	ate an	nd represent the	data in diagrams and graphs						
3.	Identif	fy the	e nature of data							
4.	Choos	e the	suitable measur	e according to the nature of the observed data						
5.	Apply the formula and calculate statistical measures for the observed data in their field									
6.	6. Check the relevance of the measures calculated									
7.	7. Interpret the results of the statistical measures used									

#### Unit – I

**Statistics -** Definition, Scope and Limitations – Types and Sources of Data – Methods of Collecting Primary Data – Tools for Data Collection - Sources of Secondary Data – Classification and Tabulation of Data.

#### Unit – II

**Frequency Distribution** - Formation of Frequency Distribution - Presentation of Data. **Diagrams:** Bar Diagrams and Pie Diagram. **Graphs** – Histogram - Frequency Polygon - Frequency Curve and Ogives – Finding Median and Mode graphically.

#### Unit – III

**Measures of Central Tendency** – Meaning - Objectives - Mean, Median, Mode, Geometric Mean and Harmonic Mean – Merits and Demerits – Properties of a Good Measure – The Best Measure among Measures of Central Tendency.

#### Unit – IV

**Measures of Dispersion** – Meaning - Objectives - Range, Quartile Deviation, Mean Deviation, Standard Deviation and Co-efficient of Variation. The Best Measure among Measures of Dispersion. **Skewness and Kurtosis -** Definition – Concept of Symmetry and Skewness - Measures of Skewness – Karl Pearson's Co-efficient of Skewness and Bowley's Co-efficient of Skewness - Measures of Kurtosis.

#### Unit – V

**Probability -** Concept – Basic Concepts – Types of Events – Mathematical and Statistical Definitions of Probability – Conditional Probability – Addition and Multiplication Theorems (Without Proof) – Problems based on these theorems.

#### PEDAGOGY STRATEGIES

• Lecturing

- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & amp; Drill Practice
- Providing feedback

#### **References:**

- **1.** S.P.Gupta (2012). Statistical Methods, Sultan Chand & Sons, New Delhi, 42nd revised Edition.
- 2. Gupta, S C. and Kapoor V. K. (2018) Fundamentals of Mathematical Statistics, Eleventh Edition, Sultan Chand & Sons, New Delhi.

#### **Further Reading:**

- **1.** P. R. Vittal Business Statistics, Margham Publications, Chennai.
- 2. P.A. Navneetham (2008). Business Mathematics & Statistics, Jai Publishers, Trichy.
- **3.** Goon A.M., Gupta M.K., and Das Gupta B. (2013). Fundamentals of Statistics, Vol.1, World Press Private Ltd, Calcutta.

## Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

- 1. https://nptel.ac.in/courses/111/105/111105041/
- 2. https://nptel.ac.in/courses/111/106/111106112/

				(	Course Le	vel Outco	mes (CLC	))	
			1	6	7				
	1	Disciplinary Knowledge	~			~	~	~	
0	2	Communication Skills		~	~	~	~	~	
s (PL	3	Critical Thinking	✓	✓	~	✓	✓		✓
come	4	Research related Skills			~	~		~	✓
el Out	5	Analytical Reasoning		$\checkmark$		$\checkmark$	$\checkmark$		✓
n Leve	6	Problem Solving							
ogran	7	Team Work							
Pr(	8	Moral and Ethical Awareness	~		~			~	
	9	Multicultural Competence	$\checkmark$		~			$\checkmark$	

Year		Sem.	Subject Code	Title of the Paper	Hours/ Week
2023-2024 onwards		2024 ardsI23BCS16AI BSc., (CS) - Allied I: STATISTICS & NUMERICAL METHODS		I BSc., (CS) - Allied I: STATISTICS & NUMERICAL METHODS	6
CO	URSE L	EVEL	OUTCOMES:		
On t	he succe	ssful co	mpletion of the	course, students will be able to:	
1	Calcula	ate and a	apply measures of	of central tendency and measures of dispersion - gro	uped data
1	cases.				
n	Calcula	ate and a	apply measures of	of central tendency and measures of dispersion -ung	rouped
2	data ca	ses.			
3	Compu	te and i	nterpret the resu	lts of Skewness and Correlation Analysis.	
4	Demon	strates a	and understands	Linear Regression and Curve fitting.	
5	Apply the acc	numeric uracy of	al methods to so f common nume	lve system of simultaneous equations and analyze an rical methods.	d evaluate
6	Solve N	Numeric	al Differentiatio	n and Central difference problems using Newton Fo	rward
0	Differe	nce and	Backward Diffe	erence.	
7	Solve N	Numeric	al Integration pr	oblems using Newton Forward Difference and Back	ward
/	Differe	nce, Tra	apezoidal Rule, S	Simpson Rule 1/3 $^{\rm rd}$ , 3/8 $^{\rm th}$ and Weddle's rules.	
	1				
Unit	<b>- I</b>				
Mea and	sures of Mode –	<b>Centra</b> Uses - N	al Tendency – M Aerits and Deme	Aean - Median and Mode - Relationship among Mearits	n, Median
Mea Coei	sures of	<b>Disper Disper</b>	<b>sion -</b> Range - <b>(</b> ion.	Quartile Deviation - Mean Deviation - Standard Dev	viation and

#### Unit - II

**Skewness and Kurtosis -** Definition - Bowley's and Karl Pearson's Coefficient of Skewness. Concept of Kurtosis.

**Correlation** - Definition - Scatter Diagram - Types of Correlation - Karl Pearson Correlation Coefficient – Spearman's Rank Correlation Coefficient.

## Unit – III

**Regression Analysis** -Definition - Regression Equations for Two Variables - Regression Coefficients - Properties - Curve Fitting - Linear - Simple Problems.

## Unit – IV

**Numerical Methods** - System of Simultaneous Equations - Gauss Elimination- Gauss Seidal Methods – Interpolation - Newton's Forward and Backward Interpolation Formula - Lagrange's Interpolation - Central difference interpolation formulae - Gauss forward and backward formula -(No Derivations) Simple Problems Only.

#### Unit - V

**Numerical Differentiation** - Newton Forward Difference - Newton Backward Difference. Numerical Integration - Trapezoidal Rule - Simpson's 1/3 rd Rule - Simpson's 3/8 th Rule and Weddle's Rule (No Derivations) Simple Problems Only.

## **PEDAGOGY STRATEGIES**

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

#### **REFERENCES:**

1	S.C. Gupta and V.K. Kapoor (2012). Fundamentals of Mathematical Statistics, Sultan Chand
1	& Sons, New Delhi, 11 th revised Edition.
C	P. Kandasamy, K. Thilagavathy and K. Gunavathi. Numerical Methods, S. Chand & Company
Ζ	Ltd. New Delhi

## **FURTHER READING:**

1 S	S.P. Gupta (2012)	. Statistical Methods.	Sultan Chand & Sons.	New Delhi, 42 nd	revised Edition.
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2 R.S.N. Pillai and V. Bagavathi (1999). Statistics – Theory and Practice, S. Chand & Sons Company Ltd, New Delhi.

3 E. Balagurusamy - Numerical Methods, Tata MC grew hill Pvt ltd.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1 https://nptel.ac.in/courses/111/105/111105041/

- 2 https://nptel.ac.in/courses/111/106/111106112/
- 3 https://www.classcentral.com/course/intro-to-numerical-analysis-13684

			Course Level Outcomes (CLO)								
		_	1	2	3	4	5	6	7		
	1	Disciplinary Knowledge									
(0	2	Communication Skills									
s (PL	3	Critical Thinking									
come	4	Research related Skills									
el Out	5	Analytical Reasoning									
ı Leve	6	Problem Solving									
ogran	7	Team Work									
$\Pr($	8	Moral and Ethical Awareness									
	9	Multicultural Competence									

YearSem.Subject CodeTitle of the Paper					Hours/ Week				
2023-2024 onwards		Ι	23BCA15A	I BCom (CA) -Allied I: BUSINESS MATHEMATICS	6				
COU	URSE L	EVEL	OUTCOMES:						
On t	he succe	ssful co	mpletion of the o	course, students will be able to:					
1	Explain	n the co	ncepts and uses o	of series.					
2	Discus	s the nat	ture of business p	problems					
3	Apply the knowledge of mathematics (algebra, matrices, calculus) in solving business								
5	probler	ns.							
4	4 Solve the business problems using Basic Mathematics								

- 5 Analyze and take decisions in day to day business transactions
- 6 Solve the Transportation problem
- 7 Discuss Assignment problem and solve it

## Unit - I

**Mathematics of Finance -** Arithmetic and Geometric Series - Simple interest - Compound interest - Annuity - Concept of present value and amount of sum types of annuities - Present value and amount of an annuity including the cases of continuous compounding - Problems relating to sinking fund.

## Unit - II

**Matrices -** Definition of a matrix - types of matrices- Properties of determinants - Calculations of values of determinants up to third order – Adjoint of a matrix – Elementary row and column operations - Inverse of a Matrix (up to  $3 \times 3$ ) - Solution of a system of linear equations having unique solution and involving not more than three variables - Rank of a Matrix (up to  $3 \times 3$ ).

## Unit – III

**Numerical Differentiation -** Variables - Constants and Functions - Differentiation - Meaning of Derivative – First and Second Order Derivatives - Maxima and Minima; cases of one variable involving second or higher order derivatives - Marginal Revenue and Marginal Cost - Simple Problems.

## Unit – IV

**Numerical Integration -** Integration as anti-derivative process - Standard forms - Meaning - Basic Integral Formulas - Methods of Integration - By substitution - By parts - By use of partial functions - Simple Problems.

Unit - V

**Transportation and Assignment Problems -** Transportation Problem - Introduction - Balanced and Unbalanced Problems – Initial Basic Feasible Solution – North-West Corner Rule, Least Cost Method and Vogel's Approximation Method (VAM) - Assignment Problem – Hungarian Method - Simple Problems.

## **PEDAGOGY STRATEGIES**

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

RE	FERENCES:
1	Vittal P.R. (2012). Business Mathematics and Statistics: Margham Publications, Chennai.
2	Eugene Don and Joel J. Lerner, (2009). Basic Business Mathematics: McGraw-Hill Education, New Delhi.
FU	RTHER READING:
1	Navneetham P.A. (2008). Business Mathematics & Statistics: Jai Publishers, Trichy.
2	Kanti Swarup, Gupta P.K and Manmohan (1980). Operations Research: Sultan Chand & Sons, New Delhi.
RF	ELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.notesformba.com/subject/business-mathematics
2	https://www.mheducation.com/highered/explore/business-math.html

			<b>Course Level Outcomes (CLO)</b>								
	-		1	2	3	4	5	6	7		
	1	Disciplinary Knowledge	$\checkmark$	$\checkmark$	~	~	~	~	~		
0	2	Communication Skills		~			~	~	~		
s (PL	3	Critical Thinking	$\checkmark$	✓		✓		~	✓		
tcome	4	Research related Skills									
el Out	5	Analytical Reasoning		✓		✓					
n Lev	6	Problem Solving					~	✓	✓		
ogran	7	Team Work									
Pr(	8	Moral and Ethical						~	~		
		Awareness									
	9	Multicultural Competence						~	$\checkmark$		

	Sem. Subject Code Title of the Paper		Title of the Paper	Hours / Week					
24 rds	I	23BBA15A	I BBA – Allied I: STATISTICS FOR MANAGEMENT- I	6					
COURSE LEVEL OUTCOMES.									
On the successful completion of the course, student will be able to:									
. Discuss the scope and necessity of Statistics									
Tab	ulate ar	nd represent the data i	n Diagrams and Graphs						
Iden	tify the	e nature of data							
Cho	ose the	suitable measure acc	ording to the nature of the observed data						
App	ly the f	formula and calculate	statistical measures for the observed data in their fie	ld					
Check the relevance of the measures calculated									
Inter	rpret th	e results of the statist	ical measures used						
	24 rds RSE le succ Disc Tab Iden Cho App Che Inter	Sem. 24 rds I RSE LEVEN e successful Discuss the Tabulate ar Identify the Choose the Apply the f Check the r Interpret th	Sem.Subject Code24 rdsI23BBA15ARSE LEVEL OUTCOMES:e successful completion of the couDiscuss the scope and necessityTabulate and represent the data iIdentify the nature of dataChoose the suitable measure accApply the formula and calculateCheck the relevance of the measInterpret the results of the statist	Sem.Subject CodeTitle of the Paper24 rdsI23BBA15AI BBA – Allied I: STATISTICS FOR MANAGEMENT- IRSE LEVEL OUTCOMES:e successful completion of the course, student will be able to:Discuss the scope and necessity of StatisticsTabulate and represent the data in Diagrams and GraphsIdentify the nature of dataChoose the suitable measure according to the nature of the observed dataApply the formula and calculate statistical measures for the observed data in their fieCheck the relevance of the measures calculatedInterpret the results of the statistical measures used					

#### Unit – I

**Statistics** – Definition - Scope and Limitations – Types and Sources of Data – Methods of Collecting Primary Data – Tools for Data Collection - Sources of Secondary Data – Classification and Tabulation of Data. **Graphs** - Histogram - Frequency Curve and Ogives – Finding Median and Mode graphically. **Measures of Central Tendency** - Mean, Median, Mode.

#### Unit – II

**Measures of Dispersion -** Meaning - Objectives - Range, Quartile Deviation, Mean Deviation, Standard Deviation and Co-efficient of Variation. The Best Measure among Measures of Dispersion. **Skewness -** Definition – Concept of Symmetry and Skewness - Measures of Skewness – Karl Pearson's Co-efficient of Skewness and Bowley's Co-efficient of Skewness.

#### Unit – III

**Correlation -** Definition - Types and Methods of measuring of Correlation - Scatter Diagram - Karl Pearson's Method - Spearman's Rank Method. **Regression -** Definition and Types – Simple Regression only – Construction of Regression Equations – Difference between Correlation and Regression.

#### Unit – IV

**Index Numbers -** Definition - types and uses - Weighted and Un-weighted Methods of constructing Price index Numbers – Time Reversal and Factor Reversal Tests. Cost of Living Index Number – Uses - Construction by Family Budget Method – Aggregate Expenditure Method.

#### Unit – V

**Time Series -** Concept and Components - Estimation of Trend – Method of Moving Averages - Method of Least squares (Linear only). Estimation of Seasonal Variation – Method of Simple Averages – Ratio-to-Moving Averages Method.

#### PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & amp; Drill Practice
- Providing feedback

#### **References:**

- **1.** S.P. Gupta (2012). Statistical Methods, Sultan Chand & Sons, New Delhi, 42nd revised Edition.
- **2.** Gupta S.C. and Kapoor V.K. (2018). Fundamentals of Mathematical Statistics, Eleventh Edition, Sultan Chand & Sons, New Delhi.

#### **Further Reading:**

- **1.** P. R. Vittal Business Statistics, Margham Publications, Chennai.
- 2. P.A. Navneetham (2008) Business Mathematics & Statistics, Jai Publishers, Trichy.
- **3.** Goon A.M., Gupta, M.K. and Das Gupta B. (2013). Fundamentals of Statistics, Vol.1, World Press Private Ltd, Calcutta.

#### Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

- 1. https://nptel.ac.in/courses/111/105/111105041/
- 2. <u>https://nptel.ac.in/courses/111/106/111106112</u>

				Course Level Outcomes (CLO)								
			1	2	3	4	5	6	7			
	1	Disciplinary Knowledge	~			✓	~	~				
0	2	Communication Skills		~	~	~	~	~				
s (PL	3	Critical Thinking	~	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$			
come	4	Research related Skills			$\checkmark$	~		~	~			
el Out	5	Analytical Reasoning		$\checkmark$		~	$\checkmark$		~			
n Leve	6	Problem Solving										
ogran	7	Team Work										
Pr(	8	Moral and Ethical	✓		✓			~				
	9	Awareness Multicultural Competence	✓		✓			✓				

Year	Sem.	Subject Code	Title of the Paper	Hours/ Week
2023-2024 onwards	II	23BGE24A	II B.Sc., GEOGRAPHY – Allied II: STATISTICS – II	8
onvaras			STILLE I	

## **COURSE LEVEL OUTCOMES:**

On the successful completion of the course, students will be able to:

- 1 Evaluate the correlation and constructing regression equations by various methods
- 2 Explain the applications of random and non-random sampling methods
- 3 Analyze and test the means, proportions using large sample procedure
- 4 Identify and apply small sample test problems for testing means and variances
- 5 Evaluate the various applications of Chi square test with relevant examples
- 6 Demonstrate layout and application of one-way and two-way classifications
- 7 Identify and apply CRD and RBD with appropriate real-life problems

#### Unit - I

**Correlation** – Meaning - Scatter Diagram - Karl Pearson's Co-efficient of Correlation - Spearman's Rank Correlation – Coefficient of Concurrent Deviation - Simple Problems.

**Regression** – Meaning - Construction of regression equations - Difference between Correlation and Regression – Properties of Regression coefficients - Simple Problems.

#### Unit - II

**Sampling Methods** – Advantages and Limitations – Sampling and Non-Sampling Errors – Random Sampling Methods - Simple Random Sampling - Systematic Sampling - Stratified Sampling – Non-Random Sampling Methods (No Derivations, Only Concepts).

#### Unit – III

**Testing of Hypothesis** - Sampling Distribution – Standard Error – Tests of Significance – Null and Alternative Hypotheses – Type I and Type II Errors.

**Large Sample Tests** – Test for Single Mean, Difference of Means, Single Proportion and Difference of Proportions – Simple Problems.

#### Unit – IV

**Small Sample Tests** - Student's 't' test – Test for Single Mean - Difference of Means (independent and paired samples) – Chi-Square Test –Test for Independence of Attributes and Goodness of Fit – F- test for Equality of Two Variances.

#### Unit - V

**ANOVA, CRD AND RBD** – Assumptions – Layout and analysis of One way and Two way Classifications (No Derivations) – Layout and analysis of Completely Randomized Design (CRD) - Randomized Block Design (RBD) - Simple Problems.

## PEDAGOGY STRATEGIES

- Lecturing
- Classroom Discussion
- Questioning
- Seminar
- Assignment
- Class Test
- Quiz & Drill Practice
- Providing feedback

## **REFERENCES:**

- 1 Gupta, S.C. and Kapoor, V.K. (2017). Fundamentals of Mathematical Statistics, Sultan Chand &Sons, New Delhi, 11th revised Edition.
- 2 Pannerselvam R (2012). Design and Analysis of Experiments Prentice Hall of India.

## **FURTHER READING:**

1	Gupta, S.P. (2014). Statistical Methods, Sultan Chand & Sons, New Delhi, 44 th Thoroughly
1	Revised Edition.
2	Gupta S.C. and Kapoor V.K. (2019). Fundamentals of Applied Statistics, Sultan Chand & Sons,
2	New Delhi 4th Thoroughly Revised Edition.
Re	elated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://nptel.ac.in/courses/110/105/110105087/
2	https://nptel.ac.in/courses/102/106/102106051/
3	https://nptel.ac.in/courses/102/101/102101056/

4 https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-mg23/

				Course Level Outcomes (CLO)								
			1	2	3	4	5	6	7			
	1	Disciplinary Knowledge	~	~	~	~	~	$\checkmark$	~			
(0	2	Communication Skills	~		~	~	~	$\checkmark$	~			
s (PL	3	Critical Thinking	✓	$\checkmark$	$\checkmark$	$\checkmark$	~	$\checkmark$	✓			
come	4	Research related Skills	✓	✓	$\checkmark$	$\checkmark$	~	$\checkmark$	~			
el Out	5	Analytical Reasoning	✓		$\checkmark$	$\checkmark$	~	$\checkmark$	✓			
n Lev	6	Problem Solving	✓		✓	~	✓	✓	✓			
ogran	7	Team Work	✓		✓	~	✓	✓				
$\Pr$	8	Moral and Ethical Awareness	~		~	$\checkmark$	~	~	~			
	9	Multicultural Competence	~		~	$\checkmark$	$\checkmark$	~	~			

Year		Sem.	Subject Code	Title of the Paper	Hours/ Week				
202	3-2024	П	23BIT25A	I BSc., (IT) - Allied II:	6				
onv	wards		2501125A	STATISTICAL METHODS	0				
COU	URSE L	EVEL	OUTCOMES:						
On t	he succe	ssful co	mpletion of the	course, students will be able to:					
Apply numerical methods to solve system of simultaneous		olve system of simultaneous equations and analyze a	nd						
1	evaluate the accuracy of common numerical methods								
2	Solve Numerical Differentiation and Central difference problems using Newton Forward								
2	Difference and Backward Difference								
	Solve Numerical Integration and differentiation problems using Newton Forward Difference								
3	and Backward Difference, Trapezoidal Rule, Simpson Rule 1/3 rd , 3/8 th rules and Weddle's								
	rule								
1	Calculate and apply measures of central tendency and measures of dispersion - grouped data								
4	cases								
5	Calcula	te and a	apply measures	of central tendency and measures of dispersion -ung	rouped				
5	data ca	data cases							
6	Compu	te and i	nterpret the resu	Its of Skewness and Correlation Analysis					
7	Demon	strates a	and understands	Linear Regression and Curve fitting					
	1								

#### Unit - I

**Numerical Methods** - System of Simultaneous Equations - Gauss Elimination- Gauss Seidal Methods – Interpolation - Newton's Forward and Backward Interpolation Formula - Lagrange's Interpolation - Central difference interpolation formulae: Gauss forward and backward formula -(No Derivations) Simple Problems Only.

#### Unit - II

**Numerical Differentiation** - Newton Forward Difference - Newton Backward Difference - Numerical Integration - Trapezoidal Rule - Simpson's 1/3 rd Rule - Simpson's 3/8 th Rule and Weddle's Rule (No Derivations) - Simple Problems Only.

#### Unit – III

**Measures of Central Tendency** – Mean -Median and Mode - Relationship among Mean, Median and Mode – Uses - Merits and Demerits

**Measures of Dispersion -** Range - Quartile Deviation - Mean Deviation - Standard Deviation and Coefficient of Variation.

#### Unit – IV

**Skewness and Kurtosis -** Meaning - Bowley's and Karl Pearson's Coefficient of Skewness - Concept of Kurtosis.

**Correlation** - Definition - Scatter Diagram - Types of Correlation - Karl Pearson Correlation Coefficient – Spearman's Rank Correlation Coefficient.

#### Unit - V

**Regression Analysis** - Definition - Regression Equations for Two Variables - Regression Coefficients - Properties - Curve Fitting - Linear - Simple Problems.

## PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

#### **REFERENCES:**

1	P. Kandasamy, K. Thilagavathy and K. Gunavathi - Numerical Methods, S. Chand & Company
1	Ltd, New Delhi.
	C.C. Contract V.K. Kanner (2012) Free demonstrate of Mathematical Statistics, Sectors Chand

2 S.C. Gupta and V.K. Kapoor (2012). Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 11th revised Edition.

## **FURTHER READING:**

 E. Balagurusamy - Numerical Methods, Tata MC Grawhill Pvt ltd.
S.P. Gupta (2012). Statistical Methods, Sultan Chand & Sons, New Delhi, 42nd revised Edition.
R.S.N. Pillai and V. Bagavathi (1999). Statistics – Theory and Practice, S. Chand & Sons Company Ltd, New Delhi.

## Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

- 1 <u>https://www.classcentral.com/course/intro-to-numerical-analysis-13684</u>
- 2 <u>https://nptel.ac.in/courses/111/105/111105041/</u>
- 3 <u>https://nptel.ac.in/courses/111/106/111106112/</u>

				<b>Course Level Outcomes (CLO)</b>								
			1	2	3	4	5	6	7			
	1	Disciplinary Knowledge	~	~	~	~	~	$\checkmark$	$\checkmark$			
(0	2	Communication Skills	~			~		$\checkmark$	~			
s (PL	3	Critical Thinking	✓			✓		$\checkmark$				
come	4	Research related Skills				~	✓	$\checkmark$	$\checkmark$			
el Out	5	Analytical Reasoning	~	$\checkmark$	$\checkmark$	~	$\checkmark$	$\checkmark$	$\checkmark$			
ı Leve	6	Problem Solving	~	~	✓	~	✓	$\checkmark$	✓			
ogran	7	Team Work	~	$\checkmark$	$\checkmark$			$\checkmark$	$\checkmark$			
Pro	8	Moral and Ethical		~	~	~	~	~				
	9	Awareness Multicultural Competence				✓	✓	✓				

Year	Sem.	Subject Code	Title of the Paper	Hours / Week				
2023-2 onwar	ds II	23BBA25A	I BBA – Allied II: STATISTICS FOR MANAGEMENT- II	6				
COUR	RSE LEVEI	L OUTCOMES	:					
On the	successful	completion of th	e course, student will be able to:					
1.	Explain the	e scope and nece	ssity of Operations Research					
2.	Identify the	e nature of data of	bserved					
3.	Discuss the	e various techniq	ues available in OR					
4.	Choose the	suitable Techni	que according to the nature of the observed data					
5.	Apply the f	formula and arriv	ve the relevant results related to the observed data in their	r field				
6.	Validate th	e relevance of th	e technique applied					
7.	7. Interpret the results arrived using the OR techniques							
	· · · ·							
Unit –	Ι							

Operations Research – Introduction – Meaning – Scope. Linear Programming Problem – Definition – Assumptions – General Form – Advantages and Limitations of LPP – Mathematical Formulation – Graphical Method.

## Unit – II

**Transportation Problem** – Definition – Balanced and Unbalanced Problems – Initial Basic Feasible Solution (IBFS) - Methods of Finding IBFS - North-West Corner Rule - Least Cost Method and Vogel's Approximation Method (VAM).

Assignment Problem – Definition – Hungarian Method of Solving – Simple Problems.

# Unit – III

Game Theory - Concept and Definition of a Game - Pure and Mixed Strategies - Saddle Point -Value of a Game – Algebraic Method – Dominance Rule.

Queuing Theory - Concept - Uses - Queuing System - Characteristics of a Queuing System -(M/M/1):(  $\infty$ /FIFO) Model – Simple Problems.

# Unit – IV

Network Analysis – Basic Concepts – Rules of Network Construction – Types of Floats – Earliest Start Time - Earliest Finish Time - Latest Start Time - Latest Finish Time - Duration of Critical Path - Critical Path Method - PERT Method - Probability Considerations.

## Unit – V

**Replacement Problem** – Definition – Concept and Types of Replacement – Replacement of items that Deteriorates Gradually – Replacement of items that Fails Suddenly – Simple Problems.

#### PEDAGOGY STRATEGIES

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & amp; Drill Practice
- Providing feedback

#### **References:**

- 1. Kanti Swarup, Gupta P.K. and Man Mohan. (2017). Operations Research, Nineteenth Edition, Sultan Chand & Sons, New Delhi.
- 2. V. Sundaresan, K.S. Ganapathy Subramanian and K. Ganesan (2000). Resource Management Techniques, A.R. Publications, Tamil Nadu.

#### **Further Reading:**

- **1.** J.K. Sharma (2007). Operations Research -Theory & Applications, Macmillan India Ltd, Third Edition.
- 2. Sharma S. D. (2017). Operations Research: Theory, Methods and Applications, Kedar Nath, Ram Nath and Co, Meerut.
- **3.** Taha H. A. (1982). Operations Research: An Introduction, Third Edition, McMillan Publishing Co., Inc., London.

#### Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

- 1. https://nptel.ac.in/courses/111/107/111107128/
- 2. https://nptel.ac.in/courses/112/106/112106134/
- **3.** https://onlinecourses.swayam2.ac.in/cec20_ma10/preview

				<b>Course Level Outcomes (CLO)</b>							
			1	2	3	4	5	6	7		
	1	Disciplinary Knowledge	~	~	$\checkmark$	~	$\checkmark$	~			
(0	2	Communication Skills	~	~	$\checkmark$	~	~	~			
s (PL	3	Critical Thinking			$\checkmark$	$\checkmark$	~	✓			
come	4	Research related Skills	✓	$\checkmark$				✓	~		
el Out	5	Analytical Reasoning			$\checkmark$	$\checkmark$	✓	✓	✓		
n Lev	6	Problem Solving			~	~	✓	✓	✓		
ogran	7	Team Work	✓	$\checkmark$		$\checkmark$	~	✓	~		
$\Pr$	8	Moral and Ethical	$\checkmark$	$\checkmark$				~	$\checkmark$		
		Awareness									
	9	Multicultural Competence	$\checkmark$	~				~	~		

Year	YearSem.Subject CodeTitle of the PaperHours/ Week							
2023-2024	ш	238DS34A	II B.Sc., Psychology –Allied III:	6				
Onwards	111	2301 534A	STATISTICS – I	U				
COURSE LEV	EL OUTC	OMES:						
On the successful	ul completi	on of the course,	student will be able to:					
1 Discuss th	e importan	ce of Statistics an	nd Scope in Psychology					
2 Draw Diag	grams, Graj	phs and compute	averages for the collected data					
3 Calculate	the Measur	es of Dispersion	and Skewness					
4 Explain the	Explain the concept of Correlation and its practical applications							
5 Describe t	he theorem	s in probability,	compute and solve the problems in probability					
6 Analyze th	ne nature of	f data and interpr	ret the measures					
7 Describe t	he concepts	s of probability a	and find solutions in real life situations					
		· ·						
UNIT - I								
Statistics - Defi	nition - Sco	ope – limitations	s - uses - Importance of Statistics in Psychology	- Collection				
of Data - Primar	y and Seco	ndary - Classific	ation and Tabulation - Formation of Frequency	Distribution.				
	-							
UNIT - II								
Diagrammatic Diagrams and P Measures of Ce	and Grag ie Diagram entral Teno	bhical Represer - Histogram, Fr dency - Mean, N	<b>ntation</b> - Simple, Multiple, Sub-Divided, Per equency Polygon, Frequency Curve and Ogives Iedian, Mode, Geometric Mean and Harmonic N	rcentage Bar Mean.				
UNIT - III								
Measures of I	Dispersion	– Range, Quar	rtile Deviation, Mean Deviation (about Mean	n), Standard				
Deviation and	Co-efficien	t of Variation	- Concept of Skewness - Karl Pearson's an	nd Bowley's				
Coefficient of S	kewness –	Simple Problems	S					
UNIT - IV								
Correlation –	Definition,	Types of corre	lation, Scatter Diagram –Measures of Correla	tions Karl-				
Pearson's Coeff	locient of Co	orrelation – Spea	rman's Rank Correlation.	na				
Regression Ana	uysis - Dei	mition – Froperi	les of Regression Coefficients – Shiple Frobler					
UNIT - V								
Probability - C	oncept of	Probability – Ba	asic Definitions – Mathematical and Statistical	Approach –				
Addition and M	ultiplication	n Theorems of P	robability (Without Proof) – Simple Problems.					
PEDAGe	OGY STRA	TERGIES:						
Lecturing	5							
Assignme	ent .							
Classroon	n Discussion	n						
• Question	ing							

- Seminar
- Class Test
- Quiz & Drill Practice
- Providing Feedback

## **REFERENCES:**

- 1 R.S.N. Pillai and V. Bagavathi (1999). Statistics Sultan Chand & Sons Company Ltd, New Delhi.
- 2 S.P. Gupta (2012). Statistical Methods, Sultan Chand & Sons, New Delhi, 42nd revised Edition.
- 3 J.P. Verma and Mohammed Ghufran. Statistics for Psychology, Tata Mcgraw Hill Education (P) Ltd. New Delhi.

## FURTHER READING:

 Henry E. Garrett (2007). Statistics in Psychology and Education, Paragon International Publishers, Twelfth Indian Reprint.

## RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]

- 1 http://cs.ioc.ee/ITKStat/files/1_intro.
- 2 https://labs.la.utexas.edu/gilden/files/2016/05/Statistics
- 3 https://numerons.files.wordpress.com/2012/04/research-methods-and-statistics-in-psychology

			Course Level Outcomes (CLO)							
			1	2	3	4	5	6	7	
	1	Disciplinary Knowledge	~	$\checkmark$	~	$\checkmark$	~	~	✓	
(0	2	Communication Skills	~	~	~	✓	~	~	~	
s (PL	3	Critical Thinking				~	$\checkmark$	$\checkmark$	✓	
come	4	Research related Skills	$\checkmark$	$\checkmark$	✓	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
el Out	5	Analytical Reasoning	~	$\checkmark$	✓	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
n Leve	6	Problem Solving	✓	✓	✓	$\checkmark$	$\checkmark$	$\checkmark$	✓	
ogran	7	Team Work			✓	$\checkmark$	$\checkmark$	$\checkmark$	✓	
$\mathbf{Pr}_{\mathbf{r}}$	8	Moral and Ethical			~	~	~	✓		
	9	Awareness Multicultural Competence			~	~	~	$\checkmark$		

YearSem.Subject CodeTitle of the Paper		Title of the Paper	Hours/ Week				
2023-2024 onwards		III	23BCA36A	II BCom (CA) - Allied III : STATISTICS FOR BUSINESS	4		
COU	J <b>RSE L</b> I	EVEL	OUTCOMES:				
On t	he succe	ssful co	mpletion of the co	urse, students will be able to:			
1	1 Deal with numerical and quantitative issues in business						
2	Enable the use of statistical, graphical and algebraic techniques wherever relevant						
3	Produce	e numer	rical descriptive sta	atistics for different types of data			
4	Use sin between	nple cor n the va	relation and simpl riables	e regression models to analyse the underlying rela	itionships		
5	Apply i weighte	ndex nu ed Meth	umber rules and co ods answer question	onstruct index number relating to Weighted and U ons within a business context	n-		
6	Demon	strate k	nowledge of the in	nportance of the tests of index number and its app	lications		
7	7 Conduct and interpret a variety time series method to aid decision making in a business context						

## Unit - I

**Introduction to Statistics:** Meaning and Definition - Primary and Secondary Data - Sources of Data - Methods of Collecting Data - Classification and Tabulation of Data - Diagrammatic Representation - Bar Diagrams - Pie Diagram - Graphical Representation - Histogram - Frequency Curve and Ogives.

## Unit - II

**Measures of Central Tendency:** Meaning – Definition – Arithmetic Mean – Median - Mode – Simple Problems.

**Measures of Dispersion**: Meaning - Definition – Absolute and relative measures - Range - Quartile Deviation- Mean Deviation- Standard Deviation – Co-efficient of variation - Simple Problems.

## Unit – III

**Correlation and Regression:** Meaning – Definition – Scatter diagram - Karl Pearson's Coefficient of Correlation - Spearman's Rank Correlation – Meaning and uses of Regression – Regression Equations – Simple Problems.

## Unit – IV

**Index Numbers:** Concept – Definition – Methods of construction of Index number– Weighted and Un-weighted Methods –Time Reversal and Factor Reversal Tests - Cost of Living Index Number - Construction of Cost of Living Index using Family Budget Method – Aggregate Expenditure Method.

## Unit - V

**Time Series Analysis:** Time Series – Concept and Components – Estimation of Trend: Methods of Moving Averages - Method of Least squares (Linear only). Measurement of Seasonal Variation: Method of Simple Averages.

#### **PEDAGOGY STRATEGIES**

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

RE	FERENCES:
1	Gupta S.P. (2012). Statistical Methods, Sultan Chand & Sons, New Delhi.
2	Goon A.M., Gupta M.K., and Das Gupta B. (2013). Fundamentals of Statistics, Vol.1,
	world Press Private Ltd, Calculta.
FU	RTHER READING:
1	Vittal P.R. (2012). Business Mathematics and Statistics, Margham Publications, Chennai.
2	Navneetham P.A, (2008). Business Mathematics & Statistics, Jai Publishers, Trichy.
3	Aczel A.D. et al., (2012). Complete Business Statistics, Tata McGraw Hill Education Private
-	Limited, New Delhi.
RF	ELATED ONLINE CONTENTS
1	https://nptel.ac.in/courses/111/105/111105041/
2	https://nptel.ac.in/courses/111/106/111106112/
3	www.edx.org > learn > statistics

			Course Level Outcomes (CLO)						
			1	2	3	4	5	6	7
	1	Disciplinary Knowledge	~	~	~	~	~	$\checkmark$	$\checkmark$
Ô	2	Communication Skills	~	~		~		~	$\checkmark$
s (PL)	3	Critical Thinking			$\checkmark$	~	$\checkmark$		$\checkmark$
come	4	Research related Skills			~	~	✓	$\checkmark$	$\checkmark$
el Out	5	Analytical Reasoning	~	$\checkmark$	~	~	$\checkmark$	$\checkmark$	$\checkmark$
ı Leve	6	Problem Solving	✓	~	✓	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
ogran	7	Team Work		$\checkmark$	~		$\checkmark$		$\checkmark$
Pro	8	Moral and Ethical Awareness			~	~	✓		$\checkmark$
	9	Multicultural Competence			✓	~	✓		$\checkmark$

Year		Sem.Subject CodeTitle of the Paper		Title of the Paper	Hours/ Week				
2023 - 2024		117	238DS///	II B.Sc., Psychology – Allied IV :	6				
Onw	ards	1 V	25DF 544A	STATISTICS – II	U				
COU	COURSE LEVEL OUTCOMES:								
On th	he succes	sful com	pletion of the co	urse, student will be able to:					
1	Discuss the importance of Discrete and Continuous distributions								
2	Explain the methods of sampling with its Advantages and Disadvantages								
3	Apply the Small sample tests, Chi-Square test and Association of Attributes in Psychological testing problems								
4	Explain the types of Measurement and scaling techniques								
5	Describe Non-Parametric tests based on one sample and two sample tests								
6	Compute the parameters of Discrete and Continuous distributions								
7	Analyze the different types of data in Statistical Inference								

## UNIT - I

**Probability Distribution** – Binomial, Poisson and Normal Distributions – Definitions, Properties and Applications (without Proof) – Simple Problems.

## UNIT - II

**Sampling Methods** – Advantages and Disadvantages – Simple Random Sampling – Stratified Random Sampling – Systematic Sampling – (Concept Only) – Sampling Distribution – Standard Error.

**Tests of Significance** – Types of Errors - LOS – Large Sample Tests for Single Mean and Two Means. Tests for single proportion and difference of two proportions.

#### UNIT - III

**Small Sample Tests** – Test for Single Mean and Two Means – Paired 't' Test. Chi-Square Test - Independence of Attributes- Goodness of fit – Contingency Tables – Theory of Association of Attributes – Yule's Coefficient of Association

#### UNIT - IV

**Measurement and Scaling techniques**- Categorical Variables - Data Types - Metric, Interval and Ratio data. Non-Metric data- Nominal, ordinal data. Scales of measurement -Comparative scale, paired Comparison scale, rank order scale, constant sum scale, Non-comparative scale- continuous rating scale, Itemized rating scale - Likert scale, Guttmann scale

#### UNIT - V

**Non – Parametric Tests**– Introduction, Definition, advantages and disadvantages. Run test, Sign test, Median test, Mann-Whitney U test (one sample only) Kolmogorov - Smirnov test (two samples).

### **PEDAGOGY STRATERGIES:**

- Lecturing
- Assignment
- Classroom Discussion
- Questioning
- Seminar
- Class Test
- Quiz & Drill Practice
- Providing Feedback

#### **REFERENCES:**

- 1 R.S.N. Pillai and V. Bagavathi (1999). Statistics Theory and Practice, S. Chand & Sons Company Ltd, New Delhi.
- 2 S.C. Gupta and V.K. Kapoor(2012). Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi, 11th revised Edition.
- 3 J.P Verma and Mohammed Ghufran. Statistics for Psychology, Tata Mcgraw Hill Education (P)Ltd. New Delhi.

## FURTHER READING:

- 1 Henry E. Garrett (2007). Statistics in Psychology and Education, Paragon International Publishers, Twelfth Indian Reprint.
- 2 Hogg, R.V and Craig, A.G. Introduction to Mathematical Statistics

## **RELATED ONLINE CONTENTS [MOOC, SWAYAM, NPTEL, Websites etc.]**

- 1 https://www.google.com/search?q=probability+distribution+ppt&rlz
- 2 https://math.ucdenver.edu/~ssantori/MATH2830SP13/Math2830-Chapter-08
- 3 https://www.cse.iitk.ac.in/users/nsrivast/HCC/lec07-09.pdf
- 4 http://www2.univet.hu/users/jfodor/biomath/Biomath12

			Course Level Outcomes (CLO)						
			1	2	3	4	5	6	7
	1	Disciplinary Knowledge	~	~	$\checkmark$	~	$\checkmark$	$\checkmark$	~
(0	2	Communication Skills	~	$\checkmark$	$\checkmark$	$\checkmark$	~	$\checkmark$	~
s (PL	3	Critical Thinking	~		$\checkmark$	$\checkmark$	$\checkmark$		
come	4	Research related Skills	✓	$\checkmark$	$\checkmark$	$\checkmark$	~	$\checkmark$	~
el Out	5	Analytical Reasoning	✓		$\checkmark$	$\checkmark$		$\checkmark$	✓
n Lev	6	Problem Solving	✓		✓	~	✓	✓	✓
ogran	7	Team Work	✓		✓	~	✓		
Pr	8	Moral and Ethical					$\checkmark$	~	$\checkmark$
	9	Awareness Multicultural Competence				✓	✓	~	✓

Year		Sem. Subject Code Title of the Paper		Title of the Paper	Hours/ Week					
2023-2024 onwards		IV	23BCO45A/ 23BIB46A	II BCOM & II BCOM (IB) - Allied IV: BUSINESS STATISTICS	4					
COU	COURSE LEVEL OUTCOMES:									
On t	he succe	ssful co	mpletion of the c	course, students will be able to:						
1	1 Differentiate numerical and quantitative issues in business									
2	2 Use the statistical, graphical and algebraic techniques wherever relevant									
3	Create	numerio	cal descriptive sta	atistics for different types of data						
4	4 Use simple correlation and regression to analyse the relationships between the variables									
5 Apply index number rules and construct index number relating to Weighted and Un-				n-						
weighted methods										
6	6 Demonstrate the importance and applications of the tests of index numbers									
7	7 Conduct and interpret the variety of time series methods in decision making problems									

#### Unit - I

**Introduction to Statistics:** Meaning and Definition - Primary and Secondary Data - Sources of Data – Methods of Collecting Data - Classification and Tabulation of Data – Diagrammatic Representation - Bar Diagrams – Pie Diagram – Graphical Representation - Histogram – Frequency Curve and Ogives.

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## PEDAGOGY STRATEGIES

- Lecturing
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- Seminar
- Class Test
- Quiz & Drill Practice
- Providing feedback

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- 1 Gupta, S. P. (2012). Statistical Methods, Sultan Chand & Sons, New Delhi.
- 2 Goon, A.M, Gupta M.K. and Das Gupta B. (2013). Fundamentals of Statistics, Vol.1,
  - World Press Private Ltd, Calcutta.

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- 1 Vittal P.R. (2012). Business Mathematics and Statistics, Margham Publications, Chennai.
- 2 Navaneetham P.A. (2008). Business Mathematics & Statistics, Jai Publishers, Trichy.
- 3 Aczel A.D, et al., (2012). Complete Business Statistics, Tata McGraw Hill Education Private Limited, New Delhi.

# **RELATED ONLINE CONTENTS**

- 1 https://nptel.ac.in/courses/111/105/111105041/
- 2 https://nptel.ac.in/courses/111/106/111106112/
- 3 www.edx.org > learn > statistics

			Course Level Outcomes (CLO)						
			1	2	3	4	5	6	7
	1	Disciplinary Knowledge	~	~	$\checkmark$	$\checkmark$	~	~	~
0	2	Communication Skills	~	~	~	$\checkmark$			~
s (PL	3	Critical Thinking			$\checkmark$	$\checkmark$	$\checkmark$		
come	4	Research related Skills			$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
el Out	5	Analytical Reasoning			$\checkmark$	$\checkmark$	~	$\checkmark$	$\checkmark$
n Leve	6	Problem Solving			$\checkmark$	~	✓	~	✓
ogran	7	Team Work			✓	$\checkmark$	✓	✓	✓
Pre	8	Moral and Ethical					✓	✓	~
		Awareness							
	9	Multicultural Competence			✓	$\checkmark$	✓		