B.Sc. ACTUARIAL AND FINANCIAL MATHEMATICS

Course Title : Statistics   *Semester-IV*
Course Code : STA251C
Credit hrs. : 5

Course Objective: The students will get overview of basic statistical concept and measurements. The students will be able to manage quantitative and quantitative data materials and also will be able to calculate the descriptive statistics from real data sets, its presentation and interpretation.

Unit I. Statistics a conceptual frame work, Statistical enquiry, collection of data, Classification, Seriation and tabulation of data. Diagrammatic and Graphic presentation of data. Measures of central tendency: mean, median, mode. Measures of dispersion-range, mean deviation, quartile deviation Standard deviation and variance. Measure of skewness- Karl-Pearson's and Bowley's methods. Measures of Kurtosis.

Unit II. Correlation Analysis - conceptual frame work .Methods of studying correlation-Scatter diagram, Karl Pearson's correlation coefficient, Spearman's rank correlation coefficient and concurrent deviation methods. Probable error (ungrouped data), coefficient of determination.
Regression Analysis - definition and uses, Linear and Non-linear regression. Regression equations and regression coefficient, Properties of regression coefficient, multiple regression

Unit III: Population and sample; population parameter and sample statistics; Sampling distributions, Sampling distribution of mean, Variance and proportions. Principles of sampling; probability and non-probability sampling, Simple random sampling, Stratified sampling, Systematic sampling, Cluster sampling and Multi stage sampling. Criteria of unbiasedness, consistency, efficiency and sufficiency, Cramer-Rao Inequality, minimum variance unbiased (MVU) estimation

Unit IV: Hypothesis testing, general procedure and errors in hypothesis testing, hypothesis testing for population parameters with large and small samples, Hypothesis testing based on F-distribution and t-distribution. Chi-Square test for goodness of fit, chi-square test for population variances, chi-square test for association.

Unit V: Analysis of variance, assumptions for ANOVA test, ANOVA for one-way and two-way classified data. Non-parametric inference, advantages of non-parametric methods over parametric methods, one-sample problem, Sign Test, Wilcoxon-Signed rank test, Kolmogrove Smirnov test, General Two Sample Problem: Wilcoxon-Mann- Whitney Test, Kolmogrov-Smirnov two sample test (for samples of equal size), median test.

Textbook: An Introduction to probability Theory and Mathematical Statistics by V.K. Rohtagi and Saleh
Supplementary Texts:
- A First Course on Parametric Inference, Narosa Publishing by Kale, B.K. (1999)
- Applied non parametric statistical methods, second edition by H.C. Tuckwll.
- Business Mathematics & Statistics', Asian Books Private Ltd. By Verma A.P.
- Fundamentals of Mathematical Statistics by S.C. Gupta
- Fundamentals of Statistics by Ellance D N, Veena Elhance & Aggarwal B. M, Kitab Mahal.
- Linear Statistical Inference and its Applications by C.R. Rao
- New Mathematical Statistics (A Problem-Oriented First Course) by Sanjay Arora and Bansi Lal
- Non-Parametric Statistical Inference. By Marcel Decker and J.D. Gibbons (1985)

B.Sc. ACTUARIAL AND FINANCIAL MATHEMATICS

Course Title	:	**Differential Equations**	*Semester-1V*
Course Code	:	**MTH251C**	
Credit hrs.	:	**4**	

Course Objective: Introduces students the concrete concept of differential equations and their applications in mathematical modeling, shell theory, informatics, and oscillation theory.

Unit I: Some basic differential equations; classification of differential equations; first order differential equations; linear equations and method of integrating factors; separable equations; modeling with first order equations; exact equations; numerical approximation and Euler's method

Unit II: Second order differential equations, homogeneous and non-homogeneous equations; fundamental solutions; linear independence and Wronskian; complex roots of the characteristics equation; higher order equations

Unit III: Series solutions of differential equations, Bessel and Legendre equations; series solutions near an ordinary point; regular singular points, Euler equations

Unit IV: Laplace transform; Laplace transforms of common functions, inverse transform and transforms of derivatives; Dirac-Delta function

Text Book:

➢ Elementary Differential Equations and Boundary Value Problems by William E. Boyce and Richard C. DiPrima

Supplementary books:

- Differential Equations with Application and Historical Notes by G Simmons
- Differential Equations by Dennis Zill
- Differential Equations – Schaum Series
- Introduction to Differential Equations by E.G. Phillips
- Differential Equations by Jane Cronin

B.Sc. ACTUARIAL AND FINANCIAL MATHEMATICS

Course Title : **Real Analysis** *Semester-1V*
Course Code : **MTH252C**
Credit hrs. : **4**

Course Objective: Introduces students the computational and algebraic techniques in real analysis with applications in day today applied fields.

Unit I: Real numbers; ordered sets; bounded and unbounded sets; supremum and infimum of a set, **o**rdered fields; completeness of the set of real numbers.

Unit II: Limits of functions, continuity, uniform continuity; sequences; limits of sequences and limit theorems; bounded and monotone sequences; Cauchy sequences; Bolzano-Weistrass Theorem;

Unit III: Riemann integrals, upper and lower sums; integrability of continuous and monotone functions; fundamental theorem of integral calculus, mean value theorems of integral calculus; improper integrals and their convergence

Unit IV: Limit, continuity and differentiability of real-values functions of two variables; partial derivatives; changing the order of derivation; change of variables, Jacobians

Text Books:
- An Introduction to Real Analysis by Bartle and Sherbert (Wiley & Sons).

Supplementary books:
- Mathematical Analysis by Tom Apostol
- Principles of Mathematical Analysis by Walter Rudin
- An Introduction to Analysis by William Wade
- A Course in Real Analysis by Shanti Narayan
- Real Analysis by R.R. Goldberg
- Undergraduate Analysis by Serge Lang
- Real Analysis by Terence Tao, Hindustan Book Agency (TRIM Series)

B.Sc. ACTUARIAL AND FINANCIAL MATHEMATICS

Course Title : Programming Concepts   *Semester-1V*
Course Code : CSC251C
Credit hrs. : 2+2

Course Objective: The course provides basic knowledge of computer fundamentals and how to use C programming for solving mathematical problems.

UNIT 1: C: Evolution, Advantages & Disadvantages, Features & Importance. Compilers and Integrated Development Environments: Editing, Compiling & Linking Programs. Basic Structure of C programs, Character Set, Identifiers, Reserved Words, Standard Data Types, Constants, Variables, Symbolic Constants, Casting, and Standard Libraries.

UNIT 2: Operators & Expressions: Assignment, Arithmetic, Relational, Logical, Compound, Increment, Decrement, Bitwise Operators & Special Operators.
Logical Control: IF, IF – ELSE,?:, SWITCH CASE. Looping Statements: FOR, WHILE, DO-WHILE, EXIT, BREAK, CONTINUE AT EXIT statements.
Functions: Concepts, Elements, Prototypes & Types. Storage classes. Recursion. Preprocessing.

UNIT 3: Arrays: Types of arrays, initialization, passing arrays to functions, dynamic arrays. Character Arrays & Strings. String-handling functions.
Structures and Unions: Syntax & use, members, structures & pointers, array of structures, structures & functions, structure within structures.

UNIT 4: Pointers: Concepts, Variables, swapping data, swapping address v/s data, pointers & arrays, pointers to pointers, pointer to strings, pointer arithmetic, additional operators, pointers to functions, void pointers.

REFERENCE BOOKS:

1. Yashwant Kanetkar, "Let Us C", BPB
2. E. Balaguraswamy, "Programming in ANSI C", Tata McGraw Hill
3. "Programming in C", Schaum Series
4. Foster and Foster, "C By Discovery", RRI PENRAM
5. ROBERT A.RADCLIFFE, "Encyclopedia C", "BPB"
6. Maha Patra"Thinking in C", BPB

B.Sc. ACTUARIAL AND FINANCIAL MATHEMATICS

Course Title	:	**Financial Management**	*Semester-1V*
Course Code	:	**SBS251C**	
Credit hrs.	:	**4**	

Course Objective: The aim of this course is to provide advance knowledge on financial management like project evaluation, Investment decision, role of financial manager, and how to raise short and long term funds.

Unit I:

Concept, scope and functions of financial management, relationship with other areas of management. Objectives of financial management, profit and wealth maximization. Organization of finance function. Role of financial Manager. Mathematics of finance. Short and long-term sources of funds, internal financing.

Unit II:

Capital structure concepts and theories, net income approach, MM approach, traditional approach. Futures of an adequate capital structure, analysis of capital structure in practice. Over and under capitalization. Capital budgeting, decisions need, importance and processes. Determination of relevant cash flow. Capital budgeting techniques, traditional methods, payback period and accounting rate of return net present value and internal rate of return.

Unit III: Dividend decisions meaning and significance, factors effecting dividend policy, stability of dividends, forms of dividends, legal contractual and internal constraints and restrictions of dividend policy. Irrelevance of dividends, MM hypothesis, relevance of dividend, Walters and Gorden's models.

Unit IV: Concepts and nature of working capital. Determinants of working capital. Estimating working capital needs and its computation. Deciding and appropriate working capital policy. Working capital control and banking policy

Suggested Readings:

1. Panday I. M. Financial management
2. Chandra Prasana Financial Management, Theories and Practices
3. Khan and Jain Financial Management , Text and Problems