B.Sc., Statistics

Syllabus

AFFILIATED COLLEGES

Program Code: 22B

2023 – 2024 onwards

BHARATHIAR UNIVERSITY

(A State University, Accredited with "A++" Grade by NAAC,
Ranked 21st among Indian Universities by MHRD-NIRF)

Coimbatore - 641 046, Tamil Nadu, India

Program Educational Objectives (PEOs)	
On successful completion of the **B**. **Sc., Statistics** program, the graduates will be able to:	
PEO1	Get employment in government, public and private sectors.
PEO2	Perform data analysis and make interpretations with the knowledge attained during the course of study
PEO3	Gain knowledge to pursue higher studies in Statistics
PEO4	Use programming languages for developing codes for statistical computation
PEO5	Serve as biostatistician, statistical investigator, statistical assistant with knowledge in statistics

Program Specific Outcomes (PSOs)	
On successful completion of B. Sc. Statistics program, the students are expected to	
PSO1	Realize the importance of statistics
PSO2	Identify the areas of applications of statistics
PSO3	Write computer programs for statistical computation
PSO4	Apply statistical software for data analysis
PSO5	Understand the limitations of statistical methods
PSO6	Analyze statistical data and make interpretations

Program Outcomes (POs)	
On successful completion of the B. Sc. Statistics program, students will be able to	
PO1	Apply the theoretical knowledge in statistics to real life situations
PO2	Apply the concepts, principles and methods of statistics to various fields of study
PO3	Adopt statistical methods for data analysis
PO4	Compute statistical measures using software and programs
PO5	Get opportunities for job placements in various sectors
PO6	Acquire skills to write competitive examinations
PO7	Move for higher level learning

BHARATHIAR UNIVERSITY: COIMBATORE 641046

Branch II: B. Sc. STATISTICS (CBCS PATTERN)

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

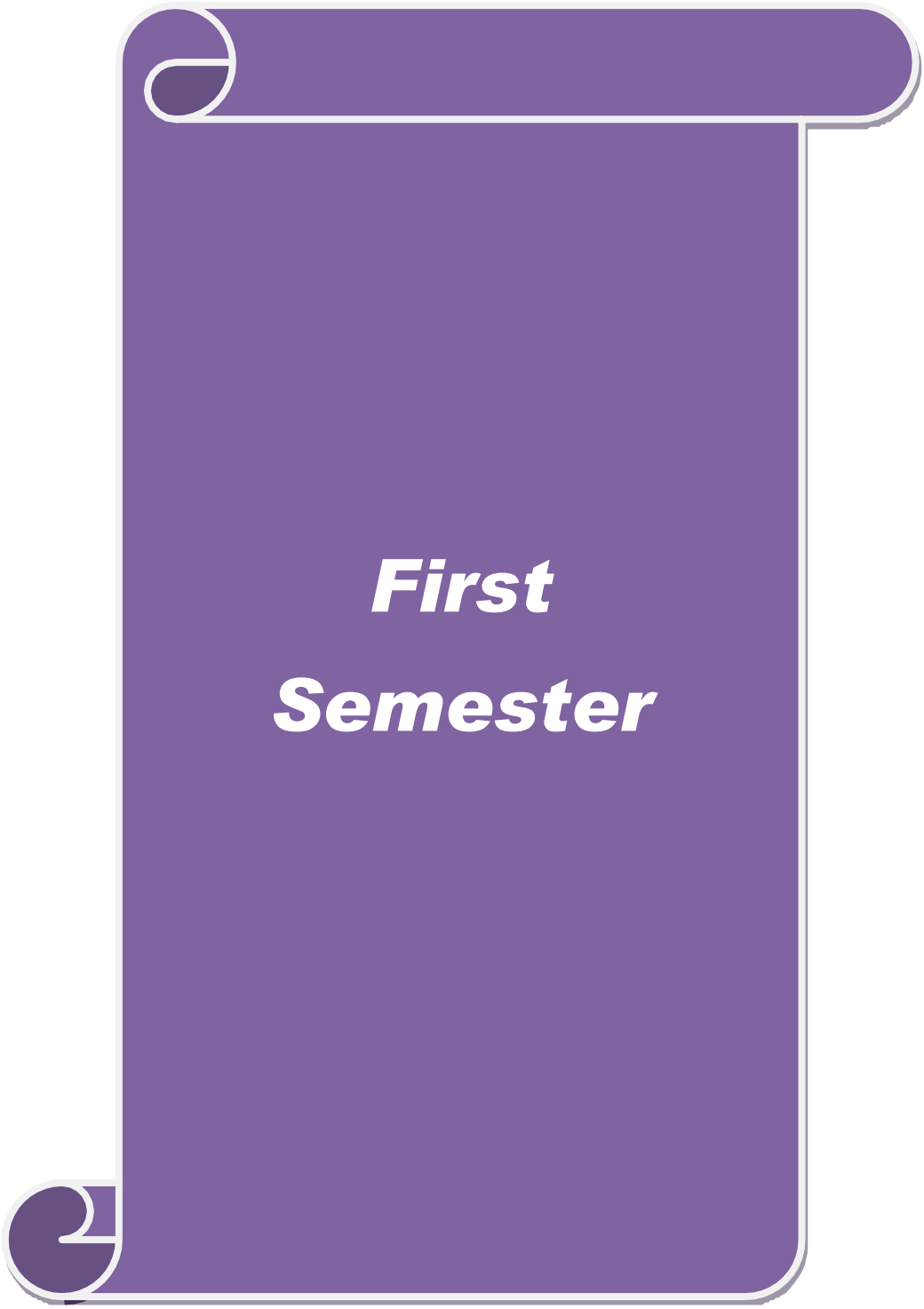
Scheme of Examination

Part	Title of the Course	Hours / Week	Examination				
			Duration in Hours	Maximum Marks			Credits
				CIA	CEE	Total	
Semester I							
I	Language – I	6	3	25	75	100	4
II	English – I	6	3	25	75	100	4
III	Core Paper I - Descriptive Statistics -I	3	3	25	75	100	4
III	Core Paper II - Descriptive Statistics -II	4	3	25	75	100	4
III	Core Practical - I (Using MS Excel)	2	-	-	-	-	-
III	Allied A: Paper I - Mathematics for Statistics – I	7	3	25	75	100	4
IV	Environmental Studies*	2	3	-	50	50	2
	Total	**30**		**125**	**425**	**550**	**22**
Semester II							
I	Language- II	6	3	25	75	100	4
II	English – II	4	3	25	25	50	2
IV	**Naan Mudhalvan**: Language Proficiency for Employability	2	3	25	25	50#	2
III	Core Paper III - Applied Statistics	7	3	25	75	100	4
III	Core Practical - I (Using MS Excel)	2	3	25	75	100	4
III	Allied A: Paper II Mathematics for Statistics – II	7	3	25	75	100	4
IV	Value Education Human Rights*	2	3	-	50	50	2
	Total	**30**		**150**	**400**	**550**	**22**
Semester III							
I	Language- III	6	3	25	75	100	4
II	English – III	6	3	25	75	100	4
III	Core Paper IV- Demographic Methods	3	3	25	75	100	4
III	Core Paper V- Probability Distribution-I	3	3	25	75	100	4
III	Allied B: Paper I Computer Programming for Statistical Analysis - I (C Programming)	5	3	20	55	75	3
III	Allied Practical (C & C++ Programming)	2	-	-	-	-	-
IV	Skill based Subject: Actuarial Statistics	3	3	25	25	50	2
IV	Tamil** / Advanced Tamil* (OR) Non-major elective - I (Yoga Human Excellence)*/Women's Rights*	2	3	50	-	50	2

	Total	**30**		**195**	**380**	**575**	**23**
	Semester IV						
I	Language IV	6	3	25	75	100	4
II	English IV	6	3	25	75	100	4
II I	Core Paper VI Probability Distribution – II	4	3	25	75	100	4
III	Core Practical II (Using Scientific Calculator)	3	3	25	75	100	4
III	Allied B: Paper II - Computer Programming for Statistical Analysis- II (Object Oriented Programming with C++)	4	3	20	55	75	3
III	Allied Practical (C & C++ programming)	2	3	30	45	75	3
IV	**Naan Mudhalvan**: Digital Skills for Employability	3	3	25	25	50#	2
IV	Tamil**/Advanced Tamil* (OR) Non-major elective -II (General Awareness*)	2	3	-	50	50	2
	Total	**30**		**175**	**475**	**650**	**26**
	Semester V						
III	Core Paper VII - Statistical Inference – I	5	3	25	75	100	4
III	Core Paper VIII - Basic Sampling Theory	5	3	25	75	100	4
III	Core Paper IX - Design of Experiments	5	3	25	75	100	4
III	Core Practical - III (Using SPSS)	2	3	-	-	-	-
III	Core Paper X - Numerical Mathematics	5	3	25	75	100	4
III	Elective I	5	3	25	75	100	4
IV	Skill based Subject : Mathematical Economics	3	3	30	45	75	3
	Total	**30**		**155**	**420**	**575**	**23**
	Semester VI						
III	Core Paper XI - Statistical Inference - II	5	3	25	75	100	4
III	Core Paper XII - Statistical Quality Control	5	3	25	75	100	4
III	Core Practical - III (Using SPSS)	4	3	20	55	75	3
III	Elective II	4	3	20	55	75	3
III	Elective III	4	3	20	55	75	3
III	Core Practical - IV (Using Scientific Calculator)	4	3	30	45	75	3
IV	**Naan Mudhalvan**: Project Based Learning: Advanced Platform Technology/ Data Analytics & Visualization	4	3	25	25	50#	2
V	Extension Activities**	-	-	50	-	50	2
	Total	**30**		**215**	**385**	**600**	**24**
	Grand Total	**180**		**1015**	**2485**	**3500**	**140**

* No Continuous Internal Assessment (CIA). Only University Examinations.
** No University Examinations. Only Continuous Internal Assessment (CIA).
@ Excluding the marks of Part IV

List of Elective papers (Colleges can choose any one of the paper as electives)		
Elective I	A	Psychological Statistics
	B	Actuarial Statistics III
	C	Big Data Analytics
Elective II	A	Elements of Econometrics
	B	Indian Official Statistics
	C	Genetical Statistics
Elective III	A	Operations Research
	B	Data Analytics using 'R'
	C	Quantitative Techniques for Managerial Decisions


First
Semester

Course Code		TITLE OF THE COURSE	L	T	P	C
Core I		Descriptive Statistics –I	3	1	-	4
Pre-requisite		Basic level of mathematical computation	Syllabus Version		2023-24	

Course Objectives:

The main objectives of this course are to:

1. Understand the origin, significance and scope of Statistics.
2. Know the significance of presenting data in the form of tables and diagrams.
3. Learn computational aspects of basic statistical measures.

Expected Course Outcomes:

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

1	Understand the scope and necessity of Statistics.	K1,K2
2	Tabulate and represent the data in diagrams and graphs.	K2, K3
3	Apply the formula and calculate descriptive measures of statistics.	K2, K3,K4
4	Analyze the nature of data and interpret the measures	K2, K3,K4
5	Analyze the data and predict the future values using curve fitting.	K4,K5

K1 - Remember; **K2** - Undestand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	Nature and Scope of Statistics	9 hours

Origin, scope, limitations and misuse of Statistics. Data- Types- Primary and Secondary Data- Methods of data Collection-Classification- Tabulation of data. Measurement of Scales. Diagrammatic representation of data: One dimensional and Two dimensional diagrams – Graphic representation: Line diagram, Frequency polygon, Frequency curve, Histogram and Ogive curves.

Unit:2	Measures of Central Tendency and Dispersion	9 hours

Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean- Properties with Merits and Demerits- Empirical Relation between means. Partition values: Quartiles, Deciles and Percentiles. Measures of Dispersion: Absolute and Relative Measures Range, Mean deviation, Quartile deviation and Standard deviation – Coefficient of Variation.

Unit:3	Measures of Skewness and Kurtosis	9 hours

Moments - Measures of Skewness - Pearson's and Bowley's Coefficient of Skewness, Coefficient of Skewness based on moments – Kurtosis and its significance.

Unit:4	Curve Fitting	9 hours

Curve Fitting: Principle of least squares, fitting of the curves of the form $y = a+ bx$, $y = a + bx + cx^2$ and curves transformable to the above form.

Unit:5	Case Study and Problems	9 hours

Case study and Problems relating to all the above units.

Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, Online seminars– Webinars		
	Total Lecture hours	**47 hours**

Text Book(s)	
1	Gupta, S.C., and Kappor, V. K. (2020). Fundamentals of Mathematical Statistics, 12th Edition, Sultan Chand & Sons (Publisher), New Delhi, India
2	Goon, A.M., Gupta, M. K., Dasgupta, B. (2016): Fundamentals of Statistics, Vol. I, World Press, Kolkata, India
3	Agarwal, B. L. (2006). Basic Statistics, New Age International Private Limited, New Delhi, India.

Reference Books	
1	Holcomb, Z. C. (2017). Fundamentals of Descriptive Statistics, Routledge, New York, US.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/111/104/111104120/
2	https://www.iiserpune.ac.in/~bhasbapat/phy221_files/curvefitting.pdf

Course Designed By: Dr. Vasanthamani .P

Mapping with Programme Outcomes										
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO2	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low

Course code		TITLE OF THE COURSE	L	T	P	C
Core II		Descriptive Statistics – II	3	1	-	4
Pre-requisite		Basic level on mathematical computation	Syllabus Version	2023-2024		

Course Objectives:

The main objectives of this course are to:

1. Understand the relationship between two variables.
2. Know the concept of association of attributes and methods.
3. Be familiar with the theoretical probability and its concepts.

Expected Course Outcomes:

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

1	Measure and interpret the degree of relationship between variables.	K1, K2, K3
2	Estimate the average relationship using regression.	K3, K4, K5
3	Interpret the association of attributes applying different methods.	K3, K4, K5
4	Understand the concepts of probability and relate to real life situations	K1, K2
5	Apply the theorems in practical problems with conditional probability	K3, K4

K1 - Remember; **K2** - Undestand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	Correlation and Regression	9 hours

Linear Correlation-Scatter diagram, Pearson's Coefficient of Correlation, Correlation in bivariate frequency table, Rank Correlation, Coefficient of Concurrent Deviation. Properties and its derivations. Regression – Types – Line of Regression and its derivation - Regression coefficients – Properties of regression coefficients – Comparison of correlation and regression.

Unit:2	Association of Attributes	9 hours

Association of attributes: Relation between class frequencies, consistency of data, independence of attributes, criterion of independence. Association of attributes: Yule's coefficient of association, Yule'coefficient of colligation.

Unit:3	Basics of Probability	9 hours

Probability: Sample space-Concepts of events- Algebraic operations on events-Definitions of probability.

Unit:4	Properties of Probability	9 hours

Generalized addition and compound Theorems of probability-independent events – Conditional probability, Inverse probability – Baye's Theorem.

Unit:5	Case Study and Problems	9 hours

Case study and problems related to all the above units

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars– webinars

	Total Lecture hours	47 hours

Text Book(s)	
1	Gupta, S.C., and Kappor, V. K. (2020). Fundamentals of Mathematical Statistics, 12th Edition, Sultan Chand & Sons (Publisher), New Delhi, India.
2	Gupta, S. P. (2011). Statistical Methods, 4th Edition, Sultan Chand & Sons (Publisher), New Delhi, India.
3	Agarwal, B. L. (2006). Basic Statistics, New Age International Private Limited, New Delhi, India.
Reference Books	
1	Holcomb, Z. C. (2017). Fundamentals of Descriptive Statistics, Routledge, New York, US.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/111/106/111106112/
2	https://nptel.ac.in/courses/111/105/111105090/
3	https://nptel.ac.in/courses/111/105/111105042/
Course Designed By: Dr. Sampath Kumar .R	

Mapping with Programme Outcomes										
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO3	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low

Second Semester

Course code		TITLE OF THE COURSE	L	T	P	C
Core III		Applied Statistics	3	1	-	4
Pre-requisite		Basic level on statistical computation	Syllabus Version		2023-2024	

Course Objectives:

The main objectives of this course are to:

1. be acquainted with the knowledge of Time series analysis.
2. understand the significance of index numbers and its types.
3. Have an idea about demographic data and vital statistics measures.

Expected Course Outcomes:

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

1	Identify the components of time series and the method of measuring trend.	K1, K2
2	Apply the different measures of variations to forecast the data.	K2, K3, K4
3	Construct index numbers, evaluate the cost of living index and interpret.	K2, K3
4	Understand the vital statistics and its importance in the civic society.	K1, K2
5	Evaluate and interpret the fertility measures.	K3, K4, K5

K1 - Remember; **K2** - Undestand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	Time Series: Components, Models, Measuring Trend	9 hours

Concept – components of time series –additive and multiplicative models-Resolving components of a time series-measuring trend: Graphic, semi-averages, moving average and principle of least squares methods.

Unit:2	Time Series: Measuring Seasonal and Cyclic Variations	9 hours

Seasonal variation- measuring seasonal variation: method of simple averages, ratio to trend method, ratio to moving average method and link relative method- Cyclical and Random fluctuations- variate difference method.

Unit:3	Index Numbers	9 hours

Index numbers and their definitions - construction and uses of fixed and chain based index numbers-simple and weighted index numbers - Laspeyre's, Paache's, Fisher's, and Marshall-edge-worth index numbers – optimum tests for index numbers-Cost of living index numbers.

Unit:4	Demographic Methods	9 hours

Demography – definition-sources of demographic data: vital registration-population census - population register-demographic surveys-population data as aid to social, economic and healthy planning - process of Indian Civil registration and census.

Unit:5	Demographic Methods	9 hours

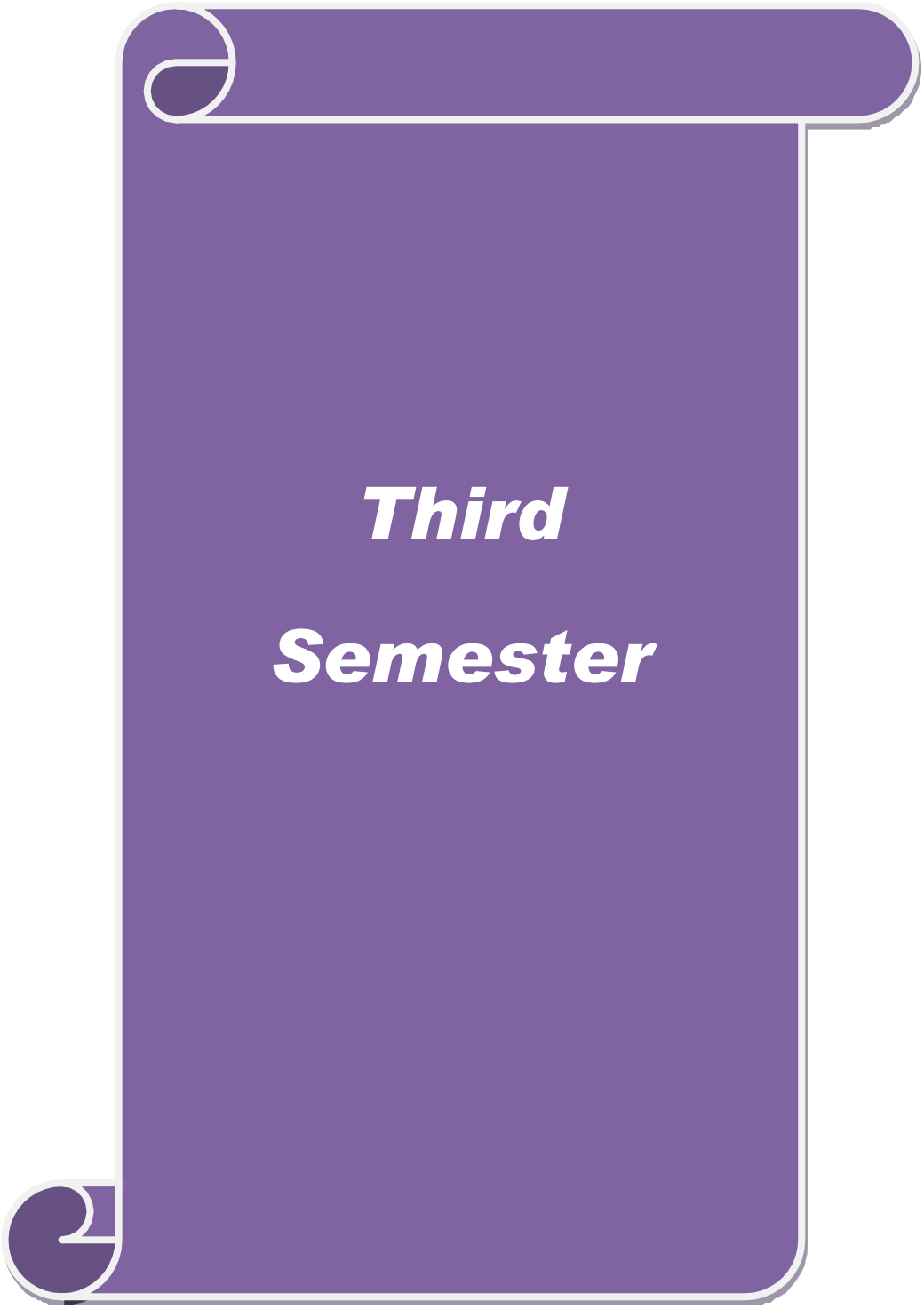
Fertility measurements: Fertility as a component of population change - Crude Birth Rate (CBR)-General, Specific and Total Fertility Rates(GFR, ASFR,TFR) - Gross and Net Reproduction Rates (GRR & NRR) the relationships and interpretation.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars – webinars		
	Total Lecture hours	**47 hours**

Text Book(s)	
1	Gupta, S.C., and Kappor, V. K. (2019). Fundamentals of Applied Statistics, Fourth Edition, Sultan Chand & Sons (Publisher), New Delhi, India
2	Goon, A.M., Gupta, M. K., Dasgupta, B. (2016): Fundamentals of Statistics, Vol. II, World Press, Kolkata, India
3	Agarwal, B. L. (2006). Basic Statistics, New Age International Private Limited, New Delhi, India.
Reference Books	
1	Parimal, M. (1999), Applied Statistics, 2nd Edition, Books & Applied Ltd., Kolkata, India
Related O2nd Editionnline Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.stat.berkeley.edu/~bartlett/courses/153-fall2010/lectures/1.pdf
2	http://www.gdcboysang.ac.in/About/droid/uploads/EconomicsPart4.pdf
3	http://ocw.jhsph.edu/courses/demographicmethods/PDFs/idm-sec1.pdf
Course Designed By: Dr. Uma .G	

Mapping with Programme Outcomes										
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO3	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low


Third
Semester

Course code		TITLE OF THE COURSE	L	T	P	C
Core IV		CORE PAPER-IV DEMOGRAPHIC METHODS	3	-	1	4
Pre-requisite		Basic level on mathematical computation	Syllabus Version	2023-2024		

Course Objectives:

The main objectives of this course are to know the:
1. Registered information of vital events.
2. Measurement of the events such as birth rates, life tables and population projection techniques.
3. Different methods of population projection techniques.

Expected Course Outcomes:

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

1	Know the mortality measurements.	K1,K2
2	understand the description and construction of life tables.	K2
3	analyze migration factors.	K4, K3
4	know population estimates and projection.	K3,K4
5	know different methods of population estimates.	K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	Mortality Measurements	9 hours

Mortality measurements: crude death rate- specific death rates-standardized death rates-direct and indirect methods.

Unit:2	Comparative Mortality Index	9 hours

Comparative mortality index-infant mortality rate-maternal mortality rate- cause- of- death rate-case fatality rate-force of mortality- graduation of mortality rates–Gompertz and Makeham's laws.

Unit:3	Construction of Life Table	9 hours

Assumptions, description and construction of various columns of a life table and their relationships-uses of a life table- age pyramid.

Unit:4	Methods of construction of life table	9 hours

Construction of an abridged life table –Reid and Merrell method - Greville's method –migration-factors effecting migration-gross and net migration rates.

Unit:5	Population estimates and projection	9 hours

Population projection –population estimates and projection –arithmetic, geometric and exponential growth rates- logistics curves-Pearl and Reed method –method of Rhodes-Basic ideas of stationary and stable population.

Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, Online seminars– Webinars		
	Total Lecture hours	**47 hours**

Text Book(s)	
1	Fundamentals of Applied Statistics by Guptha ,S.C and Kapoor ,V.K (S.Chand &Co)
2	An introduction to the study of population by Mishra D.E (South India publishers, Madras)
3	Fundamentals of Demography by DR.Hansraj (Surjeet publications Delhi)

Reference Books	
1	Indian Population Problems by Agarwala, S.N (Tata Mc Graw Hill, Bombay)
2	Fundamentals of StatisticsVol.II by Goon A.M Guptha,M.K and Das Guptha (world press)

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.encyclopedia.com/social-sciences/encyclopedias-almanacs-transcripts-and-maps/mortality-measurement
2	https://www.researchgate.net/publication/338790033_Techniques_of_life_table_construction_A_review
3	https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1728-4457.2009.00265.x

Course Designed By: T. Santhi.

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO2	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low

Course code		TITLE OF THE COURSE	L	T	P	C
Core V		CORE PAPER-V PROBABILTY AND DISTRIBUTIONS-I	3	-	1	4
Pre-requisite		Basic level on mathematical computation.	Syllabus Version	2023-2024		

Course Objectives:

The main objectives of this course are to know the:
1. the concept of random variable and its types.
2.discrete and continuous probability distributions.
3.mathematical expectation , variance , central limit theorem and law of large numbers, Tchebychev's inequality, convergence in probability.

Expected Course Outcomes:

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

1	Understand the concept of random variable and classification	K1,K2
2	Understand the probability mass functions and probability density function	K2, K3
3	Know the probability distribution functions and its properties	K2, K3,K4
4	Know the mathematical expectation,variance and moment generating function and characteristic function and their properties.	K2, K3,K4
5	Analyze the data and predict the future values using curve fitting.	K4,K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	Random Variable and Probability Distribution Functions	9 hours

Random variables –discrete and continuous random variables –distribution function-properties-probability mass function and probability density function –various statistical measures of continuous probability distribution.

Unit:2	Marginal and Conditional Distributions	9 hours

Joint, marginal and conditional distribution functions and density functions- independence of random variables –Transformation of variables (one and two dimensional-concepts only).

Unit:3	Mathematical Expectation	9 hours

Mathematical expectation-properties-addition and multiplication therorems-cauchy-schwartz inequality, conditional expectation and conditional variance.

Unit:4	Generating Functions	9 hours

Moment generating function, cumulant generating function, characteristic function and their properties.

Unit:5	Theorems on probability of random variable	9 hours

Tchebychev's inequality, convergence in probability, weak law of large numbers and central limit theorem.

Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, Online seminars– Webinars		
	Total Lecture hours	**47 hours**

Text Book(s)	
1	Fundamentals of Mathematical statistics by Guptha, S.C &Kapoor, V.K (Sulthan chand &sons)
2	Introduction to Mathematical statistics by Hogg.R.V and and Craig ,A.G. (Amerin
Reference Books	
1	Introduction to probability and probability distributions by John Benjamin ofosu and Christian Akrong Hesse
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://mathcs.clarku.edu/~djoyce/ma217/moment.pdf
2	https://www.itl.nist.gov/div898/handbook/eda/section3/eda36.htm
3	https://www.toppr.com/guides/fundamentals-of-business-mathematics-and-statistics/theoretical-distribution/theoretical-distribution/
Course Designed By:T. Santhi	

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO2	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low

Course code		TITLE OF THE COURSE	L	T	P	C
Skill based subject		ACTUARIAL STATISTICS	3	1		2
Pre-requisite		Basic level on statistical computation	Syllabus version		2023 - 2024	

Course Objectives:

The main objectives of this course are to know the:

1. On completion of this course the students should have understood the different statistical tools and life table concepts used in life insurance field.
2. To enable the students to understand the sound and gain knowledge in financial line insurance and life products

Expected Course Outcomes:

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

1	Understand simple and compound interest concept	K1,K2
2	Understand the concept of redemption of loan	K2, K3
3	Know the mortality table concept	K2, K3,K4
4	Know The strength of our Actuarial Statistics subjects is the emphasis onunderstanding statistical concepts and methods	K2, K3,K4
5	Know the net premium for assurance and annuity plans	K3,K4,K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	Simple and compound interest	9 hours

Simple and compound interest –Present value and accumulated value at fixed rate/varying rate of interest –Effective rate of interest corresponding to a nominal and effective rate –simple problems-Annuity – Classifications of annuities – Present and accumulated values of annuities – Immediate annuity due and deferred annuity

Unit:2	Redemption of loans	9 hours

Redemption of loans – Redemption of loans by installments payable times in a year Interest being p.a. effective. Role of Exponential probability distribution in general insurance - Vital Statistics –meaning and uses of vital statistics – Measures of mortality (Basic concepts)

Unit:3	Mortality table	9 hours

Mortality Table – Columns of a mortality table – Completing an incomplete mortality table and uses of mortality table – Expectation of life – Computing probabilities of survival and death using mortality tables

Unit:4	Principles of insurances	9 hours
Principles of insurances - Types of assurance: Temporary assurance, pure endowment, Endowment assurance and whole life assurance –Expression for present value of assurance benefits under-Temporary assurance, pure Endowment assurance and whole life assurance – Simple problems.		
Unit:5	**Natural premium**	**9 hours**
Net premium for assurance and annuity plans: Natural premium – Level annual premium-Mathematical expression for level annual premium under temporary assurance, pure Endowment assurance and whole life assurance-Simple problems involving the calculation of level annual premium /net annual premium under the four types of plan only.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, Online seminars– Webinars		
	Total Lecture hours	**47 hours**

Text Book(s)	
1	Mathematical basis of Life Assurance (IC-81) Published by Insurance Institute of India, Bombay.
2	Gupta, S.C. and Kapoor, V.K. (1999) Fundamentals of Applied Statistics (3 rd Edition), Sultan Chand & Co., New Delhi, (for Unit III only).
	.

Reference Books	
1	Frenk Ayres., J.R(1993), Theory and problems of Mathematics Fiance , Schaum's Outline Seeries , McGraw-Hill book Company ,Singapore
2	MN. Mishra and S.B. Mishra, Insurance Principles and practice, S .Chand & Co, New Delhi. Shaillaja R Deshmuk (2009),Actuarial Statistics and Introduction using R, University press, India

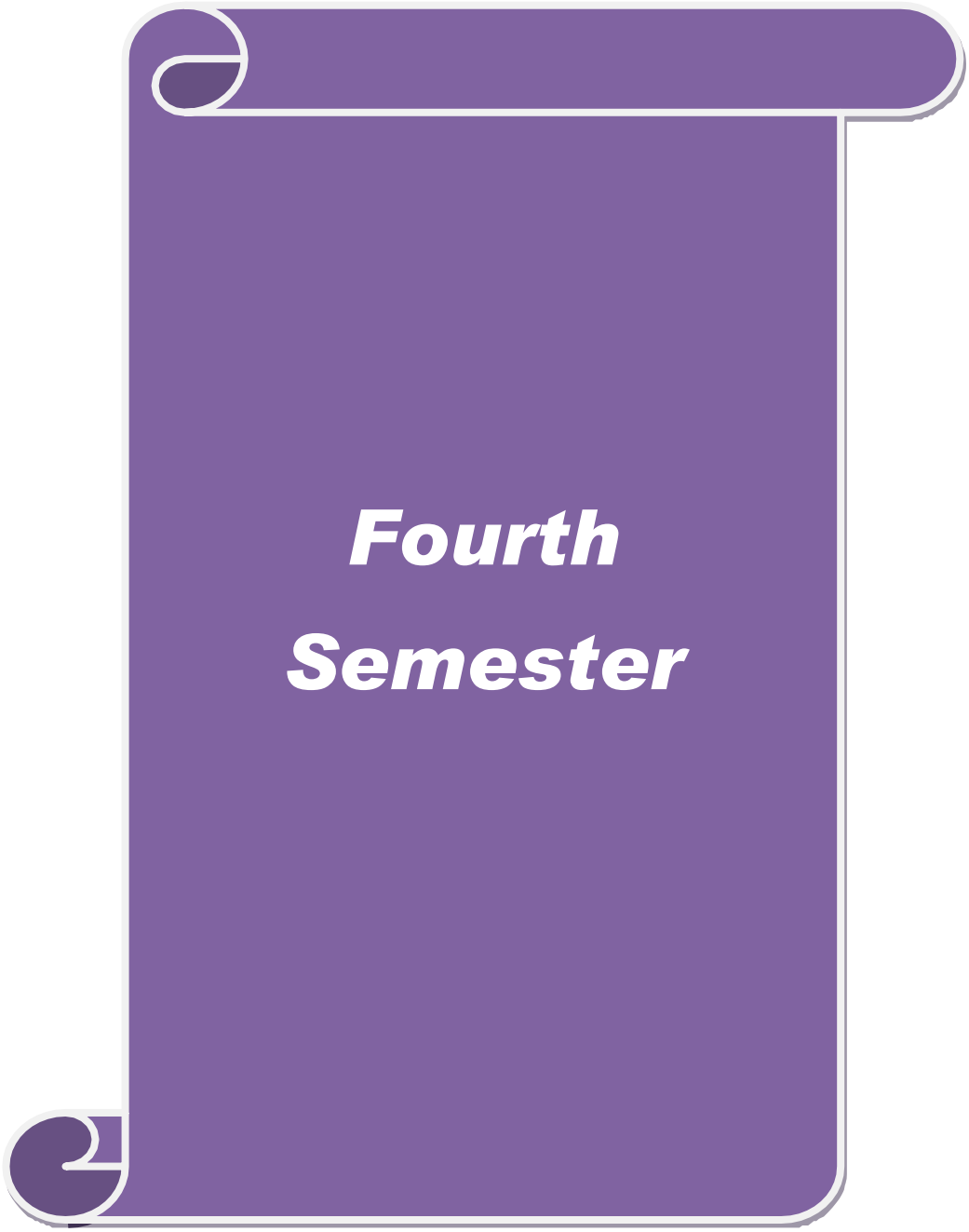
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://archive.nptel.ac.in/courses/111/105/111105043/
2	https://onlinecourses.nptel.ac.in/noc21_ma74/preview
3	https://actuaries.org.uk/qualify/curriculum/actuarial-statistics/

Course Designed By: K. GUNASEKARAN

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	-	-	-
CO2	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low


Fourth
Semester

Course code		TITLE OF THE COURSE	L	T	P	C
Core VI		CORE PAPER-VI PROBABILITY AND DISTRIBUTIONS – II	3	-	1	4
Pre-requisite		Basic level on mathematical computation	Syllabus Version		2023-2024	

Course Objectives:

The main objective of this course are to know the:
1. Definition, derivation and Properties of discrete and continuous probability distributions namely Binomial, Poisson,……Normal.
2. Derivation of M.G.F., Cumulants, recurrence relation for the probability distributions.
3. Application of Binomial, poisson and Normal probability distributions.

Expected Course Outcomes:

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

1	Know the definition and properties of Binomial, Poisson and Negative Binomial distributions.	K1,K2
2	Understand the moments, M.G.F. of hyper-geometric distributions and Multinomial distributions.	K2, K3
3	Know the normal distribution and Bivariate normal distribution and mean, median, mode and M.G.F and cumulants, mean deviation, characteristic function of normal distribution.	K2, K3,K4
4	Know Gamma and Betta distributions of I and II kind.	K2, K3,K4
5	Understand functions of normal variable leading to‘t’ and ‘F’ distribution and interrelation.	K4,K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	Binomial and Poisson Distributions	12 hours

Binomial, Poisson and Negative-Binomial distributions – Moments, m.g.f, cumulants, additive property, recurrence relation for the probabilities- simple problems.

Unit:2	Geometric and Hyper- geometric Distributions	12 hours

Geometric distribution – moments, m.g.f – Hyper-geometric distribution- mean, variance, m.g.f, Binomial as a limiting form of Hyper- geometric distribution – Multinomial distribution – moments

Unit:3	Normal Distribution and its Properties	12 hours

Normal distribution – limiting form of Binomial distribution, properties, median, mode, moments, m.g.f, cumulants, mean deviation, area property, simple problems – Rectangular distribution- moments, m.g.f. characteristic function, mean deviation – Bivariate normal distribution.

Unit:4	Gamma and Beta Distributions	12 hours

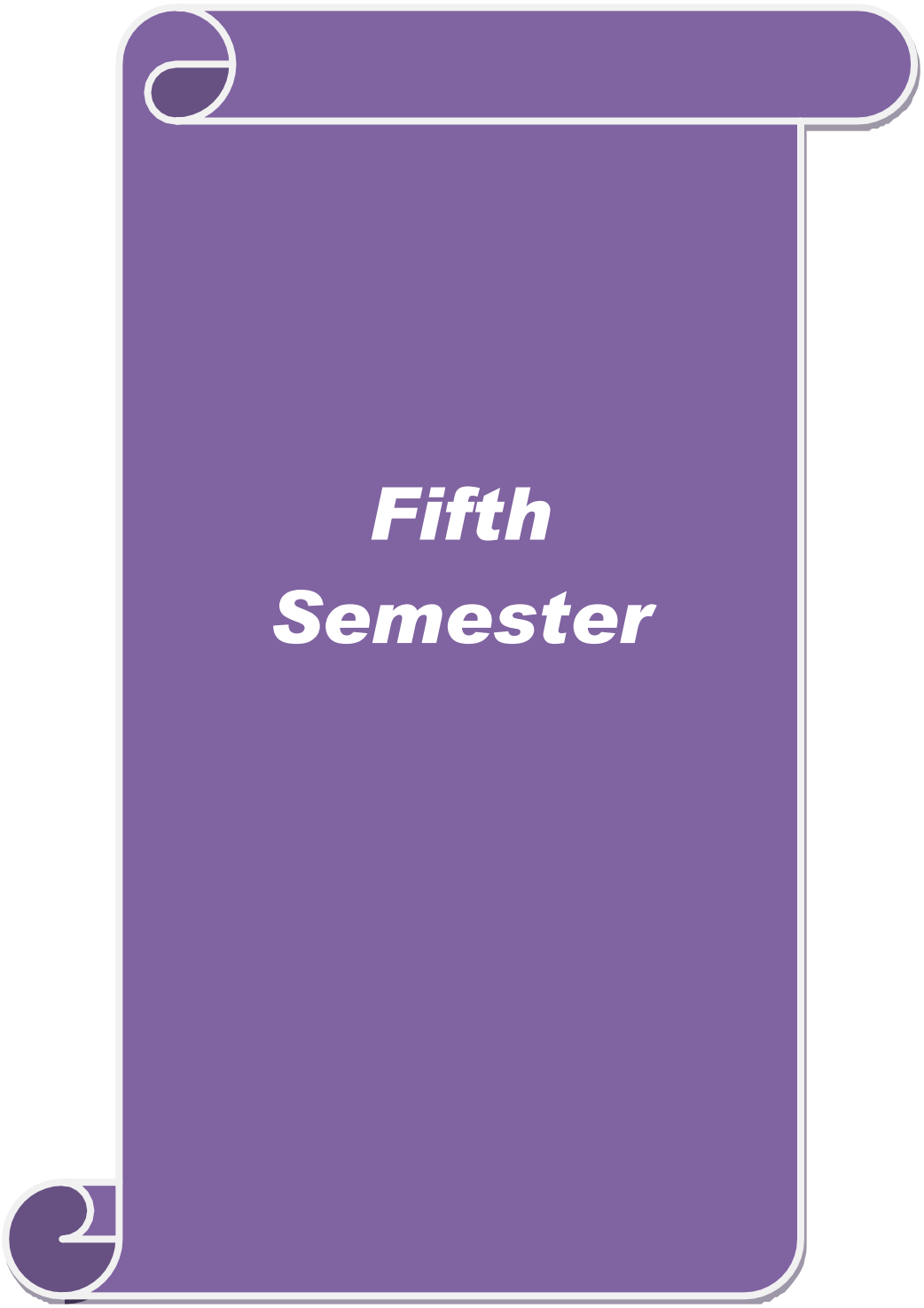
Gamma, Beta distributions of me kind and II kind – constants – Exponential distribution –additive property.

Unit:5	Derivation of Sampling Distributions t, F and χ^2	12 hours
Functions of normal random variable leading to x^2 , t and F distributions – inter relationship between the distributions and their properties. Random variables –discrete and continuous random variables –distribution function-properties- probability mass function and probability density function –various statistical measures of continuous probability distribution.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, Online seminars– Webinars		
	Total Lecture hours	**62 hours**

Text Book(s)	
1	Fundamentals of Mathematical statistics by Guptha, S.C &Kapoor, V.K (Sulthan chand &sons)
2	Introduction to Mathematical statistics by Hogg.R.V and and Craig ,A.G. (Amerin
Reference Books	
1	A.K. Sharma (2005), Text book of Probability and Theoritical distributions, Discovery publishing House.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://stattrek.com/probability-distributions/binomial.aspx
2	https://www3.nd.edu/~rwilliam/stats1/x21.pdf
3	https://mathworld.wolfram.com/GammaDistribution.html
Course Designed By: T.Santhi	

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO2	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low


Fifth
Semester

Course code		TITLE OF THE COURSE	L	T	P	C
Core VII		STATISTICAL INFERENCE – I	3	1	-	4
Pre-requisite		Basic level on statistical computation	Syllabus Version	2023-2024		

Course Objectives:

The main objectives of this course are to:
1. Understand the parametric estimation and Deviation of standard error.
2. Know the point estimation & is methods, Interval estimation.
3. Have an idea about correlation and regression problems.

Expected Course Outcomes:

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

1	Understand the parametric estimation & deviation of standard error.	K1, K2
2	Study the point estimation & its methods	K2, K3,
3	Apply the formula and calculate the confidence interval problems	K3, K4
4	Apply the various distribution formulas	K3, K4
5	Interpret the correlation and regression methods.	K4, K5

K1 - Remember; **K2** - Undestand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	**Statistical inference: Parametric estimation, Standard Error**	**15 Hours**

Concept of Statistical Inference- Parametric estimation- Sampling distribution - Standard Error. Derivation of Standard Error of mean, variance, proportion, difference between means variances and Proportions-concept of ordered statistics.

Unit:2	**Point Estimation**	**15 Hours**

Point Estimation: Estimator, properties of point estimator – unbiasedness, consistency, Crammer Rao inequality – efficiency – asymptotic efficiency and sufficiency of the estimator – Rao Blackwell theorem.

Unit:3	**Methods of Point Estimation**	**15 Hours**

Methods of point estimation: method of maximum likelihood, method of minimum chi-square and method of moments - properties of estimators obtained by these methods (Without proof).

Unit:4	**Interval Estimation and Confidence intervals**	**15 Hours**

Interval Estimation: Fiducial limits-
F distributions. Confidence intervals- using Cramer – Rao inequality-Partial and multiple correlation and regression coefficients – Multiple linear regression lines.

Unit:5	**Interval Estimation problems,Correlation & Regression**	**15 Hours**

Numerical problems in interval estimation, multiple and partial correlation and regression. –simple problems only. derivation of confidence intervals based on Normal,'t' □2 and

Unit:6	**Contemporary Issues**	**2 hours**

Expert lectures, online seminars – webinars

	Total Lecture hours	**77 Hours**

Text Book(s)	
1	Introduction to mathematical statistics by HoelP.G : (Wiley International)
2	Statistical methods by Snedecor, GW and Cochran, WG (Oxford and I B H)
3	Introduction to mathematical Statistics by Hogg V and Craig .R (Amerind)
Reference Books	
1	Theory and application of Statistics Vol. II by Ramasamy, M.M
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://stattrek.com
2	http://www3.govst.edu
3	http://analyse-it.com
Course Designed By: Sumathi. M	

Mapping with Programme Outcomes										
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO3	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low

Course code		TITLE OF THE COURSE	L	T	P	C
Core VIII		BASIC SAMPLING THEORY	3	1	-	4
Pre-requisite		Basic level on statistical computation	Syllabus Version		2023-2024	

Course Objectives:

The main objectives of this course are to:
1. Understand the sample and census surveys.
2. Know the various sampling methods.
3. Have an idea about sampling and non-sampling errors.

Expected Course Outcomes:

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

1	Understand the sample and census surveys.	K1, K2
2	Study the simple random sampling of unbiased estimates of the mean and the variance of the population	K2, K3,
3	Apply the formula and calculate the stratified random sampling	K3, K4
4	Analyze the systematic sampling of unbiased estimates of the mean and the variance of the population.	K3, K4
5	Study the sampling and non-sampling errors.	K1, K2

K1 - Remember; **K2 -** Undestand; **K3 -** Apply; **K4 -** Analyze; **K5 -** Evaluate; **K6** – Create

Unit:1	**Simple random sampling**	**15 Hours**

Sampling from a finite population –Random sampling –simple sampling with and without replacement –unbiased estimates of the mean and the variance of the population and of the variance of the estimator of the mean - Estimation of the sample size.

Unit:2	**Stratified random sampling**	**15 Hours**

Stratified sampling – proportional and optimum allocation with regard to stratified random sampling-unbiased estimates of the mean and the variance of the population and of the variance of the estimator of the mean.

Unit:3	**Systematic sampling**	**15 Hours**

Systematic sampling –Unbiased estimates of the mean and the variance of the population and of the variance of the estimator of the mean.

Unit:4	**Cluster and two stage sampling**	**15 Hours**

Cluster and two stage sampling –unbiased estimates of the mean and variance of the population and of the variance of the estimator of the mean.

Unit:5	**Sampling and non-sampling errors**	**15 Hours**

Design, organization and execution of sample surveys –sampling and non-sampling errors and methods to deal with sampling errors.

Unit:6	**Contemporary Issues**	**2 hours**

Expert lectures, online seminars – webinars

	Total Lecture hours	**77 Hours**

Text Book(s)	
1	Sampling theory and Methods by Murthy, M.N (Statistical publishing)
2	Sampling Techniques by Cochran, W.G (Wiley Est)
Reference Books	
1	Sampling theory of survey with applications by Sukathme P.V and sukathme B.V (Asia pub.House)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.scribbr.com
2	http://www.investopedia.com
3	http://www.surveygizmo.com
Course Designed By: Sumathi. M	

Mapping with Programme Outcomes										
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO3	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low

Course code		TITLE OF THE COURSE	L	T	P	C
Core IX		DESIGN OF EXPERIMENTS	3	1	-	4
Pre-requisite		Basic level on statistical computation	Syllabus Version		2023-2024	

Course Objectives:

The main objectives of this course are to:
1. Understand the Analysis of variance.
2. Know the Replication, randomization & local control techniques.
3. Have an idea about efficiencies of various designs and the concept of ANOCOVA.

Expected Course Outcomes:

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

1	Understand the Analysis of variance.	K2, K3
2	Study the Reeplication, randomization and local control techniques.	K1, K2
3	To compare more than two treatments with the help of F distribution.	K3, K4
4	Apply the formula & calculate the analysis of covariance.	K3, K4
5	Evaluate & Interpret the 2^2, 2^3, 3^2 factorial designs.	K2, K3

K1 - Remember; **K2** - Undestand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

DESIGN OF EXPERIMENTS

Unit:1	**Linear design models and Analysis of variance**	**15 Hours**

Linear design models-Least Square estimates of parameters and variance of estimates –Analysis of variance: One way and two way classifications.

Unit:2	**Fundamentals of experimentation**	**15 Hours**

Fundamentals of experimentation: Plot and pen techniques –determination of shape and size of plots – Uniformity trials –Replication, randomization and local control techniques

Unit:3	**Analysis of different experiments**	**15 Hours**

Analysis of different experiments: CRD, RBD and LSD and their efficiencies

Unit:4	**Analysis of covariance**	**15 Hours**

Missing plot techniques (atmost two values)-Analysis of covariance (ANCOVA) with one concomitant variable to CRD and RBD.

Unit:5	**Factorial designs**	**15 Hours**

Factorial designs -22,23and 32 factorial designs with and without confounding.

Unit:6	**Contemporary Issues**	**2 hours**

Expert lectures, online seminars – webinars

	Total Lecture hours	**77 Hours**

Text Book(s)

1	Experimental designs by Cochran W.G and Cox G.M (john Wiley)
2	Experimental design: Theory and applications by Federar, WT (Oxford and IBH)
3	Statistical theory in research by Anderson RL and Bangrtt TA (McGraw HILL)

Reference Books	
1	Fundamentals of Statistics by Goon, A.M., Guptha M.K and Das Guptha (World press)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://online.stat.psu.edu
2	http://www.frontiersin.org
3	http://www.statisticshowto.com
Course Designed By: Sumathi. M	

Mapping with Programme Outcomes										
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO3	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low

Course code		TITLE OF THE COURSE	L	T	P	C
Core X		CORE PAPER-X NUMERICAL MATHEMATICS	5	-	1	4
Pre-requisite		Basic level of mathematical computation	Syllabus Version	2023-2024		

Course Objectives:

The main objectives of this course are to know the:

1. Estimate functional relationship.
2. Interpolate and extrapolate the value of dependent variable.
3. Maxima and Minima using differentiation and integral value of the estimated function.

Expected Course Outcomes:

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

1	Understand finite differences, interpolation for equal intervals using Newton – Gregory forw ard and backward interpolation formulae.	K1,K2
2	Understand central difference interpolate formulae, Gauss forward and backward formulae.	K2, K3
3	Know the interpolation for unequal intervals by Newton's divided difference formula.	K2, K3,K4
4	Understand numerical differentiation and integration – Trapezoidal, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.	K2, K3,K4
5	Understand iterative method of Eigen values.	K4,K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	Finite differences	15 hours

Finite differences – difference of a polynomial, factorial polynomial- Interpolation for equal intervals – Newton-Gregory forward and backward interpolation formulae.

Unit:2	Central difference interpolation	15 hours

Central difference interpolation formulae, Gauss forward and backward formulae, Stirling's, Bessel's and Laplace – Everett's formulae, summation of series.

Unit:3	Interpolation (for unequal intervals)	15 hours

Interpolation for unequal intervals: Newton's divided difference formula and Lagrange's formulae, Inverse interpolation.

Unit:4	Numerical differentiation and integration	15 hours

Numerical differentiation and integration- Numerical differentiation up to second order, maxima and minima- Numerical integration : Trapezoidal, Simpson's 1/3 rd and 3/8th rules

Unit:5	Eigen value problems	15 hours

Iterative method of Eigen vales – Power method, Jacobi method, Solution of system of Non-Linear equations – Newton – Rapson method.

Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, Online seminars– Webinars		
	Total Lecture hours	**77 hours**

Text Book(s)	
1	Introductory Methods of Numerical Analysis by Sastry, SS (1998), (Prinitce Hall of India, New Delhi. Third Edn),
2	Numerical Methods by Kandasamy. P. Thilagavathy,. K and Gunavathy.K (2003), S.Chand & Co, New Delhi.
Reference Books	
1	Numerical Methods with worked examples by Woodford, Chris Philips
2	Computer Oriented Numerical Methods by Rajaraman
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/content/storage2/courses/122104019/numerical-analysis/Rathish-kumar/rathish-oct31/fratnode8.html
2	https://nptel.ac.in/courses/111/107/111107105/
3	https://onlinecourses.swayam2.ac.in/cec20_ma11/preview
Course Designed By: Gunasekaran . K	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO2	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low

Course code		TITLE OF THE COURSE	L	T	P	C
Skill based subject		MATHEMATICAL ECONOMICS	3	1		3
Pre-requisite		Basic level on economic computation	Syllabus Version	2023-2024		

Course Objectives:

The main objectives of this course are to know the:

1. On successful completion of this course, students will understand the economic Concepts and theories, which use mathematical tools and techniques to refine the verbal logic.
2. To enable the students to learn the application of Mathematical tools in Economics

Expected Course Outcomes:

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

1	Understand the economic dynamics and solve problems through adjustmentswith time	K1,K2
2	Successfully use mathematics in economics and business applications	K2, K3
3	Identify, solve and interpret the characteristics of each family of functions	K2, K3,K4
4	Know the mathematical methods to represent theories and analyzeproblems in economics	K2, K3,K4
5	Know the acquire mathematical skills used in economic analysis	K4,K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Nature of economics

Unit:1		9 hours

Introduction-Nature of Economics-Economic Laws – scope of mathematical methods in Economics. Concept of utility – Marginal concept –Law of diminishing marginal utility – utility function and curve. Scale of preferences – indifference curve and their properties – indifference map- utility index.

Unit:2	Price effect	9 hours

Price effect, income effect and substitution effect with respect to indifference curve analysis. Price determination – concept of equilibrium – stability of price and quantity-price fixation under perfect competition – Monopoly –Duopoly – concept of Oligopoly.

Unit:3	Cost function and curve	9 hours

Cost function and curve – Average, Marginal and overhead costs – short term and long term costs – cost elasticity – comparison of market value and normal value. Production function-factors of production. Law of Returns – Returns to scale – constant product curves-Marginal productivity law – Marginal rate of substitution – Elasticity of Productivity – Cobb – Douglass production function and its properties.

Unit:4	National income	9 hours

National Income – Methods of Estimation – uses of National income estimates – Computational difficulties in India. Economic Models – uses of models in Economic Theories.

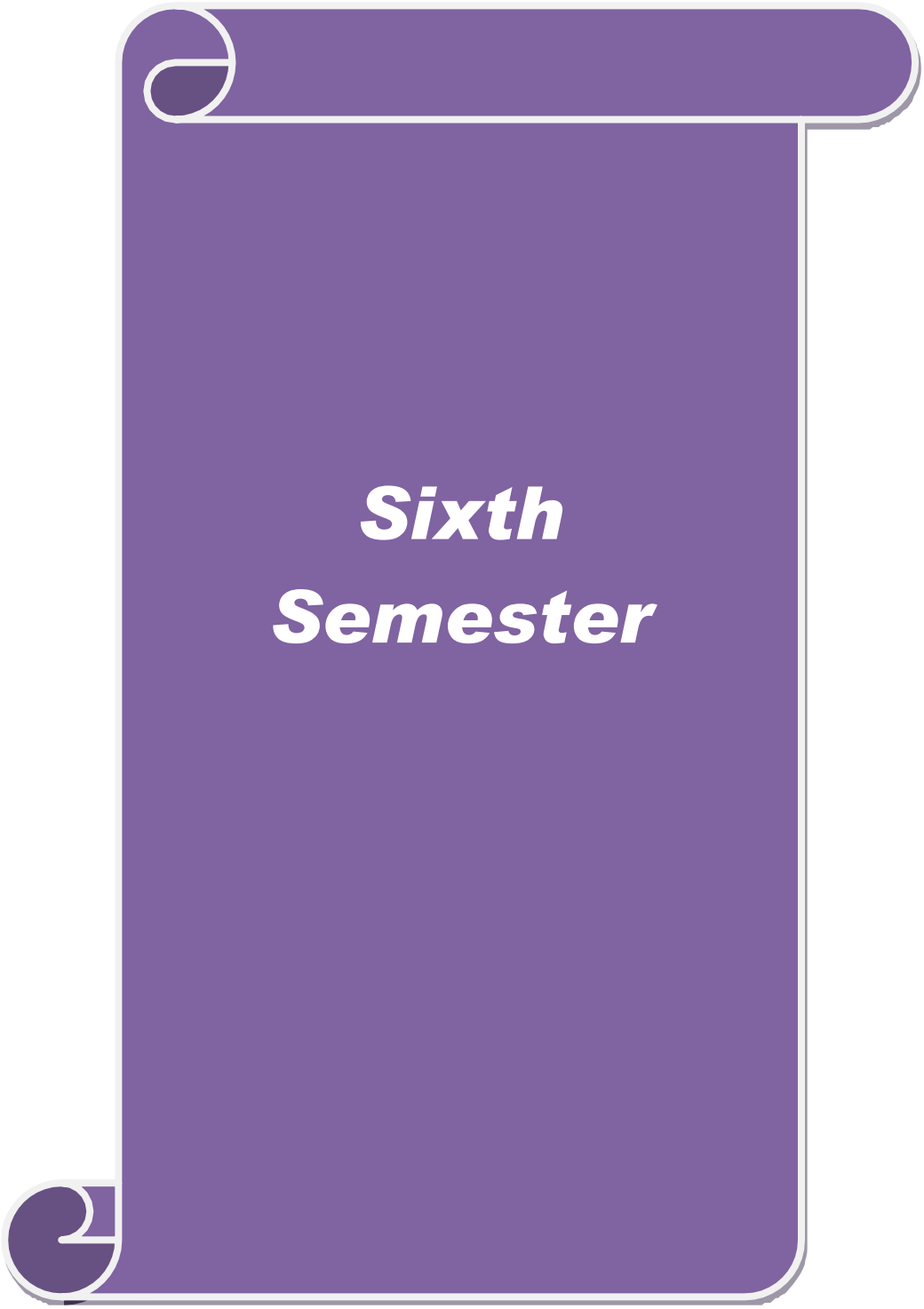
Unit:5	**Propensity to consume**	**9 hours**
Propensity to Consume – Models of multiplier and accelerator – Harrod – Domar Growth models – Cobweb model. Leontief 's input output analysis – Closed and Open Systems – Dynamic version of this model.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, Online seminars– Webinars		
	Total Lecture hours	**47 hours**

Text Book(s)	
1	S .P. Singh, AnilK . Parashar : Econometrics and Mathematical Economics. & H.P .Singh
2	Metha and Madnani : Mathematics for Economists (Sultan Chand & Sons)
Reference Books	
1	Jathar and Beri : Elementary Principles of Economics(Oxford University Press 10 th Ed.) 1969.
2	Lange O : Introduction to Econometrics (Pergamon Press -1959)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://archive.nptel.ac.in/courses/109/103/109103188/
2	https://www.classcentral.com/course/swayam-mathematical-economics-14187
3	https://onlinecourses.nptel.ac.in/noc21_hs104/preview

Course Designed By: K. GUNASEKARAN

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO2	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low


Sixth
Semester

course code		TITLE OF THE COURSE	L	T	P	C
Core XI		CORE PAPER-XI STATISTICAL INFERENCE-II	5	1	1	4
Pre-requisite		Basic knowledge in probability distributions	Syllabus Version	2023-2024		

Course Objectives:

The main objectives of this course are to know the:

1. the methods of testing the hypothesis on different distributions.

2.type of statistics to which such test procedure can be used.

Expected Course Outcomes:

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

1	Understand testing of statistical hypothesis.	K1,K2
2	Understand the concept of most powerful test and uniformly most powerful test based on normal, ‘t’ and ‘F’ distributions.	K2, K3
3	Understand test of significance, tests based on normal, ‘t’ and ‘F’ distributions.	K2, K3,K4
4	Understand Contingency table, goodness of fitness.	K2, K3,K4,K6
5	Understand free and non-parametric tests, Mann-Whitney tests.	K4,K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	Testing of statistical analysis	15 hours

Testing of Statistical hypothesis: Statistical hypothesis -simple and composite hypothesis, null and alternative hypotheses-sample and parameter space –two types of errors – critical region-power a test –Neyman- Pearson Lemma –simple applications

Unit:2	Uniformly Most Powerful Tests	15 hours

Most powerful tests-uniformly most powerful and unbiased tests based on Normal, t, and and F distributions - likelihood ratio criterion –definition and simple applications

Unit:3	Test of Significance	15 hours

Test of significance –Asympotic and exact tests based on Normal, t, and and F distributions with regard to mean, proportion, variance, Standard deviation, coefficient of correlation, regression coefficients, partial and multiple correlation coefficients-Concept of observed significance level.

Unit:4	Contingency table	15 hours

Contingency table –Test for independence by contingency tables –goodness of fitness tests –tests of homogeneity of variances, correlation and proportions .Test of Normality (application only).

Unit:5	Non - parametric test	15 hours

Elementary ideas on distribution –free and non-parametric tests –Run, Median, Sign and Mann Whitney tests (without proof)-Equality of two distributions.

Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, Online seminars– Webinars		
	Total Lecture hours	**77 hours**

Text Book(s)	
1	Introduction to Mathematical statistics by Hogg, R.V and Craig, AG (amrend)
2	Introduction to Mathematical statistics by Hoel, P.G (Wiley International)
3	Statistical Methods by Snedecor, G.W and Cochran W. G (oxford and IBH)

Reference Books	
1	Introduction to Mathematical Statistics by Brunk .H.D (Gann Co)
2	Practical Non-parametric Statistics by Conover (wiley International)

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://online.stat.psu.edu/stat502/lesson/1/1.2
2	https://onlinecourses.nptel.ac.in/noc20_ma55/preview
3	https://www.coursera.org/learn/statistical-inference

Course Designed By: Gunasekaran . K

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO2	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium; L-Low

Course code		TITLE OF THE COURSE	L	T	P	C
Core XII		CORE PAPER-XII STATISTCIAL QUALITY CONTROL	5	-	1	4
Pre-requisite		Basic knowledge in probability distributions and statistical computation	Syllabus Version	2023-2024		

Course Objectives:

The main objectives of this course are to know the:

1. Various tools used such as control charts, sampling plans, quality system standards.
2. Reliability concepts to control the quality of industrial outputs.

Expected Course Outcomes:

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

1	Understand need for SQC.	K1,K2
2	Understand control chart for attributes np, p, c and u chart.	K2, K3
3	Know the acceptance sampling for attributes – single, double and sequential sampling plans.	K2, K3,K4
4	Quality system standards ISO 9000.	K2, K3,K4
5	Reliability concepts and measures, common life distributions namely exponential, Gamma and Weibull distributions.	K4,K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	Control charts for variables	15 hours

Need for SQC – Role of frequency distribution – Statistical basis for SQC – variable control charts –, R and charts.

Unit:2	Control chart for attributes	15 hours

Control Chart for attributes – np, p, c and u chart – Group control chart, OC and ARL of control charts, CUSUM charts using V- mark and decision intervals (concepts only)

Unit:3	Acceptance sampling for attributes	15 hours

Acceptance sampling for Attributes – Single sampling plan – Double sampling plan – OC, AOQ, ASN and ATI curves – sequential sampling plan and their properties.

Unit:4	Quality system standards	15 hours

Quality system standards – ISO 9000- Elements of ISO – 9000 – Benefits of ISO 9000- Elements of a quality system – Documentation ISO 9000 accreditation

Unit:5	Reliability concepts	15 hours

Reliability concepts and measures, components and systems, reliability function, hazard rate, common life distribution viz, exponential, gamma and weibull.

Unit:6	Contemporary Issues	2 hours

Expert lectures, Online seminars– Webinars

	Total Lecture hours	77 hours

Text Book(s)	
1	Fundamentals of Applied statistics by Gupta S.C and Kapoor, V.K –
2	Quality control and Industrial Management by Dunkan A.J.(Richard D.Irwin Inc.USA)
3	Statistical Quality Control by R.S. Leaven worth (Mc Graw Hill)
Reference Books	
1	Statistics of Quality control, Sampling Inspection and Reliability by Biswas S (1996)(New Age Intl)
2	Statistical Analysis of Reliability and Life Testing Models, by Bain, L.J and Englehard, M. (1991) (Maral Dekker)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.linkedin.com/learning/excel-statistical-process-control/statistical-process-control-2
2	https://www.udemy.com/course/statistical-quality-control-sqc/
3	http://www.samplingbook.com/course
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Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	-	-	-
CO2	S	S	M	S	S	M	M	-	-	-
CO3	S	S	M	M	S	M	S	-	-	-
CO4	S	S	S	M	S	M	M	-	-	-
CO5	S	S	S	M	M	S	M	-	-	-

*S-Strong; M-Medium ; Low - L

Annexure

BHARATHIAR UNIVERSITY, COIMBATORE 641046

DEPARTMENT OF STATISTICS

MISSION

The course aims to encourage students to acquire knowledge on theoretical and applied areas of Statistics in a wider range. It intends to create awareness on the importance of the concepts of statistics in various fields of study and to provide practical training on the applications of statistical methods for carrying out analysis of data using programming knowledge such as R and C++. The course is designed in such a way to help the students to pursue higher studies in Statistics and to get placements on successful completion of the course.