Annexure No.	**19 B**
SCAA Dated	**29.02.2008**

BHARATHIAR UNIVERSITY :: COIMBATORE - 641 046
M. Sc. STATISTICS WITH COMPUTER APPLICATIONS (CBCS)
with Compulsory Diploma in Actuarial Science
(with effect from 2008-09 onwards)
List of Core/Elective/Supportive Subjects to be offered

CORE Subjects

1. Probability and Distributions
2. Sampling Theory and Methods
3. Statistical Quality Control
4. Statistical Inference – I
5. Multivariate Analysis
6. Programming Lab - I
7. Statistical Inference - II
8. Linear Models and Design of Experiments
9. HTML & Web Designing
10. Time Series and Stochastic Processes
11. Application of Statistical Software Packages
12. Programming Lab – II
13. Project & VIVA-VOCE

ELECTIVE Subjects (for students of Statistics)

1. Object Oriented Programming with C++
2. Programming in JAVA
3. Programming in Visual Basic

ELECTIVE Subjects (for students of other departments)

1. Bio-Statistics
2. Probability and Statistics
3. Statistics for Management
4. Operations Research Methods
5. Actuarial Statistics

SUPPORTIVE Subjects (for students of other departments)

1. Descriptive Statistics
2. Data Analysis
3. Statistical Methods for Industries
4. Statistical Methods for Researchers
5. Statistical Methods for Biologists
6. Elements of Operations Research

Diploma Course (PG Diploma in Actuarial Science)

1. Principles of Insurance
2. Financial Mathematics
3. Practice of Life Assurance
4. Insurance Business Environment

CONTINUOUS INTERNAL ASSESSMENT

Theory Papers: Maximum 40%

The sessional Assessments may be in the form of Combination of Periodical tests, Assignments and Seminar. The Assessment Procedure to be followed for each Course shall be approved by the Programme Committee.

BRANCH II - STATISTICS

Course Title: M.Sc. (Statistics with Computer Applications) :: Course Code: (08STAB)

Course Structure and Scheme of Examinations

Semester – I					
Subject Code	**Title of the papers**	**Credit Point**	**Int Mark**	**Ext Mark**	**Total Marks**
08S13A	Probability and Distributions	4	40	60	**100**
08S13B	Sampling Theory and Methods	4	40	60	**100**
08S13C	Statistical Inference – I	4	40	60	**100**
08S1EA (Elective)	Object Oriented Programming with C++	4	40	60	**100**
Supportive	Offered by other Departments	2	20	30	**50**
08S1LA	Diploma: Paper I - Principles of Insurance	4	40	60	**100**
	Total	**18+4**			**550**

Semester – II					
Subject Code	**Title of the papers**	**Credit Point**	**Int Mark**	**Ext Mark**	**Total Marks**
08S23A	Statistical Inference – II	4	40	60	**100**
08S23B	Multivariate Analysis	4	40	60	**100**
08S2EA (Elective)	Programming in JAVA	4	40	60	**100**
08S23P	Programming Lab – I	4	40	60	**100**
Supportive	Offered by other Departments	2	20	30	**50**
08S2LA	Diploma: Paper II - Financial Mathematics	4	40	60	**100**
	Total	**18+4**			**550**

Semester – III					
Subject Code	**Title of the papers**	**Credit Points**	**Int Mark**	**Ext Mark**	**Total Marks**
08S33A	Statistical Quality Control	4	40	60	**100**
08S33B	Linear Models and Design of Experiments	4	40	60	**100**
08S33C	HTML & Web Designing	4	40	60	**100**
08S3EA (Elective)	Programming in Visual Basic	4	40	60	**100**
Supportive	Offered by other Departments	2	20	30	**50**
08S3LA	Diploma: Paper III - Practice of Life Assurance	4	40	60	**100**
	Total	**18+4**			**550**

Semester – IV					
Subject Code	**Title of the papers**	**Credit Points**	**Int Mark**	**Ext Mark**	**Total Marks**
08S43A	Time Series and Stochastic Processes	4	40	60	**100**
08S43B	Application of Statistical Software Packages	4	40	60	**100**
08S43P	Programming Lab – II	4	40	60	**100**
08S4PV	* Project and viva-voce	6			**150**
08S4LA	Diploma: Paper IV- Actuarial Mathematics / Insurance Business Environment	4	40	60	**100**
	Total	**18+4**			**550**

TOTAL MARKS: 2200
Core 1350
Elective 300
Supportive 150
Diploma 400

TOTAL CREDITS: 88
Core 54
Elective 12
Supportive 6
Diploma 16

*Internal Assessment (30%)+Evaluation of Project (40%)+Project viva-voce (30%)
45+ 60+ 45= 150

SEMESTER – I

AIMS:

1. To provide a broad based high quality education with combination of the subjects like Probability, Distributions, Sampling Theory, Statistical Inference, Object oriented Programming with C++ and Principles of Insurance to Post-Graduate Degree level for students who have to demonstrate their ability and potential towards Statistical Theory and Applications.

2. To develop knowledge, understanding and experience of the theory, practice and application of selected areas of statistical computing and to produce graduates needed by public and private sector to help and solve practical problems using the skills and techniques of these areas and to develop analytical skills for Insurance Sector.

3.To develop enterprise competences emphasizing the key skills of learning and communication for Statistical theory.

OBJECTIVES:

1.An understanding of the Statistical principles, techniques and applications of selected areas of Statistics and computing.

2.The ability to evaluate, select, write and use of computer software packages for Statistical theory, which takes into account the needs of the user and constraints towards computing environment.

3.The ability and confidence to analyze and solve problems both of a routine and of obvious nature towards applications of Statistical theory.

4.To gain deeper understanding, problem solving skills and greater knowledge of selected topics in statistical computation.

08S13A **Core - 1**

PROBABILITY AND DISTRIBUTIONS

UNIT-I

Probability Spaces and Distribution in R^n, Expectations and Moments, Basic, Markov, Chebyshev's, Holders, Minkowiski and Jensen's Inequalities. Independence of events and random Variables, Multiplication Property.

UNIT-II

Convergence of random variables, Convergence in Probability, Almost sure in the r^{th} mean and in distribution, their relationships, convergence of moments, Helly-Bray theorem.

Convergence of series of random variables, Kolmogorov's three series theorem, Glivenko-Cantelli theorem.

UNIT-III

Characteristic functions, its properties, Inversion theorem, Continuity theorem and its applications.

UNIT-IV

Kinchine's Weak Law of Large Numbers, Strong Law of Large Numbers. Central Limit Theorem - Statement of CLT, Lindeberg and Levy and Liaponov forms with proof and Lindeberg-Feller's form without proof and examples.

UNIT-V

Review of Sampling Distributions, Non-central t, F and Chi-Square Distributions and their properties. Order Statistics, their distributions and properties.

Books for Study:

1. Rohatgi V.K. (2002) : **Introduction to Mathematical Statistics**, Wiley.
2. Bhat, B. R. (1984) : **Modern Probability Theory – An Introductory Text Book**, Second Edition, Wiley Eastern.

Books for Reference :

1. Feller, W. (1972) : **Introduction to Probability Theory and its Applications**, Vol. II, Second Edition, Wiley Eastern.
2. Rao, C.R. (1973): **Linear Statistical Inference**, Second Edition, Wiley Eastern.
3. Johnson and Kotz (1972): **Distributions in Statistics**, Princeton University Press.

08S13B **Core - 2**

SAMPLING THEORY AND METHODS

UNIT-I

Concept of Sampling Design, Sampling Scheme and Sampling Strategy, Estimator of Population mean in SRS with replacement. Systematic sampling - Variance of Estimated mean, Populations in Random order, population with Linear and Period Trend, Auto-Correlated Populations.

UNIT-II

Des Raj method of Estimation, Murthy's Unordering Principle, Sampling Strategy due to Rao-Hartley and Cochran, Hartley-Ross Estimator, Midzuno Scheme of Sampling, PPS Sampling Procedures.

Cluster Sampling-Single Cluster Sampling-Cluster of Equal and Unequal sizes, Two Stage Cluster Sampling; Mean, Variance, Variance of the Estimated Mean.

UNIT-III

Ratio Estimates-Methods of Estimation, Approximate Variance of Ratio Estimates, Bias of the Ratio Estimates, Conditions under which the Ratio Estimate is Optimum, Unbiased Ratio-Type Estimates.

Regression Estimates-Linear Regression Estimates, Regression estimated when computed from sample, Accuracy of the Variance of Regression Estimates.

UNIT-IV

Double sampling Procedures and repeated surveys, Double Sampling for Stratification and Optimum Allocation, Regression Estimates-Estimated Variance for Stratification and Regression Ratio Estimates-Repeated Samplings-Sampling on two occasions, Sampling on more than two occasions.

UNIT-V

Errors in Surveys-Non Response, types of Non-Response, Call -Backs, a mathematical model of the effects of Call-Backs adjustment for basis without Call-backs, Mathematical Model for Errors of Measurement, Interpenetrating sub sample.

Books for Study:

1. Cochran, W.G.(1972): **Sampling Techniques**, Wiley Eastern Private Limited.
2. Sukhatme, P.V. and Sukhatme, B.V.(1977): **Sampling Theory of Survey with Applications**, Asia publishing House.

Books for Reference:

1. Des Raj (1976): **Sampling Theory**, Tata-Mcgraw Hill.
2. Sampath.S (2000) : **Sampling Theory and Methods**, Narosa publishing company, New Delhi.
3. Murthy, M.N. (1967): **Sampling theory and Methods,** Statistical Publishing Society, Calcutta.

08S13C STATISTICAL INFERENCE – I Core 3

UNIT-I

Estimation and point estimation - Sufficiency – Factorization Theorem – minimal sufficiency, likelihood equivalence – completeness – Uniformly minimum variance unbiased estimator – Rao-Blackwell and Lehmann-Scheffe's theorems.

UNIT-II

Mean-squared error,Fisher's information measure. Cramer-Rao inequality, Bhattacharya inequality, Chapman-Robbins inequality - Fisher's information matrix-simultaneous of parameters in normal(univariate and bivariate) distribution.

UNIT -III

Methods of point estimation-maximum likelihood method(the 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. Asymptotic properties of maximum likelihood estimators. Example of consistent but not asymptotic normal estimators from Pitman family.Information 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 propotion(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:

1. Goon,A.M.,Gupta,M.K.and Dasgupta,B.(1989).An Outline of Statistical Theory-Vol.II.,
2. Kale,B.K.(1999). A First Course on Parametric Inference,Narosa Publishing House, NY
3. Rohatgi,V.K.(1992).An Introduction to Probability Theory and Mathematical Statistics,Wiley Eastern Ltd,New Delhi.

BOOKS FOR REFERENCE:

1. Dudewicz,E.J., and S.N.Mishra(1988).Modern Mathematical statistics, JohnWiley, NY.
2. Lehman,E.L.,and G.Cassella(1998).Theory of point estimation(II Edition),Springer, NY

08S1EA OBJECT ORIENTED PROGRAMMING WITH C++ Elective 1

UNIT-I

Principles of Object – Oriented Programming – Software Evolution Procedure and Object Oriented Paradigm – Basic concepts of Object – Oriented Programming – Benefits of OOP – Object Oriented Languages – Application of OOP - Beginning with C++ - What is C++?. - Application of C++ - C++ statements – Structure of C++ Program – Tokens , Expressions

and Control Structures – Tokens – Identifiers – Basic and User – Defined Data Types – Operators in C++ - Operator Overloading – Operator precedence – Control Structures.

UNIT-II
Functions in C++:- The Main Function – Function Prototyping – Call by Reference – Return by Reference – Inline functions – Function Overloading – Friend and Virtual Functions – Classes and Objects – Introduction – Specifying a Class – Defining Member function – Nesting of Member Function – Private member Functions – Arrays within a Class – Static Data Members- Static Member Function – Array of Objects – Objects as Function Arguments, Friendly Functions – Pointers to Members.

UNIT-III
Constructors and Destructors:– Constructors – Copy Constructor Dynamic Constructor-Constructing Two – Dimensional Arrays – Destructors – Operators Overloading –Type Conversions.

UNIT-IV
Inheritance, Extending Classes:– Defining Derived classes – Single, Multilevel, Multiple, Hierarchical and Hybrid inheritance – Virtual Base Classes – Abstract Classes-Pointers, Virtual Functions and Polymorphism – Pointers to Derived Classes – Virtual Functions.

UNIT-V
Managing Console I/O Operations:–C++ streams – C++ stream Classes – Unformatted I/O Operations - Formatted Console I/O Operations – Managing output with Manipulators-Working with Files:– Classes for File Stream Operations- Opening and Closing a File - File Pointers and their manipulators – sequential I/O Operations. Simple Statistical Problems.

Books for Study and Reference:
1. E.Balagurusamy (1998) : **Object Oriented Programming with C++**. Tata McGraw Hill Publishing Company Limited.
2. K.R.Venugopal, Rajkumar, T.Ravi shankar (1998): **Mastering C++**, Tai.

08S1LA **Diploma - 1**

PRINCIPLES OF INSURANCE

UNIT-I
Concepts of risk, concept of Insurance, Classification of Insurance, Type of Life Insurance, pure and terms, Types of general Insurance, Insurance Act, Five, Marine, Motor, Engineering, Aviation and Agricultural, Alternative Classification, Insurance Property, Pecuniary interest, liability and person, Distribution between Life and General Insurance.

UNIT-II
History of Insurance in General in India, Economic Principles of Insurance, Legal principles of Insurance, The Indian contract Act 1872, Insurable interest, Nomination and assignment, Utmost Good faith, Indemnity, Subrogation, contribution, Proximate cause.

UNIT-III
Representations, Warranties, Conditions

UNIT-IV
Financial Principles, Premium income and outgo investments, Reserves, Surplus, Profit, Valuation of surplus.

UNIT-V
Theory of rating, Actuarial principles, Mortality tables, Physical and Moral Hazard, Risk appraisal, Risk selection, Under writing, Reinsurance, concepts and methods.

Books for Study and Reference:
1. Neill, Aistair, Heinemann (1977): **Life Contingencies.**
2. Gerber, Hans, U (1997): **Life Insurance Mathematics**, Springer, Swiss association of actuaries.
3. Booth, Philip N. et al (1999): **Modern Actuarial Theory and Practice**, Chapman and Hall.
4. Dayken, Chris.D et al (1994): **Practical Risk Theory for Actuaries**, Chapman and Hall.

SEMESTER – II

AIMS:

1. To provide a broad based high quality education with combination of the subjects like Statistical Inference, Multivariate Analysis, Programming in JAVA, Programmng Lab and Financial Mathematics to Post-Graduate Degree level for students who have to demonstrate their ability and potential towards Statistical Theory and Applications.

2. To develop knowledge, understanding and experience of the theory, practice and application of selected areas of statistical computing and to produce graduates needed by public and private sector to help and solve practical problems using the skills and techniques of these areas and to develop analytical skills for Insurance Sector.

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1. An understanding of the Statistical principles, techniques and applications of selected areas of Statistics and computing.

2. The ability to evaluate, select, write and use of computer software packages for Statistical theory which takes into account the needs of the user and constraints towards computing environment.

3. The ability and confidence to analyze and solve problems both of a routine and of obvious nature towards applications of Statistical theory.

4. To gain deeper understanding, problem solving skills and greater knowledge of selected topics in statistical computation.

08S23A STATISTICAL INFERENCE-II Core - 4

UNIT-I

Testing of hypotheses: simple and composite hypothese,two types of errors,level of significance,randomized and non-randomised tests,power and size of a test.Most powerful test-Neyman-Pearson lemma.Monotone likelihood ratio property-uniformly most powerful tests.Applicationsto standand statistical distributions.

UNIT-II

Generalization of Nyman-Pearson fundamental lemma(statement only).Unbiased tests-Construction of uniformly most powerful unbiased tests for one-parameter and multi-parameter exponential families-applications to standard statistical distribution-similar regions.Locally most powerful(LMP)test-LMP unbiased test.

UNIT-III

Invariance-maximal invariant statistic-invariant test. Likelihood ratio(LR)test-asymptotic distribution of LR test statistic-consistency of LR test-Construction of LR tests for standard statistical distributions. Analysis of variance(one-way).Bartlett's test for homogeneity of variances.

UNIT-IV

U statistic and its property as an estimator of its expected value.Tests for goodness of fit-Chi-square and Kolmogorov-Smirvon tests. Test for randomness. Wilcoxon's signed-rank test. Kolmogorov-Smirvon two samplr test. Mann-Whitney U test. Kruskal-Wallis test.

UNIT-V

Introduction to sequential procedures - Stopping times - Wald's equation. SPRT: termination property, approximation to stopping bounds and applications to standards distributions. Statement of Wald's fundamental identity. OC and ASN functions and their plotting

BOOKS FOR STUDY

1. Conover,W.J.(1980).Practical Non-parametric Statistics,(Second Edition),John Wiley and sons,Newyork.
2. Gibbons,J.D. and Chakrabarthi.S(1992) Non-parametric Statistical Inference(Third Edition)
3. Goon,A.M., Gupta,M.K.,Das Gupta.B(1973).An outline of Statistical Theory,Vol.II,The World Press,Calcutta.
4. Kale,B.K.(1999).A First course on parametric Inference,Narosa Publishing House,NewDelhi/
5. Lehmann,E.L.(1986).Testing Statistical hypethese(Second Edition),John Wiley,Newyork.
6. Rohatgi,V.K.(1988).An Introduction to probability Theory and Mathematical Statistics,Wiley Eastern Ltd.,NewDelhi.
7. Wald,A.(1982) Sequential Analysis .John Wiley,Newyork.

08S23B **Core - 5**

MULTIVARIATE ANALYSIS

UNIT-I

Reviews of Multivariate Distributions, Multiple and Partial Correlation and Regression, Multivariate Normal Distribution, Marginal and Conditional Distributions.

UNIT-II

Maximum likelihood Estimators of Parameters, Distribution of Sample Mean Vector, and Sample Dispersion Matrix, James-Stein Estimator for the Mean Vector, Wishart Distribution and its Properties (without derivation), Maximum Correlations and their Null Distributions. Tests based on total, partial and multiple Correlations.

UNIT-III

Tests on Mean Vectors for one and two Multivariate Normal Distributions, Hotelling's T^2 and Mahalanobis D^2 Distributions, Related Confidence Regions. Testing and Illustration using likelihood Ratio Criterion.

UNIT-IV

Principal Component Analysis, Factor Analysis Underlying Models and Illustrations, Identification Problem, Estimation - Maximum likelihood Method, Centroid Method, Principal Factor Analysis, Estimating Factor/Score, Testing goodness of fit, Rotation of Factors.

UNIT-V

Classification Analysis using Discriminant Function Hierarchical Clustering: (a) Agglomerative techniques, Single Linkage Method, Complete Linkage Method, Incremental Sum of Squares Method, Median Method, Group Average Methods, Comparison of Methods, Divisive techniques -Monothetic Methods, Polythetic Methods.

Books for Study:

1. Anderson, T.W. (1980): **An Introduction to Multivariate Statistical Analysis**, Second Edition, Wiley Eastern.
2. M.Jambu and Lebeaux, M.O.(1983): **Cluster Analysis and Data Analysis,** North-Holland Publishing Company.

Books for Reference:

1. Kshirsagar, A.M. (1972): **Multivariate Analysis**, Marcel Decker.
2. Morrison, D.F.(1976): **Multivariate Statistical Methods**, Second Edition, McGraw Hill.
3. Afifi,A.A.and Azen, S.P. (1979): **Statistical Analysis - A Computer Oriented Approach**, Academic Press.

08S2EA **PROGRAMMING IN JAVA** **Elective 2**

UNIT I

Java – data types, variables and arrays – Operators – Control statements – Classes – Methods – Inheritance – Program using these concepts – Package and interfaces.

UNIT – II

Exception handling – Multithreaded programming – Input/Output Basics – Programs using these concepts.

UNIT – III

String handling – Exploring Java language – utility classes – Exploring Java 1.0 programming using land and 1.0 package.

UNIT – IV

Networks – sockets – reserved sockets – proxy server, internet addressing, Java and Net, Inetaddress – TCP/IP client sockets, URL, TCP/IP server and client applet basics – class and architecture – applet skeleton – display methods – handling events – understanding the HTML – APPLET tag – passing parameters to Applets – AudioClip, Applet stub interface – Outputting to the console – simple programming examples.

UNIT –V

Introduction to Abstract Window Toolkit (AWT) – working with Windows, Graphics and Text, AWT controls, Layout managers, menus, images – simple programming examples.

Books for Study:

1. Patrick Naughton and Herbert Schildt, The Complete Reference Java (Osborne series), Tata McGraw Hill Ppublishing Company Limited, New Delhi, 1997
2. Thomas, M.D., Patel, P.R., Hudson, A.D., and Ball, D.A., Java Programming for the Internet – A Guide to Creating Dynamic Interactive Internet Applications, Ventana Communications Group, Inc, 1996.

Books for Reference:

1. ABC of the Internet, Tech Media, BPB Publications, New Delhi.
2. ABC of MS Internet, Tech Media, BPB Publications, New Delhi.

08S23P **Core – 6**

PROGRAMMING LAB – I

The Maximum Mark is 100 with 40 Marks for Internal involving Test and Record work. 60 Marks for End Examination. The candidate should attend 3 questions 20 Marks each with internal choice. Problem relating to the areas listed below covered under Semester I and Semester II. The Core Practical-I examination is to be conducted at the end of the II Semester. The list of topics included for practical are given below,

1. **OBJECT ORIENTED PROGRAMMING WITH C++**

Writing Programs using C++ for the following problems in Statistics

Descriptive Statistics – Correlation and Regression – Matrix operations – Sorting of numbers – String Manipulations – Unbiased estimates of population mean and Variances under Simple

Random Sampling, Stratified Random Sampling, Systematic Sampling – Ratio and Regression estimates – Control limits for various charts in Quality Control – Computation of Probabilities in Basic distributions – Calculation of parametric and non parametric test statistics – computation of Hotellings T^2 and Mahalanobis D^2 Statistics.

2. **PROGRAMMING IN JAVA**

Writing Programs using JAVA for the following problems in Statistics

Matrix operations – Sorting of numbers – String Manipulations – Applet – AWT Controls – Simple programs.

08S2LA **Diploma - 2**

FINANCIAL MATHEMATICS

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.

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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. Bowers, Newton.L. et al (1997): **Actuarial Mathematics**, Society of Actuaries, 2nd Edition.
2. Meculcheon, John, J. Scott William F (1986): **An Introduction to Mathematics of Finance**, London, Heinemanr.
3. Study Material of Actuarial Education company – London (1988) for subject 1 **Fundamentals of Actuarial Mathematics.**

SEMESTER – III

AIMS:

1. To provide a broad based high quality education with combination of the subjects like Statistical Quality Control, Linear Models, Design of Experiments, HTML & Web Designing, Programming in Visual Basic and Practice of Life Assurance to Post-Graduate Degree level for students who have to demonstrate their ability and potential towards Statistical Theory and Applications.

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1. An understanding of the Statistical principles, techniques and applications of selected areas of Statistics and computing.

2. The ability to evaluate, select, write and use of computer software packages for Statistical theory which takes into account the needs of the user and constraints towards computing environment.

3. The ability and confidence to analyze and solve problems both of a routine and of obvious nature towards applications of Statistical theory.

4. To gain deeper understanding, problem solving skills and greater knowledge of selected topics in statistical computation.

08S33A **Core - 7**

STATISTICAL QUALITY CONTROL

UNIT-I

Shewhart Control Charts for X, $\overline{R}$, np, p, c etc., and their uses, OC and ARL of Control Charts, Control Charts based on C.V., Modified Control Charts, CUSUM procedures, use of V-mask, Derivation of ARL.

UNIT-II

Decision Interval Schemes for CUSUM charts. Economic Designs of Control Charts, Pre-control, Relative Precision and Process Capability analysis and Gauge capability analysis, Multivariate Control charts χ^2 and Hotelling T^2.

UNIT-III

Basic Concepts of Acceptance Sampling, Single, Double, Multiple and Sequential Sampling Plans for Attributes, Curtailed and Semi Curtailed Sampling. Dodge-Romig Tables-LTPD and AOQL protection (Single Sampling Plan only). MIL-STD-105D.

UNIT-IV

Variable Sampling: Assumptions, Single and Double Variable Sampling Plans. Application of Normal and Non-central t-Distributions in Variable Sampling. Continuous Sampling Plans:CSP-1, CSP-2 and CSP-3. Special Purpose Plans: Chain Sampling Plans, Skip-lot Plans.

UNIT-V

Concept : Hazard Function and Reliability Function. Exponential, Gamma and Weibull Failure Models.Models for wearout failures. System Reliability-Serial, parallel and mixed systems.

Books for Study:

1. Montgomary,D.C.,(1985):**Introduction to Quality Control** John Wiley.
2. Schilling, E.G.(1982):**Acceptance Sampling in Quality Control**, Marcel Dekker.
3. Burr,I.W., (1976): **Statistical Quality Control Methods**, Marcel Dekker.
4. H.J.Mittag and H.Rinne (1993): Statistical Methods of Quality Assurance, Germany Chapman & Hall India(UK) – Chapter 3 and 4.

Books for Reference:

1. Whetherill,G.B.,(1977): **Sampling Inspection and Quality Control**, Halsted Press, New York.
2. Freeman,H.A., Friedman,M. and Others (1948). **Sampling Inspection Principles-Procedures and Tables for Single, Double and sequential Plans in Acceptance Quality Control**, McGraw Hill.
3. Hald, A. (1981): **Statistical theory of Sampling by Attributes**, Academic Press.
4. Ott,E.R.,(1975):**Process Quality Control**, McGraw Hill.
5. Halpern,S (1979):**An Introduction to Quality Control and Reliability**, Prentice Hall of India.
6. Lawless J.R. (1982) : **Statistical Methods for Lifetime Data**, Johnwiley & Sons.

08S33B **Core - 8**

LINEAR MODELS AND DESIGN OF EXPERIMENTS

UNIT-I

Linear Models and Linear Model Assumptions on Error Components-Fixed/Mixed and Random Component Models-Gauss-Markov set up and its generalization-Linear estimation-Gauss-Markov theorem-BLUE-Test for Linear Hypothesis- Analysis of Covariance-Multiple Comparisons - Multiple Range Tests.

UNIT-II

Review of Basic Designs and Principles of Experimentation CRD-RBD-LSD. Construction of Orthogonal - Analysis of Graeco Latin Squares, Cross Over Designs, Split Plot and Strip Plot Designs.

UNIT-III

Construction and Analysis of Factorial Experiments Symmetrical and Asymmetrical Factorial-2^n, 3^n, S^n and pxp Experiments - Concept and Principle of total, partial and balanced Confounding in Symmetrical Factorial.

UNIT-IV

Concept of Fractional Replication in Symmetrical Factorial 1/2 and 1/4 in replicate of 2^n, 1/s replicate of S^n Construction and Analysis. Concept of Orthogonal Arrays.

Response Surface experiments - first and second order Rotatable Designs and their Construction.

UNIT-V

Analysis of Block Designs, C-matrix and its properties, Concept of Connectedness and Orthogonality Simple and Balanced Lattice Designs-Balanced Incomplete Block Designs-Youden Square Design, Partially Balanced Incomplete Block Designs and its Classification, Group Divisible Designs.

Books for Study:

1. Montgomory, D.C. (1976): **Design and Analysis of Experiments**, John Wiley and Sons.
2. Graybill, F.A. (1968): **An Introduction to Linear Statistical Models**, McGraw Hill.
3. Aloke Dey (1986): **Theory of Block Designs**, Wiley Eastern.

Books for Reference:

1. Fisher, R.A. (1947): **The Design of Experiment**, Fourth Edition, Oliver and Boyd.
2. Federar, W.T. (1963): **Experimental Design Theory and application**, Mcmillian and Co., New York Oxford IBM.
3. Kempthorne, O (1965): **Design and Analysis**
4. Cochran, W.G. and Cox,G.M.: **Experimental Designs**, John Wiley.
5. Nigam,A.K., Puri, P.D and Gupta,V.K. (1988): **Character- isations and Analysis of Block Design**, Wiley Eastern.
6. Kshirsagar,A.M: **A Course in Linear Models** - Marcel Dekkar.

08S33C HTML & WEB DESIGNING Core - 9

UNIT-I

Understanding HTML and Design Basics: What is HTML – What is Dynamic HTML - The Ins and Outs of Tags – Understanding URLs – Using Graphics.

Beginning to Build the Basic Web site : Laying the Groundwork for Text – Beginning the Body of Web site – Working with Text – Coloring with RGB - Creating Lists.

UNIT –II

Designing the Intermediate Web site : Laying out the Pages – Creating Tables – Using Frames – Creating more effective Tables – Learning about Frames – Making further use of Frames – Creating Client-side Image Maps – Creating forms.

UNIT – III

Designing the Advanced web site : Designing the Pages – Designing the Style sheet – Defining the Construction tasks – Finishing the Opening Page – Adding the Scripts for the Book Page – Using Java Applet – Writing and using the CSS.

UNIT – IV

Web site Design Principles: Design for the medium – Design the whole site – Design for the User - Design for the Screen. Planning the site: Create a site specification – Identify the content Goal - Analyze the Audience – Build a Web site Development Team – Filenames and URLs – Directory Structure – Diagram the site.

UNIT - V

Publishing and Maintaining the Web site: Publishing the Web site – Testing the Web site – Refining and Updating the Content – Attracting Notice to the Web site – Case Study.

Books for Study:

1. "Hands on HTML", Greg Robertson & Tim Altom, BPB Publications, 1999.
2. "Principles of Web Design", Joel Sklar, Thomson Course Technology, 2007.

08S3EA PROGRAMMING IN VISUAL BASIC Elective 3

UNIT - I

Fundamentals of VB, Anatomy of VB program – The code window – statements in VB – Assignment and property settings – variables – strings – numbers – constants – repeating operations – making decisions.

UNIT - II

Working with objects at a time – projects with multiple forms – displaying information – the printer object – advanced programming technique – arrays pointer – built in functions – user defined functions and procedures.

UNIT - III

Objects – manipulations of objects in VB – collections – creating an object in VB – Building - files – sequential files – random access files – binary files – sharing files.

UNIT - IV

Communicating with other windows application: clipboard activity windows applications – Dynamic data exchange and OLE 2.

UNIT - V

Database features: Modern database – data manager – use of data control – programming with data control – monitoring change to the data base – SQL basics objects.

Books for Study:

1. Programming in VB, Tech Media, BPB Publications, New Delhi.
2. VB4: Nuts and Bolts for Experienced Programmers .

Books for Reference:

1. VB5, Steve Brown, BPB Publications.
2. VB5, Interactive Course Tech Media, Waite Group
3. VB5,6 Series, Tech Media, Waite Group.

08S3LA **Diploma - 3**

PRACTICE OF LIFE ASSURANCE

UNIT-I

Life insurance organization, The Indian context, The Distribution system, function of appointment and continuance of agency, remuneration of agents, trends in life insurance distribution channels.

UNIT-II

Plans of Life insurance, need levels, term life increasing, decreasing term policy, whole life insurance endowment insurance, money back endowment plan, marriage endowment plan, education annuity plan, children deferred assurance plans annuities.

UNIT-III

Group insurance, nature of group insurance types of group insurance, gratuity liability, group superannuating scheme, other group schemes, social security schemes, other special need plan, industrial life insurance salary saving scheme, disability plans.

UNIT-IV

Application and acceptance, prospectus, proposal forms and other related documents, age proof, special reports, policy documents, need and format, preamble operative conditions clauses, proviso, schedule, attestation conditions and privileges, alteration duplicate policy, premium, premium calculation, days of grace, non-forfeiture options, lapse and revival schemes.

UNIT-V

Assignment nomination loans, surrenders, foreclosures, Married women's property act policy, calculations, policy claims, maturity claims, survival benefit payments, death claims, waiver of evidence of title, early claims, claim concession, presumption of death accident benefit and disability benefit settlements options valuations and bonus, distribution of surplus, Types of reinsurance, exchange control regulations payment of premia payment claims etc., assignment in favor of non-residents deposit export of polices

Books for Study and Reference:

1. Booth, Philip, M et. al. (1999): **Modern Actuarial Theory and Practice**, Chapman Hall
2. Panjer, Harry H et. al. (1998): **Financial Economics with Applications to Investments Insurance and Pensions**, The Actuarial Foundations

SEMESTER – IV

AIMS:

1. To provide a broad based high quality education with combination of the subjects like Time Series, Stochastic Process, Application of Statistical Software Packages, Programming Lab, Project-Viva voce and Insurance Business Environment to Post-Graduate Degree level for students who have to demonstrate their ability and potential towards Statistical Theory and Applications.

2. To develop knowledge, understanding and experience of the theory, practice and application of selected areas of statistical computing and to produce graduates needed by public and private sector to help and solve practical problems using the skills and techniques of these areas and to develop analytical skills for Insurance Sector.

3. To develop enterprise competences emphasizing the key skills of learning and communication for Statistical theory.

OBJECTIVES:

1. An understanding of the Statistical principles, techniques and applications of selected areas of Statistics and computing.

2. The ability to evaluate, select, write and use of computer software packages for Statistical theory which takes into account the needs of the user and constraints towards computing environment.

3. The ability and confidence to analyze and solve problems both of a routine and of obvious nature towards applications of Statistical theory.

4. To gain deeper understanding, problem solving skills and greater knowledge of selected topics in statistical computation.

08S43A **Core - 10**

TIME SERIES AND STOCHASTIC PROCESSES

UNIT-I

Introduction to Stochastic Process, Classification of Stochastic Process. Countable State Markov Chain. Chapman-Kolmogorov's Equations, Calculation of n-step Transition Probability and its limit. Stationary Distribution, Classification of States, Transient Markov chain, Random Walk and Gambler's Ruin Problem.

UNIT-II

Continuous Time Markov Process: Kolmogorov Differential Equations, Poisson Process, Birth and Death Process, Applications to queues and Storage problems.

UNIT-III

Discrete Parameter Stochastic Process/time series. Auto- Covariance and Auto-correlation and their properties.

UNIT-IV

Detailed study of the stationary process like (a) Moving Average, (b) Autoregressive, (c) Autoregressive moving average. (d)Autoregressive Integrated Moving Average, Box Jenkins Models, Brief discussion of Estimation and Related Large Sample theory of the mean.

UNIT-V

Choice of AR and MA terms. Brief discussion of techniques of the ARIMA model parameters and forecasting. Study of Residuals and Diagnostic Checking.

Books for Study:

1. Karlin,S. and Taylor,H.M. (1975): **A First Course in Stochastic Process**, vol.I, Academic Press.
2. Medhi, J. (1982): **Stochastic Process**, Wiley Eastern.
3. Fuller, W.A. (1976): **Introduction to Statistical Time Series**, John Wiley, NY.

Books for Reference:

1. Granger, C.W.J. and Newbold, (1984): **Forecasting Econometric Time Series**, Third Edition, Academic.
2. Box, G.E.P., and Jenkins, G.M., (1976): **Time series Analysis- Forecasting and Control**. Holden-Day San Francisco.
3. Anderson, T.W., (1971): **The Statistical Analysis of time Series**, Wiley, NY.
4. Kendall, M.G., and stuart,A.(1966): **The advanced Theory of Statistics**, Vol.3, charles Griffin, London.
5. Adke, S.R. and Manjunath, S.A. (1984): **An Introduction to Finite Markov Processes**, Wiley Eastern.
6. Parzen, E. (1962): **Stochastic Processes**, Holland-Day.

08S43B **Core – 11**

APPLICATION OF STATISTICAL SOFTWARE PACKAGES

UNIT-I

Introduction to Excel – Various Distributions - Descriptive Statistics - Data analysis tools – ANOVA – Covariance - Regression – Correlation – Non parametric tests — Time series analysis - Using Macros

UNIT-II

Introduction to SPSS 10.0 Icons - Opening files - File extension - Working with Data - Summarizing Data and Printing - Hypothesis Testing - Descriptive statistics for qualitative and quantitative data – Graphs and Charts - Regression and Correlation Analysis - Simple Correlation – scatter diagram, Simple Regression – scatter diagram, Simple Regression – Estimation and Interpretation of results, Multiple Regression Scatter plot Matrix - Multiple Regression - Estimation and Testing of Hypothesis - Time Series Analysis and Forecasting – Linear Trend – Non – Linear Trend – Seasonality –Forecasting with Linear Trend and regression Models - Index Numbers.

UNIT-III

Introduction to MINITAB 14.2 – Preliminary data analysis – Descriptive statistics – Probability theory – Inferential Statistics for single through multiple samples.

UNIT-IV

Introduction to STATISTICA 7- Basic Statistical Analysis Methods – ANOVA – Nonparametric – Distribution Fitting – Multiple Regression – General Linear / Nonlinear models – General Regression Models – Time Series and Forecasting models – Cluster, Factor, Principal Component and Discriminant Analysis – Quality Control Charts – Experimental Design (DOE) – Process Analysis

UNIT-V

Case studies – Problem Solving and Applications of SPSS, Statistical Process Control, MINITAB, STATISTICA and MS Excel

Websites:

www.spss.com\Help
www.stata.com
www.spss.org

Help manuals of SPSS version 10
Manual of MINITAB
Books for Study and Reference:

1. **SPSS for Windows Step by Step: A simple Guide and Reference**, 10.0 update (3rd edition) by Darren George and Paul Mallery
2. **An Introductory Guide to SPSS for Windows** by Eric L. Einpruch
3. Borovikov, I.P. and Borovikov, V.P. **STATISTICA: Data Preparation and Analysis**. Moscow: Filini, (1998)
4. Borovikov, V.P. **A Quick Introduction to STATISTICA**. Moscow: Computer, (1998)
5. **The Complete Idiot's Guide to Microsoft Excel (**2000) By Sherry Kinkoph
6. **How to Do Everything with Microsoft Office Excel** (2003) By Guy Hart - Davis

08S43P **Core - 12**

PROGRAMMING LAB – II

The Maximum Mark is 100 with 40 Marks for Internal involving Test and Record work. 60 Marks for End Examination. The candidate should attend 3 questions 20 Marks each with Internal choice. Problem relating to the areas listed below covered under Semester III and Semester IV. The Core Practical II examination is to be conducted at the end of the IV Semester. The list of topics included for practical are given below,

1. **Programming in VISUAL BASIC**

Event Procedure (Keyboard, Mouse) – Text Manipulations with various controls – Application using Scroll bars – Designing Calculator performing simple arithmetic functions – Creation of Menu – Application of Arrays and Control Arrays – Applications on Flex Grid Control, Timer Control, Data Control using MS-Access Database , Shape controls – Construction of ANOVA table for Simple designs (CRD, RBD, LSD) – Curve fittings (Linear and Non-Linear).

2. **HTML and Web Designing**

Web Page with Text manipulations – Web page with Table creations – Web page with Frame tag – Web page using CSS – Web page using Script

08S4PV **Core - 13**

PROJECT WORK

Project work shall be carried out under the supervisor of a Faculty member on the recommendation of the Head of the Department. **Three copies** of the Project report should be submitted atleast two weeks before the last working day of the fourth semester. The Project work with components are:

Internal Assessments : 30%

Evaluation of Project report by External Examiner and Guide : 40 %

Supervisor and External Examiner by Viva-Voce : 30 %

The Evaluation of the Project will be based on Project Report and a VIVA-VOCE examination to be conducted by the Supervisor and an External Examiner.

08S4LA **Diploma - 4**

INSURANCE BUSINESS ENVIRONMENT

UNIT I

Laws to the regulation of Insurance business in India. The Insurance Act 1938, The IRDA ACT 1999, LIC of India ACT 1956 and General Insurance Business ACT 1972. Motor vehicles ACT 1939, Public Liability Insurance ACT 1991, Marine Insurance ACT 1963, Carriage of goods ACT 1925 etc, including consumer protection ACT 1986.

UNIT II

The economic environment vis-à-vis national Income, Various five year plans, Effect of inflation, recession, fiscal policy, VAT, Information Technology, Indian Agricultural sector, Natural resources, Railways

UNIT III

Social and political environment, constitution of India, social milien, Population education, Health, Industrial environment in the socialistic pattern, economic reforms in India, globalization, Role of public sector, automobile, aviation, pharma, Biotech, International trade, WTO.

UNIT IV

The commercial environment & Financial environment, partnership, Cooperative organizations, companies ACT 1956, Money, Monetary policy, financial institutions, Narasimham committee, Mutual funds, stock exchanges

UNIT V

Office organization, methods of filing, business correspondence, structure of business letters, controls, insurance business ABROAD, pensions.

REFERENCES:

1. Insurance Business Environment, S.Balachandran, published by Insurance Institute of India, Mumbai.
2. Principles of Life Insurance, S.Balachandran published by Insurance Institute of India, Mumbai.
3. Principles of General Insurance by Insurance Institute of India, Mumbai.

List of Elective & Supportive Papers offered for Other Department Students

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Details of the Subjects offered and Scheme of Examinations

Elective Papers					
Subject Code	**Title of the papers**	**Credit Point**	**Internal**	**End Exam**	**Total Marks**
01STAGE13	Bio-Statistics	4	40	60	**100**
01STAGE14	Probability and Statistics	4	40	60	**100**
01STAGE15	Statistics for Management	4	40	60	**100**
01STAGE16	Operations Research Methods	4	40	60	**100**
06STAGE24	Actuarial Statistics	4	40	60	**100**

Supportive Papers					
Subject Code	**Title of the papers**	**Credit Point**	**Internal**	**End Exam**	**Total Marks**
01STAGS17	Descriptive Statistics	2	20	30	**50**
01STAGS18	Data Analysis	2	20	30	**50**
01STAGS19	Statistical Methods for Industries	2	20	30	**50**
01STAGS20	Statistical Methods for Researchers	2	20	30	**50**
06STAGS21	Statistical Methods for Biologists	2	20	30	**50**
06STAGS22	Elements of Operations Research	2	20	30	**50**

01STAGE13 **Elective–I**

BIO-STATISTICS

UNIT-I

Nature of biological and Clinical experiments and data - Classification of data -Need and nature of tabulation - Charts and Diagrams for data - Bar diagrams, pie diagrams, pictograms, histograms-frequency curves and their use.

UNIT-II

Measures of Central tendency - Mean, Median, Mode, Geometric mean, Use of these averages in biological Studies.

Measures of deviation and Standard deviation – Co-efficient of variation -Measure of Skewness and Kurtosis.

UNIT-III

Correlation and regression theory - Correlation coefficient - rank correlation -Regression equations (only problems) - Multiple and Partial correlation and regression.

Basic concepts of sampling - Simple random sample - Stratified sample -Systematic samples.

UNIT-IV

Test of significance based on large sample test: for mean - Variance and proportions-test for means, Variance and attributes using t, F and Chi-Square distribution. Test for correlation regression coefficients, Chi-Square test for goodness of fit.

UNIT-V

Analysis of variance: One way and two way Classifications - Completely Randomized blocks - Randomized Block Design and Latin Square Design (Simple problems based on biological and biochemical data).

Books for Study and Reference:

1. Sundar Ra0, Jesudian, Richard - **An Introduction to Biostatistics**, Wiley**.**
2. Alvi E-Lewis-**Biostatistics**-Eastwest Press.
3. Daniel. Wayne : **Bio-Statistics**, Wiley.
4. Campell-**Statistical for Biologist,** Wiley.
5. Zar.S **Bio-Statistics**, Prentice Hall India.

01STAGE14 **Elective-II**

PROBABILITY AND STATISTICS

UNIT-I

Sample spaces – events – Probability axioms – Conditional Probability – Independent events – Baye's formula- Random Variables - Distribution functions – Marginal distributions, Conditional distribution – Stochastic Independence. Expectation – Conditional expectation and Conditional Variance. Moment generating functions – Cumulant generating functions.

UNIT-II

Probabilty distributions – Binomial,Poisson,geometric, Uniform, exponential, normal, gamma, beta (generating function, Mean, variance & Simple problems).

Correlation – Regression – Multiple & Partial Correlation & regression(Only Problems).
Probability density function & Properties to t,f, Chi-square distributions.

UNIT-III
Test for means, Variances & attributes using the above distributions large sample tests – tests for means, Variances & Proportions.
Analysis of Variance: One way and two way classifications – Complete Randomized blocks – Randomized Block Design and Latin Square Design (Only Problems).

UNIT-IV
Estimation: Point estimation – Characteristics of estimation – Interval estimation – Interval estimates of Mean, Standard deviation, proportion, difference in Means & ratios of Standard deviations.
Time series analysis: Trend & Seasonal variations – Box – Components of time Series – Measurement of trend – linear & Second degree Parabola.

UNIT-V
Statistical quality control – Statistical basis for control charts – Control limits – Control Charts for variables – X,R Charts, Charts for defective – P, nP Charts – charts for defects – C Charts..

Books for Study:
1. K.S.Trived, (1982): **Probability & Statistics with reliability, queueing & Computer applications**, Prentice Hall.
2. S.C.Gupta & V.Kapoor, (1977) : **Fundamentals of Mathematical Statistics**, Sultan Chand & Sons.

Books for Reference:
1. Montogomery.DC, and Johnson.A, (1976): **Forecasting & time Series analysis**, McGraw Hill.
2. Dajeh Bester field, (1986): **Quality Control**, Prentice Hall.

01STAGE15 **Elective-III**

STATISTICS FOR MANAGEMENT

UNIT-I
Nature of quantitative analysis in Management, purpose of Statistics, Measurements, attributes, Units, Variables, discrete and Continuous.

Need and nature of tabulation-Charts and diagrams for data-Bar diagrams, pie diagrams, pictograms-frequency curves.

UNIT-II
Measure of Central tendency-Mean, Median, Mode-Measure of dispersion - Quartile deviation, Mean deviation and Standard deviation-Coefficient of variation-Measureof Skewness and Kurtosis.

UNIT-III
Concepts of events-probability of events-joint, conditional, Marginal probabilities-Probabaility distribution of a Random variable-Expected value and variance.

UNIT-IV

Theoretical probability distribution-Binomial, Normal and students t distributions.

UNIT-V

Estimation-population and sample-population parameters-Central Limit and theorem-point estimate and interval estimates of population mean and population proportion.

Concept and Construction of Index numbers. Understanding Index numbers applicable in the context of economics, business and Management.

Books for Study and Reference:

1. Richard Levin, **Statistics for Management**. Prentice Hall.
2. Paul Marton, **Applied Business Statistics**, Holt and Reinlast.
3. Good and Hatt, **Research Methods on Social Science**.

01STAGE16 **Elective-IV**

OPERATIONS RESEARCH METHODS

UNIT-I

Linear Programming-Graphical Method for two-dimensional problems-General Problem of Linear programming-Various definitions-Statements of basic theorems & properties. Phase I and Phase II of the Simplex Method-Sensitivity analysis-transportation Problem and its Solution. Assignment Problem and its Solution Duality and Shadow Price.

UNIT-II

Queueing theory: Characteristics of queueing Systems-Steady State M/M/1, M/M/C and M/M/K queueing Models.

Replacement theory: Replacement of items that deteriorate–Replacement of items that fail – Group replacement.

UNIT-III

Inventory theory: Costs involved in inventory Problems-Single item deterministic Model-Economic lot size Models without shortages & with shortages having production rate infinite & finite.

UNIT-IV

Decision Making:Decision under certainty, uncertainty & under risk. Decision trees-expected value of Project information & imperfect information.

UNIT-V

PERT & CPM: Arrow networks-time estimates-earliest expected time, latest allowable occurrence- critical path- probability of meeting scheduled time of completeness of projects-calculations on CPM networks, various floats for structures- external path-updating project-operation time cost trade of curve.

Books for Study and Reference:

1. Kanti Swarup, Gupta P.K.,and Man Mohan.(1977): **Operations Research**, Sultan Chand and Sons.
2. Taha, H.A (1982): **Operations Research**, Third Edition, Collier- McMillan.
3. Ackoff,R.L. and Sasieni,M.W (1968):**Fundamentals of Operations Research**,John Wiley.

06STAGE24 **Elective-V**

ACTUARIAL STATISTICS

UNIT-I

Elements of Compound Interest (nominal and effective rates of interests). Annuities certain, Present values, accumulated amounts, deferred annuities – Simple problems.

UNIT-II

Redemption of loans, Sinking funds, The Average yield on the life fund of an insurance office. Simple Problems.

UNIT-III

The mortality table – construction, characteristics and uses of mortality table . The features of Indian assured lives, Orientals 1925-1935 mortality tables. The LIC (1961-64) table and the LIC(1970-7 table – Simple Problems

UNIT-IV

Premiums, general principles, natural premiums, level premiums, office premiums, loading for expenses. With profit and without profit premiums, adequacy of premiums relative consistency.

UNIT-V

Life office valuation, General principles, Policy values, Retrospective and prospective methods of valuation of liabilities. (net premium, gross premium and bounds reserve) Sources of surplus principle method of surplus.

Books for Study :

1.Federation of Insurance Institutes study courses : **Mathematical Basic of the Life Assurance F.I.2.1**

Books for Reference:

1. Donald D.W. : **Compound interest and annuities**
2. Neil. A : **Life Contingencies**
3. Gupta S.P.CH. : **Fundamentals of Applied Statistics**

01STAGS17 **Supportive-I**

DESCRIPTIVE STATISTICS

UNIT-I

Origin-Scope-Functions, limitations, uses and Misuses of statistics. Classification and Tabulation of data, Diagrammatic and graphic representation of data.

UNIT-II

Measure of Central tendency–Measures of Dispersion-relative measures of dispersion-Skewness and Kurtosis-Lorenz's curve.

UNIT-III

Elementary Probability space-Statistical probability Axiomatic approach to probability-Finitely additive and countable additive probability functions-Addition and multiplication theorems-Conditional probability-Bayes theorem-Simple problems.

UNIT-IV

Random variables-Discrete and continuous random variables-Distribution function and probability density function of a random variable-Expectation of a random variable-Addition and product theorems- Evaluation of standard measures of location, dispersion, Skewness and Kurtosis.

UNIT-V

Simple linear correlation and regression-Regression equations-their properties spearman's Rank correlation Co-efficient.

Books for Study:

1. Goel & Sharma : **Mathematical Statistics**.
2. S.P.Gupta (1969): **Statistical Method**, Sultan Chand and Sons.
3. S.C.Gupta & V.K.Kapoor (1977): **Fundamentals of Mathematical Statistics**, Sultan Chand and Sons.

Books for Reference:

1. A.M.Goon, Gupta & Das Gupta: **Fundamentals of Statistics**, Vol.1 World press Ltd, Calcutta.
2. Rohatgi, V.K.: **An introduction to Probability Theory and Mathematical Statistics**, Wiley Eastern Ltd., New Delhi.

01STAGS18 **Supportive-II**

DATA ANALYSIS

UNIT-I

Sampling procedure - determination of Sample size and selection of sample formation of questionnaire- Structured and unstructured questionnaire. Field work- Execution of survey-data collection, Scaling techniques -Guttman scale-Likert 5 points scale.

UNIT-II

Summarizing data- tabulation- averages- Dispersions- measurement of risk- relative measures of dispersion-efficiency and consistency- comparison of two or more populations-large samples test, small sample test - ANOVA - Application of Statistical packages.

UNIT-III

Association of attributes: Chisquare test- correlation-rank difference correlation/biserial correlation, point biserial correlation. Significance of correlation, rank correlation and biserial correlation coefficient, partial and multiple correlations. Significance of multiple regression equation-significance of bo, b_1.. b_n the liner regression coefficient- application of statistical packages.

UNIT-IV

Non-parametric tests: Tests for randomness, Run test, Sign test, and Mann Whitney U test. Wilcoxzon signed rank test. Median test- Statistical packages

UNIT-V

Curve fitting - Curves of type

Y=a+bx+cx2 Y= abx

Y =a+bx+cx Y=a.ebx

Time series -estimates of trend and seasonal variation -forecasting -statistical packages.

Books for Study and Reference :

1. Siegel, sand Castellan, NJ (1988): **Non-Parametric Statistics for Behavioral Science** McGraw Hill Book Co, New York
2. Srivastava UK, Shenoy GC and Sharma SC (1989): **Quantitative Techniques Managerial Decision** Wiley Eastern ,New Delhi.
3. VK Kapoor and SC Gupta, (1986): **Fundamentals of Mathematical Statistics**, Sultan Chand and sons, New Delhi
4. Garrett H.E, (1973): **Statistics in Psychology and Education**. Vakils, Feffer and Simons Pvt. Ltd.
5. Hoel P.G. (1957): **Introduction to Statistics**, Asia Publishing Housing Pvt Ltd, New Delhi
6. Kothari CR (1984): **Quantitative Techniques**, vikas Publishing House Pvt Ltd, New Delhi
7. Kothari CR (1990): **Research Methodology**, Wiley Eastern Ltd, New Delhi

01STAGS19 **Supportive - III**

STATISTICAL METHODS FOR INDUSTRIES

UNIT-I

Historical development of Statistical Quality Control - Meaning of Quality - improvement - Quality cost - Total Quality Management - causes of variations - X, R, P and C charts.

UNIT-II

Acceptance sampling plans by Attributes - Single Sampling Plan - Double Sampling Plan - OC curves - AOQ, ATI curves, Dodge Roaming AOQL and LTPD plans, MIL - STD 105D plans.

UNIT-III

Variable Sampling Plan - One sided and Two sided specifications - Taguchi philosophy and contributions to Quality Improvement (Basic concepts only)

UNIT-IV

Test of significance and design of experiments: Tests based on t, F and chi-square distributions - Analysis of variance - One way and Two way classification Complete Randomized Design(CRD), Randomized Block Design(RBD) , Latin Square Design(LSD).

UNIT-V

Basic of reliability theory - Life time distribution - Hazard rate- Survival function- Exponential, Weibull, Gamma and life time distributions

Books for Study and Reference:

1. Montgomery, DC (1991) **Introduction of Statistical Quality Control**, John Wiley and Sons.
2. Sivazlian and Stanfel (1975), **Analysis of Systems in Operations Research**, Prentice Hall

01STAGS20 **Supportive - IV**

STATISTICAL METHODS FOR RESEARCHERS

UNIT-I

Definition of Statistics and its applications in various disciplines - Collection of Data - Classification, Tabulation and graphical representation of data- Construction of univariate and Bivariate frequency distribution-measures of central tendency-measures of dispersion - coefficient of variation.

UNIT-II

Random experiment-sample space-events-mathematical and statistical definition of probability-conditional probability-Baye's theorem-random variable-distribution function-moments- Binomial distribution-Poisson distribution-normal distribution and their properties

UNIT-III

Scatter diagram-Karl Pearson's coefficient of correlation - concurrent deviation method-coefficient of determination-Spearman's Rank correlation-Linear regression-regression lines.

UNIT-IV

Tests of significance-types of hypotheses-two types of errors-critical region-level of significance, small sample tests based on t, F distribution, Chi-square test of goodness of fit, contingency table-test of independence of factors-Large sample tests.

UNIT-V

Test of equality of several populations means, one way and two way analysis of variance. Non-parametric tests-sign, Run and Median tests-two sample rank test-sampling and its uses, sampling methods- unrestricted Random sampling (SRS)- Restricted Sampling (Stratified and Systematic).

Books for Study and Reference:

1. Agarwal (1980): **Basic Statistics**, Wiley Eastern
2. Sokal P.R. and Rohlf F.J. (1969): **Bio Statistics**, W.H. Freedom & Co, San Francisco
3. Snedecor G.W. and Cochran W.G. (1967): **Statistical Methods**, Oxford-IBH, Pvt Co.
4. Zar,J.H.(1984): **Bio Statistical Analysis**, Prentice Hall,Inc, London.

06STAGS21 **Supportive - V**

STATISTICAL METHODS FOR BIOLOGISTS

UNIT-I

Nature of Biological and Clinical experiments of data-Classification and tabulation of data-Diagrammatic representation of data- Histogram and frequency curves

UNIT-II

Measures of Central tendency-Mean, Median, Mode, Geometric mean, Harmonic Mean-Measures of deviation – Range, Mean deviation, Quartile and standard deviation – Measures of Skewness and Kurtosis.

UNIT-III

Correlation : Rank Correlation – Multiple and Partial Correlation – Regression – Regression equations for biological problems.

UNIT-IV

Basic concepts of sampling – Simple random sample – Stratified sample – systematic sample – cluster sample. Test of significance based on large sample – Mean, Variance and Proportions.

UNIT-V

Analysis of variance –One way and Two way classifications – Completely Randomized blocks – Randomized Block design and Latin Square Design (Simple problems based on biological data)

Books for Study and Reference:

1. Alvi E-Lewis-**Biostatistics** – East west Press
2.Campell - **Statistical for Biologist**, Wiley
3.J.N.Kapur and H.C.Saxena – **Mathematical Statistics**
4.Marcello Pagano and Kimberlee Gauvrean – **Principles of Bio- Statistics.**

01STAGS22 **Supportive - VI**

ELEMENTS OF OPERATIONS RESEARCH

UNIT-I

Linear Programming Problem – Graphical Method – General Problem of Linear Programming – Simplex Method – Phase I and Phase II Problems – Transportation and Assignment Problems.

UNIT-II

Replacement theory : Replacement of Items that deteriorate – Replacement of items that fail completely – Individual and group replacement policy.

UNIT-III

Sequencing Theory – Processing ‘n’ jobs through 2 machines – Processing ‘n’ jobs through 3 machines – Processing ‘n’ jobs through ‘m’ machines.

UNIT-IV

Network Theory – Introduction to Network – Determination and flow for Critical Path Method – Project Evaluation Review Techniques and its differences.

UNIT-V

Inventory Theory – Meaning of Inventory – Factors involved in Inventory – Economic Models with and without shortages.

Book for Study and Reference:

1.Kanti Swarup, Gupta P.K. and Man Mohan (1977) – **Operations Research**, Sultan Chand and Sons
2. Taha, H.A. (1982) : **Operations Research, Mc.Millan**