DEPARTMENT OF ECONOMICS

Department	Economics	Class	II – B.A.		Semester	III
Course Title	Economics of Tourism	Hours	Credit	CIA	External	Total
Course Code	18U3VSM3	30	2	25	75	100

Objectives

1. To understand tourism practices
2. To obtain knowledge and skills about important tourist places in the region

Learning Outcome

Students get awareness on tourism economics

Unit -I: Introduction **(6 hours)**

Meaning and Definitions – Importance of Tourism – Tourists and classification of tourist – International and domestic tourism – Socio-economic Merits of tourism – Demerits of tourism.

Unit –II: Tourism Marketing **(6 hours)**

Tourism marketing – Features – Tourist product – Market segmentation – Market research – Market advertisement.

Unit –III: Tourism Transport **(6 hours)**

Tourism transport – Functions – Classifications – Holiday-inns – Tourist Guides – Travel Documents – Travel Agents and their functions.

Unit – IV: Tourism Development **(6 hours)**

India Tourism Development Corporation – Tamil Nadu Tourism Development Corporation – Tamil Nadu Tourism Policy.

Unit – V: Local Tourism **(6 hours)**

Selective Tourist places in and around Madurai district.

Text Book

1. Sipra Mukhopadhyay (2008), **"**Tourism Economics**",** Ane Books India, New Delhi.

References

1. Jha, S.M. (2010) , **"**Tourism Marketing"**,** Himalaya Publishing House, Mumbai.
2. Bhatia, A.K. (2001), **"**International Tourism Management**",** Sterling Publishers Pvt. Ltd., New Delhi.
3. Vishwanath Ghosh (2000), **"**Tourism and Travel Management**",** Vikas Publishing House, Pvt. Ltd., New Delhi.

Website / e-book

https://www.kobo.com/us/en/ebook/tourism-economics

CERTIFICATE COURSE IN TEACHING AND RESEARCH APTITUDE

Sl. No.	Course Title
1.	Teaching and Research Aptitude
2.	Research and Data Interpretation

EXAMINATION COMPONENTS

I – Question Paper pattern for C.I.A

Duration: 1 Hour **Maximum Marks: 25**

Test - 25 Marks

Answer All objective type – multiple choice questions (25 questions x 1 Mark = 25)

II – Question Paper pattern for End of Semester Examination

Duration : 2 Hours **Maximum Marks: 75**

- Answer All objective type – multiple choice questions (50 questions x 1.5 Marks =75)
- 10 Questions from each unit

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Blue Print for End of Semester Question Paper

Question Paper Type	Unit – I	Unit – II	Unit – III	Unit – IV	Unit – V	Total Questions
Objective Type - Multiple Choice Questions	10	10	10	10	10	50

*** Question paper setting and valuation shall be done by the Faculty of Department of Economics.**

Department	Economics	Class	Certificate Course		
Course Title	Teaching and Research Aptitude	Hours	CIA	External	Total
Paper	1	30	25	75	100

Objectives

1. To cater the needs of the students of Arts, Languages, Humanities, Commerce and Computer Science.
2. To make the students to be qualified for the Assistant Professor in the Colleges and Universities.

Learning Outcome

Production of quality teachers to the Higher Educational Institutions.

Unit - I Teaching Aptitude **(6 Hours)**

- Teaching: Concept, Objectives, Levels of teaching (Memory, Understanding and Reflective), Characteristics and basic requirements.
- Learner's characteristics: Characteristics of adolescent and adult learners (Academic, Social, Emotional and Cognitive), Individual differences.
- Factors affecting teaching related to: Teacher, Learner, Support material, Instructional facilities, Learning environment and Institution.
- Methods of teaching in Institutions of higher learning: Teacher centred vs. Learner centred methods; Off-line vs. On-line methods (Swayam, Swayamprabha, MOOCs etc.).
- Teaching Support System: Traditional, Modern and ICT based.
- Evaluation Systems: Elements and Types of evaluation, Evaluation in Choice Based Credit System in Higher education, Computer based testing, Innovations in evaluation systems.

Unit - II Research Aptitude **(6 Hours)**

- Research: Meaning, Types, and Characteristics, Positivism and Post- positivistic approach to research.
- Methods of Research: Experimental, Descriptive, Historical, Qualitative and Quantitative methods.
- Steps of Research.
- Thesis and Article writing: Format and styles of referencing.
- Application of ICT in research.
- Research ethics.

Unit - III Comprehension **(6 Hours)**

- A passage of text be given. Questions be asked from the passage to be answered.

Unit-IV Communication **(6 Hours)**

- Communication: Meaning, types and characteristics of communication.
- Effective communication: Verbal and Non-verbal, Inter-Cultural and group communications, Classroom communication.
- Barriers to effective communication.
- Mass-Media and Society.

Unit – V Higher Education System **(6 Hours)**

- Institutions of higher learning and education in ancient India.
- Evolution of higher learning and research in Post Independence India.
- Oriental, Conventional and Non-conventional learning programmes in India.
- Professional, Technical and Skill Based education.
- Value education and environmental education.
- Policies, Governance, and Administration.

Reference Books

1. Rashmi Singh and Asim Khan (2019), UGC-NET Paper – I, Disha Publication, New Delhi.
2. Dr.Usha Rani Jain (2018), UGC-NET, Mital Books India Ltd., New Delhi.
3. Madan KVS ((2019), NTA-UGC NET/SET/JRF – Teaching and Research Aptitude, Pearson India Education Services Pvt. Ltd., Noida.

Websites / e-sources

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https://easynotes4u.com/product/nta-ugc-net-paper-1-complete-updated-book/
https://www.latestcarernews.com/ugc-net-paper-1/
https://www.free-ebooks.net/teachers-resources/UGC-NET-Exam-Complete-Guide/pdf?dl&preview

Department	Economics	Class	Certificate Course		
Course Title	Research and Data Interpretation	Hours	CIA	External	Total
Paper	2	30	25	75	100

Objectives

1. To cater the needs of the students of Arts, Languages, Humanities, Commerce and Computer Science.
2. To make the students to be qualified for the Assistant Professor in the Colleges and Universities.

Learning Outcome

Production of quality teachers to the Higher Educational Institutions.

Unit –I Mathematical Reasoning and Aptitude **(6 Hours)**

- Types of reasoning.
- Number series, Letter series, Codes and Relationships.
- Mathematical Aptitude (Fraction, Time & Distance, Ratio, Proportion and Percentage, Profit and Loss, Interest and Discounting, Averages etc.).

Unit – II Logical Reasoning **(6 Hours)**

- Understanding the structure of arguments: argument forms, structure of categorical propositions, Mood and Figure, Formal and Informal fallacies, Uses of language, Connotations and denotations of terms, Classical square of opposition.
- Evaluating and distinguishing deductive and inductive reasoning.
- Analogies.
- Venn diagram: Simple and multiple use for establishing validity of arguments.
- Indian Logic: Means of knowledge.
- Pramanas: Pratyaksha (Perception), Anumana (Inference), Upamana (Comparison), Shabda (Verbal testimony), Arthapatti (Implication) and Anupalabddhi (Non-apprehension).
- Structure and kinds of Anumana (inference), Vyapti (invariable relation), Hetvabhasas (fallacies of inference).

Unit - III Data Interpretation **(6 Hours)**

- Sources, acquisition and classification of Data.
- Quantitative and Qualitative Data.
- Graphical representation (Bar-chart, Histograms, Pie-chart, Table-chart and Line-chart) and mapping of Data.
- Data Interpretation.
- Data and Governance.

Unit – IV Information and Communication Technology (ICT) **(6 Hours)**

- ICT: General abbreviations and terminology.
- Basics of Internet, Intranet, E-mail, Audio and Video-conferencing.
- Digital initiatives in higher education.
- ICT and Governance.

Unit – V People, Development and Environment **(6 Hours)**

- Development and environment: Millennium development and Sustainable development goals.
- Human and environment interaction: Anthropogenic activities and their impacts on environment.
- Environmental issues: Local, Regional and Global; Air pollution, Water pollution, Soil pollution, Noise pollution, Waste (solid, liquid, biomedical, hazardous, electronic), Climate change and its Socio-Economic and Political dimensions.
- Impacts of pollutants on human health.
- Natural and energy resources: Solar, Wind, Soil, Hydro, Geothermal, Biomass, Nuclear and Forests.
- Natural hazards and disasters: Mitigation strategies.
- Environmental Protection Act (1986), National Action Plan on Climate Change, International agreements/efforts -Montreal Protocol, Rio Summit, Convention on Biodiversity, Kyoto Protocol, Paris Agreement, International Solar Alliance.

Reference Books

1. Rashmi Singh and Asim Khan (2019), UGC-NET Paper – I, Disha Publication, New Delhi.
2. Dr.Usha Rani Jain (2018), UGC-NET, Mital Books India Ltd., New Delhi.
3. Madan KVS ((2019), NTA-UGC NET/SET/JRF – Teaching and Research Aptitude, Pearson India Education Services Pvt. Ltd., Noida.

Websites / e-sources

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https://www.latestcarernews.com/ugc-net-paper-1/
https://www.free-ebooks.net/teachers-resources/UGC-NET-Exam-Complete Guide/pdf?dl&preview

DEPARTMENT OF STATISTICS

MADURA COLLEGE (Autonomous), MADURAI

DEPARTMENT OF STATISTICS

M.Sc., Statistics

(Choice Based Credit System)

(For the candidates admitted during the academic year 2019 – 2020 and onwards)

Course Structure and Scheme of Examinations

Semester	Course Code	Course Title	Hours	Credits
I	19P1SMC1	Real Analysis and Linear Algebra	6	4
	19P1SMC2	Probability Theory	6	4
	19P1SMC3	Distribution Theory	6	4
	19P1SMC4	Operations Research	6	4
	Major Elective - I (one to be chosen)			
	19P1SME1(A)	Official Statistics	6	4
	19P1SME1(B)	Financial Mathematics		
II	19P2SMC5	Sampling Theory	5	4
	19P2SMC6	Statistical Estimation Theory	5	4
	19P2SMC7	Demography	5	4
	19P2SMC8	Programming in C	4	3
	19P2SMP1	Lab: Practical in C	2	1
	19P2SMP2	Statistics Practical I*	4	4
	Major Elective - II (one to be chosen)			
	19P2SME2(A)	Data Mining	5	4
	19P2SME2(B)	Actuarial Statistics		
III	19P3SMC9	Testing Statistical Hypotheses	5	4
	19P3SMC10	Multivariate Analysis	5	4
	19P3SMC11	Statistical Quality Control	5	4
	19P3SMC12	Programming in R	4	3
	19P3SMP3	Lab: Practical in R	2	1
	19P3SNM	Elements of Operations Research	4	4
	Major Elective - III (one to be chosen)			
	19P3SME3(A)	Econometrics	5	4
	19P3SME3(B)	Biostatistics and Survival Analysis		
IV	19P4SMC13	Linear Models and Design of Experiments	6	4
	19P4SMC14	Stochastic Processes	6	4
	19P4SMP4	Statistics Practical II**	6	4
	19P4SMP5	Software Practical using SPSS	6	4
	Major Elective - II (one to be chosen)			
	19P3SME4(A)	Regression Analysis	6	6
	19P3SME4(B)	Categorical Data Analysis		

***** Statistics Practical I is based on the problems relating to the topics covered in Semester I and II

****** Statistics Practical II is based on the problems relating to the topics covered in Semester III and IV

Course code	Course title	C	H	I	E	T
19P1SMC1	Real Analysis and Linear Algebra	4	6	25	75	100

Learning Objectives:

- To get an overview of real numbers and analysis.
- To understand the concept of Limits and Convergence.
- To understand the concept of algebra that will useful in Statistics.

Learning out comes:

- Understand continuity, derivability of real valued functions.
- Differentiate between Riemann Integral and Riemann – Stieltjes integral.
- Grasp the concept of Linear algebra.

Unit I - Sequences and Infinite Series

Bounded ness and limit of a sequence - Convergence of sequences and series of real numbers – absolute and conditional convergence – Point - wise and uniform convergence – Tests for absolute, conditional and uniform convergence – Properties of uniform convergence.

Unit II - Real valued functions

Limits, continuity and uniform continuity of functions – Algebra of continuous functions - Differentiability – Algebra of Derivatives - Maxima and Minima of functions – Mean value theorems - Taylor's theorem – Functions of several variables.

Unit III -Rieman-Stieljtes (R-S) intergral

Upper and lower R-S integrals - Necessary and sufficient condition for R-S integrability - Algebra of R-S integrable functions - Class of R-S integrable functions - Integration by parts - First mean value theorem and Cauchy's mean value theorem for R-S integrals.

Unit IV - Vector Spaces

Vector Spaces - Examples of Vector Spaces - Linear Combinations - Spanning Sets - Subspaces - Linear Spans - Row Space of a Matrix - Linear Dependence and Independence - Basis and Dimension - Linear transformation - Orthogonality – Orthonormal basis.

Unit V- Matrices

Matrices – Rank and inverse of matrices – properties – Idempotent and partitioned matrices –Generalized Inverse - Polynomials of Matrices - Characteristic Polynomial – Cayley-Hamilton Theorem - Characteristic roots and characteristic vectors - Quadratic forms – Reduction and classification of quadratic forms – Cochran's theorem.

Books for Study and Reference

1. A Basic Course in Real Analysis by Ajit Kumar and Kumaresan, S, Chapman and Hall/CRC Press(2014).
2. Real Analysis by Arora, S,Satya Prakashan Mandir, New Delhi(1988).
3. Methods of Real Analysis by Goldberg R R, Oxford & IBH Publishing Company, New Delhi(1976).
4. Mathematical Analysis by Malik SC and Arora S, Second Edition, New Age International, New Delhi(2009).
5. Principles of Mathematical Analysis by Rudin, W, McGraw-Hill, New York(1985).
6. Linear Algebra by Lipschutz, S and Lipson ML, Schaum's Outline Series, McGraw Hill, New York(2009).
7. Linear Algebra by Rao, AR and Bhimasankaram P, Second Edition, Hindustan Book Agency, Hyderabad(2000).
8. Real Analysis by Sharma JN and Vasishtha A R, Krishna Prakashan Media (P) Ltd - , Meerut(2008).

Course code	Course title	C	H	I	E	T
19P1SMC2	Probability Theory	4	6	25	75	100

Learning Objectives:

- To explain the concept of Probability Theory.
- To understand the concept like random variables, Probability measure and expectation etc., under stochastic situation.
- To understand the applications of central limits theorems in statistical theory.

Learning out comes:

- Grasp the fundamentals of Probability theory.
- Have an idea of random variables, expectation and probability measure etc., - under stochastic situation.
- Understand the convergence in Probability, Weak Law of Large numbers and different theorems applicable in research.

Unit I – Probability

Functions and Inverse Functions - Random Variables – Limits of Random Variables – Definition of Probability – Simple Properties – Discrete Probability Space – General Probability Space – Induced Probability Space.

Unit II - Distribution Function

Distribution Function of a Random Variable – Decomposition of Distribution functions – Jordan Decomposition Theorem – Distribution Functions of Vector Random Variables - Mathematical Expectation – Properties of Expectation – Moments – MGF – Holder's Inequality – Minkowski Inequality - Basic Inequality - Markov Inequality.

Unit III - Convergence of Random Variables

Convergence in Probability - Almost Sure Convergence - Convergence in Distribution - Convergence in Mean - Relationships - Monotone Convergence Theorem.

Unit IV - Characteristic Function

Characteristic Function of a random variable - Properties – Uniqueness theorem - Inversion Formula – Problems – Borel-Cantelli Lemma - Borel 0 - 1 Law – Helly-Bray Lemma.

Unit V - Law of Large Numbers

Weak and Strong Law of Large Numbers – Bernoulli's Law of Large Numbers – Khintchine's law of large numbers – Kolmogorov's strong law of large numbers - Simple problems - Central Limit Theorems: *de*-Moivre – Laplace central limit theorem - Lindeberg – Levy's central limit theorem - Liaponov's form of central limit theorem - Lindberg – Feller Central Limit Theorem (Statement only).

Books for Study and Reference

1. Modern Probability Theory – An Introductory Text Book by Bhat B R,Third Edition (Reprint), New Age International Private Ltd - , New Delhi(2009).
2. Modern Mathematical Statistics by Dudewicz, EJ and Mishra S N, John Wiley & Sons, New York(1988).
3. Mathematical Statistics by Mukhopadhyay, P, Third Edition, Books and Allied (P) Limited, Kolkata(2006).
4. Introduction to Probability Theory and Mathematical Statistics by Rohatgi VK, John Wiley & Sons, NY(1976).
5. An Introduction to Probability and Statistics by Rohatgi V K and Saleh, AKME,Third Edition, John Wiley & Sons, NY(2015).

Course code	Course title	C	H	I	E	T
19P1SMC3	Distribution Theory	4	6	25	75	100

Learning Objectives:

- To study the probability distributions.
- To provide concepts underlying the Multivariate techniques.
- To identify the applications of mutilator analysis.

Learning out comes:

- Derive the truncated probability distributions relevant to functions of random variable.
- Derive Non-central χ^2, t and F distribution from normal distribution and derive the Sampling distributions of sample correlation coefficient and regression coefficient.
- Perform Statistical tests of the mean(s) vectors of a multivariate normal distribution.
- Use principal component, Factor analysis, Classification theorem and Canonical correlation for typical problems.

Unit I - Discrete Probability Distributions

Bernoulli, Binomial, Geometric, Negative Binomial, Hypergeometric, Multinomial, Poisson and Uniform Distributions – Properties.

Unit II - Continuous Probability Distributions

Uniform, Normal, Exponential, Gamma, Beta, Cauchy, Laplace, Log-normal, Logistic and Weibull Distributions – Properties.

Unit III - Truncated Distributions

Binomial, Poisson and Normal Distributions – Properties - Power Series Distributions, Compound Distributions, Logarithmic Distributions – Properties.

Unit IV - Sampling Distributions

Central and Noncentral t, Chi-square and F Distributions – Properties.

Unit V - Order statistics

Distribution of rth order statistics – Joint distribution of two or more order statistics - Distribution of sample range and median - Quadratic forms: Distribution of quadratic forms - Cochran's theorem - Independence of quadratic forms.

Books for Study and Reference

1. Modern Mathematical Statistics by Dudewicz, EJ and Mishra S N, John Wiley & Sons, New York(1988).
2. Introduction to Mathematical Statistics by Hogg RV, McKean J W and Craig AT, , Seventh Edition, Pearson Education, London(2012).
3. Univariate Discrete Distributions by Johnson N L, Kemp AW and Kotz S, Third Edition, John Wiley and Sons, New York(2005).
4. Continuous Univariate Distributions - Vol - I by Johnson N L, Kotz S and Balakrishnan N, John Wiley and Sons (Asia), Singapore(2004).
5. Continuous Univariate Distributions, Vol - II by Johnson N L, Kotz S and Balakrishnan N, John Wiley and Sons (Asia), Singapore(2014).
6. Introduction to the Theory of Statistics byMood AM, Graybill, FA and Boes DC, Third Edition, McGraw-Hill International Edition(2017).
7. Mathematical Statistics by Mukhopadhyay P, Books and Allied (P) Limited, New Delhi(2002).
8. Introduction to Probability Theory and Mathematical Statisticsby Rohatgi VK, John Wiley & Sons, NY(1976).
9. An Introduction to Probability and Statistics Second Editionby Rohatgi VK and Saleh, A KMd E, John Wiley and Sons, New York(2011).

Course code	Course title	C	H	I	E	T
19P1SMC4	Operations research	4	6	25	75	100

Learning Objectives:

- To understand of the concepts of LPP duality principles and decision making.
- To understanding the concepts in Inventory models.
- To understand Dynamic programming and Non Linear Programming problems.

Learning out comes:

- Develop the knowledge about the dual simplex problems and decision analysis and decision trees and its application.
- Solvesensitive analysis and inventory control with decision making problems.
- Find a solution of project activities using pert and cpm.
- Develop the knowledge about the dynamic problems to shortest route, goal programming and its application.
- Simulate the real life queuing and inventory problems.

Unit I - Linear programming problems (LPP)

Formulation - Graphical and simplex methods of solving LPP - Use of artificial variables - Two-phase method and Big-M method - Degeneracy in LPP - Duality – Interpretation of duality - Dual Simplex Method.

Unit II - Integer programming problem (IPP)

Integer programming problem (IPP) – Pure and mixed IPP - Gomory's constraints and cutting plane algorithm - Mixed IPP – Branch and Bound technique - Dynamic programming problem (DPP) - Principle of optimality – Recursive equation approach - Characteristics of DPP.

Unit III - Inventory control

Inventory control: Analytic structure of Inventory Problems, Concept of economic order quantity - Sensitivity analysis and extensions allowing quantity discounts and shortages - Deterministic and probabilistic inventory models - Models with random demand, and static risk models - Multi-item deterministic inventory problems.

Unit IV - Queueing theory

Queueing systems, queueing models, classification of models - M/M/1, M/M/C and M/C/1 queues and their steady state solutions, Waiting Time Distributions for M/M/1 and M/M/C Models.

Unit V - Sequencing and Scheduling Models

Sequencing problems with 2 machines n jobs and 3 machines n jobs - Network scheduling: Basic components, PERT, CPM, determination of flows and critical path.

Books for Study and Reference

1. Introduction to Operations Researchby Hillier F Sand Leiberman GJ, Fifth Edition, McGraw-Hill, NY(1990).
2. Operations Researchby Kanti Swarup, Gupta, P K and Man Mohan, Sultan Chand & Sons,Nineteenth Edition, New Delhi(2017).
3. Operations Research: An Introduction by Taha, H, Third Edition, McMillan Publishing Co - , Inc - , London(1982).
4. Operations Research: Theory, Methods and Applicationsby Sharma SD, Kedar Nath, Ram Nath and Co, Meerut(2017).
5. Principles of Operations Research with Application toManagerial Decisionsby Wagner H M, Second Edition, Prentice Hall India Learning Private Limited and New Delhi(1980).

Course code	Course title	C	H	I	E	T
19P1SME1(A)	Official statistics	4	6	25	75	100

Learning Objectives:

- To introduce Indian and international statistical systems.
- To understand about the system of collection of agricultural statistics, impact of irrigations.
- To study about present official statistical systems in India, banking and finance.

Learning out comes:

On completion of the course, students should be able to

- Describe basic statistical systems related to population census of India.
- Understand about agricultural statistical system Industrial statistic, Inflation.
- Analyze methods of collection of official statistics, their reliability and limitations, labour and employment.

Unit I

Introduction to Indian and International statistical systems - Role, function and activitiesof Central and State statistical organizations - Organization of large scale sample surveys - Role of National Sample Survey Organization - General and special data dissemination systems.

Unit II

Population growth in developed and developing countries - Evaluation of performance of family welfare programmes - Projections of labour force and manpower - Scope and content of population census of India.

Unit III

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

Unit IV

Statistics related to industries - Foreign trade - Balance of payment - Cost of living – Inflation - Educational and other social statistics.

Unit V

Indian official statistics : Present official statistical system in India - Methods of collection of official statistics, their reliability and limitations - Principal publications

containing data on the topics such as population, agriculture, industry, trade, prices, labour and employment, transport and communications - Banking and finance - Various official agencies responsible for data collection and their main functions.

Books for Study and Reference

1. Basic Statistics Relating to the Indian Economy - India - Central Statistical Organization(1990).
2. Statistical System in India - India - Central Statistical Organization(1995).
3. Guide to Official StatisticsIndia - Central Statistical Organization(1999).
4. Family Welfare Yearbook - Annual Publication of D/o Family Welfare.
5. Monthly Statistics of Foreign Trade in India, DGCIS, Calcutta and other Govt - Publications.
6. Panse, V - G - (1964) - Estimation of Crop Yields (FAO), Food and Agriculture Organization of the United Nations.
7. Principles and accommodation of National Population Censuses, UNESCO.

Course code	Course title	C	H	I	E	T
19P1SME1(B)	Financial Mathematics	4	6	25	75	100

Learning Objectives:

- To get an overview of cash flow techniques.
- To understand the concept of the present value and accumulated value of a stream of equal or unequal payments, inflation rate.
- To understand the investment and risk characteristics.

Learning out comes:

On completion of the course, students should be able to

- Understand about making allowance for the probability of payments.
- Grasp the concept of repayment by regular installments of interest and capital, discounted cash flow techniques.
- Understand the structure of interest rates, simple stochastic interest rate models.

Unit I

Generalized Cash Flow model for financial transaction, making allowance for the probability of payment, Time value of money using the concepts of compound interest and discounting, Interest rates or discount rates in terms of different time periods.

Unit II

Calculation of the present value and the accumulated value of a stream of equal or unequal payments using specified rates of interest and the net present value at a real rate of interest, assuming a constant rate of inflation.

Unit III

Use of compound interest function, Equation of value, Repayment by regular installments of interest and capital, Discounted cash flow techniques.

Unit IV

The investments and risk characteristics of the following types - Simple compound interest problems, The delivery price and the value of the forward contract using arbitrage free pricing methods.

Unit V

Structure of interest rates, Simple Stochastic interest rate models.

Books for Study and Reference

1. An Introduction to the Mathematics of Financeby Mecutcheon J J and Scott W F, , Published for the Institute of Actuaries and the Faculty of Actuaries by Heinemann, UK(1986).
2. Mathematics of Finance by Zima P and Brown RL, Second Edition, Schaum's Outline Series, McGraw-Hill Co - , Inc - , New York(1996).
3. Actuarial Mathematicsby Bowers NL, Society of Actuaries, Second Edition(1997).
4. Introduction to Financial Mathematics by Buchanan R J, World Scientific Publishing Co - , Pvt - , Ltd, Singapore(2006).
5. Fundamentals of Actuarial Mathematics by Promislow S D, John Wiley and Sons, New York(2011).

Course code	Course title	C	H	I	E	T
19P2SMC5	Sampling theory	4	5	25	75	100

Learning Objectives:

- To explain necessity of sampling.
- To give an account of the sampling techniques useful in survey methodology in collection and its efficiency.
- To explain different estimators of sampling methods and two stage sampling techniques.

Learning out comes:

- Appreciate the uses of sampling.
- Get an overview of Simple random Sampling, Stratified random sampling and other estimation techniques.
- Know the difference and efficiency of different sampling method.
- Have knowledge about Ratio and Regression estimators.

Unit I - Population and Sample

Population and Sample – Census and sample survey – sampling – sampling unit, sampling frame, sampling distribution, standard error, questionnaire and schedule, sampling design – sampling and non-sampling errors – non-response and its effects – sample surveys – principles of sample survey - principal steps in sample survey - limitations of sampling.

Unit II - Simple Random Sampling (with and without replacement)

Notations and terminology - Estimates of population total, mean and their variances and standard errors – Pooling of estimates - Determination of sample size - Simple random sampling for attributes.

Unit III - Stratified random sampling

Estimates of population total, mean and their variances - Related properties – Allocation of sample sizes – Neyman's proportional and optimum allocations - Comparison of stratified sampling with simple random sampling - Estimation of proportion under stratified random sampling.

Unit IV - Systematic sampling

Estimates of population total, mean, and their variances and standard errors – systematic sampling with linear trend – comparison of systematic sampling with stratified and simple random sampling – circular systematic sampling - Two stage sampling with equal number of second stage units and cluster sampling.

Unit V - Varying Probability Sampling

Probability proportional to size (PPS) sampling (with and without replacement) - Selection procedures – Ordered and unordered estimates – Horwitz – Thompson estimates - Ratio Estimates – Methods of estimation, approximate variance of the Ratio Estimate - Regression Estimators – Difference Estimators, Regression Estimators in Stratified Sampling.

Books for Study and Reference

1. Sampling Techniquesby Cochran,WG, Third Edition, John Wiley & Sons, NY(1977).
2. Sampling Theoryby Des Raj (1978), Tata-McGraw Hill, New DelhiSampling Theory.
3. Applied Statistics by Mukhopadhyay P, Books and Allied (P) Limited, New Delhi(2005).
4. Sampling Theory and Methodsby Murthy M N, Statistical Publishing Society, Calcutta(1967).
5. Theory and Analysis of Sample Survey Designby Singh D and Chowdhary FS, New Age International Private Ltd - , New Delhi(2018).
6. Sampling Theory of Surveys with Applicationsby Sukhatme PV and Sukhatme BV , Asia Publishing House, New Delhi(1970).

Course code	Course title	C	H	I	E	T
19P2SMC6	Statistical Estimation Theory	4	5	25	75	100

Learning Objectives:

- To introduce concepts and terminologies in estimation theory.
- To acquire knowledge in methods of estimation with its properties.
- To understand the complete family of distribution.
- To know about the Estimation and its methods.
- To apply in the real life situations.

Learning out comes:

- Have the knowledge about the estimators and its properties.
- Understand the theorems and its applications.
- Able to estimate the parameters based on methods of estimation.
- Apply the interval estimation and Bayesian estimation in real life problems.

Unit I - Introduction

Estimation - Point estimator – Choice of estimator – Amount of concentration - Mean squared error and variance - Sufficiency – Factorization Theorem – Minimal sufficiency, likelihood equivalence – Completeness.

Unit II - Unbiased estimator

Unbiased estimator – Estimable function – Rao-Blackwell's theorem - uniformly minimum variance unbiased estimator – Lehmann-Scheffe's theorem - Fisher's information measure Cramer-Rao inequality, Bhattacharya inequality, Chapman-Robbins inequality.

Unit III - Methods of point estimation

Methods of point estimation - Maximum likelihood method (asymptotic properties of ML estimators are not included), method of moments, method of minimum chi-square and modified minimum chi-square.

Unit IV - Consistency and CAN estimators

Consistency and CAN estimators - Asymptotic properties of maximum likelihood estimators - Example of consistent but not asymptotic normal estimators from Pitman family - Fisher's lower bound for asymptotic variance - Asymptotic relative efficiency - Method of least squares.

Unit V - Interval estimation

Confidence level and confidence coefficient - Duality between acceptance region of a test and a confidence interval - Pivotal quantity method - Shortest length confidence intervals - Construction of confidence intervals for population proportion (small and large samples) and

between two population proportions (large samples) - Confidence intervals for mean, variance of a normal population, difference between mean and ratio of two normal populations.

Books for Study and Reference

1. Modern Mathematical Statistics by Dudewicz E J and Mishra S N, John Wiley & Sons, NY(1988).
2. An Outline of Statistical Theory-Vol - IIby Goon A M, Gupta MK and Dasgupta B, World Press, Calcutta(1989).
3. A First Course on Parametric Inferenceby Kale B K, Narosa Publishing House, New Delhi(1999).
4. Introduction to the Theory of Statistics by Mood AM, Graybill FA and Boes, DC , Third Edition, McGraw-Hill International Edition(2017).
5. Statistical Inferenceby Rajagopalan Mand Dhanavanthan P, PHI Learning Pvt - Ltd -, New Delhi(2012).
6. Introduction to Probability Theory and Mathematical Statistics by Rohatgi V K, John Wiley & Sons, NY(1976).
7. An Introduction to Probability and Statisticsby Rohatgi VK and Saleh A K Md E, Second Edition, John Wiley and Sons, New York(2011).

Course code	Course title	C	H	I	E	T
19P2SMC7	Demography	4	5	25	75	100

Learning Objectives:

- To achieve knowledge about the size, composition, organization and distribution of the population .
- To undertake demographic analysis for the measurement of fertility, mortality, migration and population change under different models.
- To estimate birth and death process using stochastic process.
- To impart the knowledge about life table and derive its function.
- Know the types of migration and apply methods of estimating net migration.

Learning out comes:

- Identify different source of data for measuring mortality andMorbidity.
- Explain some of the problems relating to the completeness and Quality of data.
- Obtain fertility measures and models under different conditions, also identify causes of fertility changes and its implications.
- Project the population growth and have knowledge in migrationApply the concepts of stochastic processes to real life situations On Birth and Death process.

Unit I - Population Theories

Coverage and content errors in demographic data, use of balancing equations and Chandrasekharan - Deming formula to check completeness of registration data - Adjustment of age data, use of Myer and UN indices, Population composition, dependency ratio.

Unit II - Measurements of Mortality

Introduction and sources of collecting data on vital statistics, errors in census and registration data - Measurement of population, rate and ratio of vital events - Measurements of Mortality: Crude Death Rate (CDR), Specific Death Rate (SDR), Infant Mortality, Rate (IMR) and Standardized Death Rates.

Unit III - Life (Mortality) Tables

Stationary and Stable population, Central Mortality Rates and Force of Mortality - Life (Mortality) Tables: Assumption, description, construction of Life Tables and Uses of Life Tables.

Unit IV - Measurements of Fertility

Crude Birth Rate (CBR), General Fertility Rate (GFR), Specific Fertility Rate (SFR) and Total Fertility Rate (TFR) - Measurement of Population Growth: Crude rates of natural increase, Pearl's Vital Index, Gross Reproduction Rate (GRR) and Net Reproduction Rate (NRR).

Unit V- Special Distribution of Population

Special Distribution of Population – Basic concepts – Measurements and Models of Migrations - Components of Population Growth and Change – Methods of Projection – Logistic Equation – Component Method of Projection.

Books for Study and Reference

1. Techniques of Population Analysisby Barclay G W, John Wiley and Sons, New York(1958).
2. Principles of Demographyby Bogue D J, Wiley, New York(1969).
3. Applied General Statisticsby Croxton F E, Cowden D J and Klein S, Third Edition, Prentice Hall of India Pvt - Ltd(1973).
4. Fundamentals of Statistics, Vol - IIby Goon A M, Gupta MK and Dasgupta B, Ninth Edition, World Press, India(2008).
5. Applied Mathematical Demographyby Keyfitz NandCaswell H, Springer - Verlag, New York(2005).
6. An Introduction to the Study of Populationby Mishra B D, South Asian Publishers Pvt - Ltd, New Delhi(1980).
7. Applied Statisticsby Mukhopadhyay P, Second Edition, Books and Allied (P) Ltd - , India(2011).
8. Fundamentals of Applied Statisticsby Gupta SC and Kapoor VK, Sultan Chand & Sons Pvt–Ltd., New Delhi(2017).

Course code	Course title	C	H	I	E	T
19P2SMC8	Programming in C	3	4	25	75	100

Learning Objectives:

- To enrich the students to have a good foundation and practical knowledge on programming in C.

Learning out comes:

On satisfying the requirement of the is course, students will have the knowledge and skills to

- Write a C program for simple applications of real life using structures and files.
- Implement programs with pointer arrays.
- Design an algorithmic solution for a given problem.

Unit I - Overview of C

Introduction - Importance of C – Basic structure of C programs – Programming style – Executing a C program - Constants, Variables, Data types: Character set - C tokens – Keywords and identifiers – Constants – Variables – Data types – Declaration of variables – Assigning values to variables – Defining symbolic constants.

Unit II - Operators and expressions

Arithmetic operators - Relational and logical operators – Assignment operators – Increment and decrement operators – Conditional operators – Bitwise operators - C expressions – Evaluation of expressions - Hierarchy of operators precedence and order of evaluation – Type conversion in expressions - Managing input and output operators: Reading and writing character – Formatted input and output.

Unit III - Decision making and branching

Simple IF statement – IF ELSE statement – Nesting of IF ELSE statement – ELSE IF ladder – SWITCH statement - ?: operator – GOTO statement - Decision making and looping: WHILE statement – Do statement – FOR statement – Jumps in loop.

Unit IV - Arrays

One-dimentional, two-dimensional and multidimensional arrays - Handling of strings: Declaring and initializing string variables - Reading and writing strings – Arithmetic operations on characters – Comparisons of two strings – String handling functions - User defined functions: Need for user defined functions – Form of C functions – Return values and their types – Calling a function – Category of functions – Nesting of functions – Recursion – Functions with arrays - Scope and life time of variables in functions.

Unit V - Structures

Structures - Array of structures – Structure and functions – Unions - Pointers – Pointer expressions – Pointers and arrays – Pointers and strings – Pointers and functions – Pointers and structures – File management in C: Definitions – Input and output operations on files – Error handling during I/O operations – Random access to files – Command line arguments.

Books for Study and Reference

1. Programming in ANSI Cby Balagurusamy E, Fourth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi(2007).
2. Theory and Problems of Programming with Cby Gottfried B S, Schaum's Outline Series, McGraw - Hill Publishing Company, New York(1997).
3. C - The complete Reference by Schildt H, Fourth Edition, McGraw – Hill Education, New York(2017).
4. Let Us C, Kanetkar Y P, Twelveth Edition, BPB Publications(2017).
5. The C Programming Language by Kernighan BW and Ritchie D M, Second Edition, Prentice Hall(1998).

Course code	Course title	C	H	I	E	T
19P2SMP1	Lab: Practical in C	1	2	50	50	100

S.NO	Programs
1.	Program to solve Quadratic equation.
2.	Program to Prepare Payable calculation.
3.	Program to Calculate Power function.
4.	Program to Perform Text counting.
5.	Program to find Product of two matrices.
6.	Program to find the Binary coefficient.
7.	Program to convert Decimal to Binary Numbers.
8.	Program to Check Palindrome or Not.
9.	Program for Sorting of integers.
10.	Program to calculate the Standard deviation.
11.	Program to Prepare electric bills.
12.	Program for Sorting of strings.
13.	Program to Employee Recursive Procedure.
14.	Program to solve HCF and LCM of two numbers.
15.	Generation of Fibonacci series.

Course code	Course title	C	H	I	E	T
19P2SME2(A)	Data mining	4	5	25	75	100

Learning Objectives:

- To understand various tools of data mining and their techniques to solve the real time problems.
- To describe the designing of data warehousing so that it can be able to solve the root problems.
- To introduce the basic concepts of data warehouse and data mining techniques.
- To develop and apply critical thinking problem solving and decision making skills.

Learning out comes:

- Describe and demonstrate basic data mining algorithms methods, and tools.
- Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.
- Process raw data to make it suitable for various data mining algorithms.
- Analyze large sets of data to gain useful business understanding.

Unit I - Introduction

Datamining- Kinds of data – Datamining Functionalities - Classification of Data mining Systems - Major Issues on Datamining - Introduction to OLAP - OLAP technology for Data Mining - Data warehousing - Data warehousing to Datamining - Optimizing Data for mining - Data preprocessing.

Unit II - Data Mining Primitives

Data mining Querylanguage - Association Rules in large - Data mining - KDD Process - Fuzzy sets and logic - Classification and Prediction**:**Information retrieval - Dimensional Modeling of Data - Pattern Matching - Estimation Error- EM and MLE.

Unit III - Models based on Summarization

Bayes Theorem - Chi squared Statistics Regression - Decision Tree - Neural Networks - Genetic Algorithms - Cluster Analysis– Outlier - Cluster Vs Classification - Clustering Issues - Impact of Outliers on clustering- Clustering problems - Clustering Approaches.

Unit IV - Clustering Algorithms:

Hierarchical algorithm – Single Link- MST Single Link - Complete Link - Average Link- Dendrogram - Partitional Algorithm – MST - Squared Error - K-Means - Nearest Neighbor – PAM – BEA – GA - Categorical algorithm - Large Database.

Unit V - Web Mining:

Introduction - Webdata - Web Knowledge Mining Taxonomy - Web Content mining - Web Usage Mining Research - Ontology based web mining Research - Web mining Applications.

Books for Study and Reference

1. Data Mining Techniques by Berry JA and Linoff GS,Third Edition - John Wiley & Sons(2011).
2. Data mining Methodsby Chattamvelli R, Alpha Science International(2009).
3. Data mining: Introductory and Advanced Topicsby Dunham MH, Pearson Education India(2006).
4. Data mining Concepts, Models and Techniquesby Gorunescu F, Springer (2010).
5. Data mining Concepts and Techniques by Han J and Kamber M, (Seventh Edition) - Morgan Kaufmann Publications(2001).
6. Discovering Knowledge in Data: An Introduction to Data miningby Larose DT, John Wiley & Sons, Canada(2005).
7. Data mining Techniquesby Pujari AK, Universities press(2001).
8. Data mining Concepts, Tasks and Techniquesby Sivanandam SN - and S - Sumathi (2006):, Springer.
9. Data Mining: Theory and Practiceby Soman,KP, Diwakar S and Ajay V, PHI Learning Pvt - Ltd., New Delhi(2006).

Course code	Course title	C	H	I	E	T
19P2SME2(B)	Actuarial statistics	4	5	25	75	100

Learning Objectives:

- To understand the concept of Measures of Mortality.
- To study about the concepts of Management, social security scheme.

Learning out comes:

- Apply the concept of present value and future value in real life problems.
- To understand Insurance and utility theory joint life status, survival status and control risk.

Unit I - Measures of Mortality

Life tables and its relation with survival function – Life table function at non integer age (fractional ages) – Analytical laws of mortality - Gompertz and Makeham's laws of mortality – Select, ultimate and aggregate mortality tables.

Unit II - Abridged life tables

Abridged life tables – construction of abridged life tables – methods by Read and Merrell, Greville's, Kings and JIA method - Insurance and Utility Theory.

Unit III - Annuities

Pure endowments - Annuities – Accumulations – Assurances - Varying annuities and assurances - Continuous annuities - Family income benefits - Models for individual claims and their sums – Multiple life function – Joint life status and last survival status.

Unit IV - Policy Values

Nature of reserve - Prospective and retrospective reserves - Fractional premiums and fractional durations - Modified reserves – Continuous reserves - Surrender values and paid up policies - Industrial assurance - Children's deferred assurances.

Unit V - Contingent Functions

Contingent probabilities - Contingent assurances - Reversionary annuities – Multiple decrement table - Forces of decrement - Construction of multiple decrement tables - Pension Funds: Capital sums on retirement and death - Widow's pensions – Sickness benefits - Benefits dependent on marriage.

Books for Study and Reference

1. Techniques of Population Analysis by Barcley GW, Wiley, New York(1970).
2. Financial and Actuarial Statistics: An Introduction by Borowiak DS and Shapiro AF, CRC Press, London(2013).
3. Compound Interest and Annuities-certain by Donald, DWA, For The Institute of Actuaries and the Faculty of Actuaries at the University Press(1970).

4. Life Contingenciesby Spurgeon ET,Cambridge University Press, Cambridge(2011).
5. Life and other contingenciesby Hooker PF, Longley L H, Cook, Cambridge(1957).
6. Life Contingenciesby Alistair N, Heinemann Professional Publishing, Portsmouth(1977).
7. Introductory Statistics with Applications in General Insurance by Hossack IB, Pollard J H and Zehnwirth, B, Cambridge University Press, Cambridge(1999).

Marks Distribution

- Theory Paper : Internal 25Marks and External 75Marks
- Practical Paper : Internal 50Marks and External 50Marks

Question Paper Pattern (Summative Examination)

Duration: 3 Hours **Maximum Mark: 75**

Part – A (10×1=10 marks)
Answer ALL questions

- Multiple choice questions.
- Two questions from each unit.

Part - B (5×7=35 marks)
Answer ALL questions

- Either or pattern questions.
- Two questions from each unit.

Part –C (3×10=30 marks)
Answer ANY THREE questions

- One question from each unit.