Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: B.Sc

Revised Syllabus of S.Y.B.Sc. Information Technology
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2020-2021

Semester III

Course Code **UIT3MAT**	**Applied Mathematics**	
Objectives The learners will understand the concepts of applications of the methods for solving different mathematical structures. This course introduces the advance learning of matrices and complex numbers, differential equations, Laplace transforms and the error functions. **Expected Learning Outcomes** 1) Learners should be able to solve the matrix using different methods and solve the hyperbolic functions of the complex numbers. 2) Learners should be able to identify the origin and applications of differential equations, solve initial value problems and linear DE with constant coefficient. 3) Learners should be able to understand laplace transform and apply inverse laplace to find solution of differential equations. 4) Learners should be able to find area and volume using integrals. 5) Learners should be able to find the error functions and understand the properties of beta gamma functions.		
I	**Matrices:** Inverse of a matrix, Properties of matrices, Elementary Transformation, Rank of Matrix, Echelon or Normal Matrix, Inverse of matrix, Linear equations, Linear dependence and linear independence of vectors, Linear transformation, Characteristics roots and characteristics vectors, Properties of characteristic vectors, Caley-Hamilton Theorem, Similarity of matrices, Reduction of matrix to a diagonal matrix which has elements as characteristics values. **Complex Numbers:** Complex number, Equality of complex numbers, Graphical representation of complex number(Argand's Diagram), Polar form of complex numbers, Polar form of x+iy for different signs of x,y, Exponential form of complex numbers, Mathematical operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic functions, Differentiation and Integration, Graphs of the hyperbolic functions, Logarithms of complex quality, j(=i)as an operator(Electrical circuits)	**12**
II	**Equation of the first order and of the first degree:** Separation of variables, Equations homogeneous in x and y, Non-homogeneous linear equations, Exact differential Equation, Integrating Factor, Linear Equation and equation reducible to this form, Method of substitution. **Applications of first order Differential equations** **Linear Differential Equations with Constant Coefficients:** Introduction, The Differential Operator, Linear Differential Equation f(D) y = 0, Different cases depending on the nature of the root of the equation f(D) = 0, Linear differential equation f(D) y = X, The complimentary Function, The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X; the general methods, Particular integral.	**12**
III	**The Laplace Transform:** Introduction, Definition of the Laplace Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The	**12**

	Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives, **Inverse Laplace Transform:** Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function)	
IV	**Multiple Integrals:** Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals. **Applications of integration:** Areas, Volumes of solids.	**12**
V	**Beta and Gamma Functions –** Definitions**,** Properties and Problems. Duplication formula. **Differentiation Under the Integral Sign** **Error Functions**	**12**

Books and References:

1) A text book of Applied Mathematics Vol I, P. N. Wartikar and J. N. Wartikar ,PuneVidyathi Graha
2) Applied Mathematics II , P. N. Wartikar and J. N. Wartikar ,Pune Vidyathi Graha
3) Higher Engineering Mathematics, Dr. B.S.Grewal, Khanna publications.

Semester IV

Course Code UIT4COS	**Computer Oriented Statistical Techniques**	
Objectives The objective of this course is to provide an understanding for the learners on statistical concepts to include measures of dispersion probability distribution, sampling estimation, hypothesis testing, regression and correlation analysis. **Expected Learning Outcomes:** By completing this course the learners will be able to perform: 1. To calculate and apply measures of dispersion. 2. To apply discrete and continuous probability distribution to various problems. 3. The test of hypothesis as well as calculate confidence interval for a population parameter and learn the concept to p-value. 4. Learn non parametric test such as the Chi- Square test for Independence as well as goodness of fit. 5. to compute and interpret the results of bivariate and multivariate regression and correlation analysis and to perform ANOVA. Be able to perform multiple regression using computer software R.		
I	**The Mean, Median, Mode, and Other Measures of Central Tendency**: Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency ,The Arithmetic Mean , The Weighted Arithmetic Mean ,Properties of the Arithmetic Mean ,The Arithmetic Mean Computed from Grouped Data ,The Median ,The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H ,The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles, Software and Measures of Central Tendency. **The Standard Deviation and Other Measures of Dispersion**: Dispersion, or Variation, The Range, The Mean Deviation, The Semi-Interquartile Range, The 10–90 Percentile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation, Properties of the Standard Deviation, Charlie's Check, Sheppard's Correction for Variance, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coefficient of Variation, Standardized Variable; Standard Scores, Software and Measures of Dispersion. **Introduction to R:** Basic syntax, data types, variables, operators, control statements, R-functions, R –Vectors, R – lists, R Arrays .	**12**
II	**Moments, Skewness, and Kurtosis** : Moments , Moments for Grouped Data ,Relations Between Moments , Computation of Moments for Grouped Data, Charlie's Check and Sheppard's Corrections, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis. **Elementary Probability Theory**: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation, Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis, Combinations, Stirling's Approximation to n!, Relation of Probability to Point Set Theory, Euler or Venn Diagrams and Probability. **Elementary Sampling Theory** : Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Differences and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory .	**12**

III	**Statistical Estimation Theory:** Estimation of Parameters, Unbiased Estimates, Efficient Estimates, Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error. **Statistical Decision Theory:** Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules, Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests, Operating-Characteristic Curves; the Power of a Test, p-Values for Hypotheses Tests, Control Charts, Tests Involving Sample Differences, Tests Involving Binomial Distributions. **Statistics in R:** Mean, Median, Mode, Normal Distribution , Binomial Distribution, Frequency Distribution in R	**12**
IV	**Small Sampling Theory**: Small Samples, Student's t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The Chi-Square Distribution, Confidence Intervals for Sigma , Degrees of Freedom, The F Distribution. **The Chi-Square Test**: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coefficient of Contingency, Correlation of Attributes, Additive Property of chi-square	12
V	**Curve Fitting and the Method of Least Squares:** Relationship Between Variables, Curve Fitting, Equations of Approximating Curves, Freehand Method of Curve Fitting, The Straight Line, The Method of Least Squares, The Least-Squares Line, Nonlinear Relationships, The Least-Squares Parabola, Regression, Applications to Time Series, Problems Involving More Than Two Variables. **Correlation Theory:** Correlation and Regression, Linear Correlation, Measures of Correlation, The Least-Squares Regression Lines, Standard Error of Estimate, Explained and Unexplained Variation, Coefficient of Correlation, Remarks Concerning the Correlation Coefficient, Product-Moment Formula for the Linear Correlation Coefficient, Short Computational Formulas, Regression Lines and the Linear Correlation Coefficient, Correlation of Time Series, Correlation of Attributes, Sampling Theory of Correlation, Sampling Theory of Regression	**12**

Course Code	**Practical List**
UIT4COP	1.Using R execute the basic commands, array, list and frames. 2.Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations. 3.Using R Execute the statistical functions: mean, median, mode, quartiles, range, inter quartile range histogram 4.Using R import the data from Excel / .CSV file and Perform the above functions. 5.Using R import the data from Excel / .CSV file and Calculate the standard deviation, variance, co-variance. 6. Using R import the data from Excel / .CSV file and draw the skewness. 7. Import the data from Excel / .CSV and perform the hypothetical testing. 8. Import the data from Excel / .CSV and perform the Chi-squared Test. 9.Using R perform the binomial and normal distribution on the data. 10.Perform the Linear Regression using R. 11.Compute the Least squares means using R. 12.Compute the Linear Least Square Regression

Reference Books: 1. Statistics, Murray R Spiegel, Larry J. Stephens, Mcgraw –Hill Iternational, Fourth Edition.
2. Fundamental Of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, Sultan Chand and Sons, eleventh edition.
3. A Practical Approach Using R , R.B. Patil, H.J. Dand And R. Bhavsar , SPD Publication, First Edition.