M.O.P. VAISHNAV COLLEGE FOR WOMEN

(AUTONOMOUS)

Choice Based Credit System

Course of Study for the batch of Candidates admitted in

2017 – 2018

2016 – 2017

2015 – 2016

ACADEMIC YEAR 2017 – 2018

B. Sc Mathematics

Activities / Content with direct bearing on Employability/ Entrepreneurship/ Skill Development

M.O.P. VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS), CHENNAI-34
(Effective for the batch of candidates admitted in 2017-2018)
B.Sc. MATHEMATICS

Choice Based Credit System
Course of Study for the batch of
Candidates admitted in 2017 – 2018

M.O.P. VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS), CHENNAI-34
(Effective for the batch of candidates admitted in 2017-2018)
B.Sc. MATHEMATICS

CORE I - ALGEBRA & TRIGONOMETRY

COURSE CODE: 14UMAT301	**YEAR/SEMESTER: I / I**	**MAXIMUM MARKS: 100**
COURSE TYPE:THEORY	**CREDITS: 4**	**TOTALTEACHING HOURS: 60**

COURSE OBJECTIVES:

- To understand the fundamental concepts in algebra and develop problem solving skills.
- To synthesize and relate the applications in real time situations.

UNIT I
Theory of equations
Polynomial equation, Imaginary and irrational roots, Symmetric functions of roots in terms of coefficients, Reciprocal equations, Transformation of equations, Descartes rule of signs, Approximate solutions of roots of polynomials by Horner's method. (15 hours)

UNIT II
Summation of series
Binomial, Exponential and logarithmic series (Statements only). (13 hours)

UNIT III
Matrices
Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, Similar, Orthogonal and unitary matrices, Cayley-Hamilton theorem (Statement only) Eigen vectors, Diagonalization of a matrix. (12 hours)

UNIT IV
Expansions
Expansions of sin θ and cos θ in a series of ascending powers of θ, Expansions of cosnθ, sin nθ, Expansion of tan nθ in powers of tanθ, Expansion of tan (A+B+C….), Power of sines and cosines of θ in terms of functions of multiples of θ. (10 hours)

UNIT V
Hyperbolic Functions
Definition, Relations between Hyperbolic & Circular functions, Inverse hyperbolic functions.
Logarithm of complex quantities: Definition, Logarithms of (x+iy), General value of logarithm of (x+iy). (10 hours)

TEXT BOOKS

- S.Narayanan&T.K.Manickavachagom Pillai (2004), Algebra(Volume I), Vijay Nichole ImprintsPvt Ltd., Chennai.
- S.Narayanan&T.K.Manickavachagom Pillai (2004), Algebra (Volume II), Vijay Nichole Imprints
  Pvt Ltd., Chennai.

- S.Narayanan&T.K.Manickavachagom Pillai (2004), Trigonometry, Vijay Nichole Imprints Pvt.Ltd, Chennai.

REFERENCE BOOKS

- P.R.Vittal (2004), Algebra & Trigonometry (Volume I & II), Margham Publications, Chennai.
- S.Sudha (1998), Algebra and Trigonometry, Emerald Publishers, Chennai.
- B.S.Grewal (2002), Higher Engineering Mathematics, Khanna Publishers, New Delhi.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Worksheet: Problems on determining the nature of roots by Descarte's rule and solving higher degree algebraic equations by using the techniques of transformation of equations.
Peer teaching: Finding Eigen values, Eigen vectors and Diagonalisation of a matrix.
Net surfing: Students asked to surf the internet, explore the role of significance of eigen values and eigen vectors in civil engineering and present them in the class.
Seminar: On trigonometric expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ in terms of $\sin\theta$, $\cos\theta$, $\tan\theta$.
Class presentation: On the role of significance of eigen values and eigen vectors in civil engineering.
Brain storming: Proving identities and related problems on hyperbolic, inverse hyperbolic functions and logarithm of complex quantities.

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B.Sc. MATHEMATICS

CORE II - DIFFERENTIAL CALCULUS

COURSE CODE: 14UMAT303	YEAR/SEMESTER: I/I	MAXIMUM MARKS: 100
COURSE TYPE: THEORY	CREDITS: 4	TOTAL TEACHING HOURS: 60

COURSE OBJECTIVES:

- To develop mathematical continuity to learn advanced concepts.
- To synthesize and relate the applications to real time situations.

UNIT I

Differentiation

Successive differentiation, Formation of equations involving derivatives, n^{th} derivative, Leibnitz's theorem (without proof) and its applications, Partial differentiation,Euler's theorem, Jacobian. (14 hours)

UNIT II

Differentiation (contd)

Maxima and Minima of functions of two & three independent variables, Lagrange's method of undetermined multipliers (without proof), Concavity & Convexity, Points of inflexion, Simple problems. (12 hours)

UNIT III

Polar Coordinates

Angle between the radius vector and tangent, Length of perpendicular from the pole to the tangent, p-r equation (no derivations). (10 hours)

UNIT IV

Applications

Radius of curvatureinCartesian& polar coordinates, Centre of curvature, Envelope , methods of finding the envelope, Evolute& Involute (no derivations). (12 hours)

UNIT V

Linear Asymptotes

Definition, Methods of finding asymptotes of rational algebraic curves with special cases (without proof), Intersection of curve with asymptotes. (12 hours)

TEXT BOOK

- S. Narayanan & T.K. Manickavachagom Pillai (2004), Calculus (Volume 1, Differential Calculus), Revised edition, Vijay Nichole Imprints Pvt. Ltd., Chennai.

REFERENCE BOOKS

- P.R.Vittal&V.Malini (2003), Calculus and Coordinate geometry of two dimensions, Margham Publications, Chennai.
- P.R.Vittal&V.Malini (2003), Calculus and Differential geometry, Margham Publications, Chennai.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Assignments: On computation of nth derivative and apply Leibnitz theorem for obtaining the desired result.
Think and apply: Maxima and minima principles are employed in any competitive market (global, national, local) to find the equilibrium price and revenue.
Solvingchallengingproblems: On radius of curvature (Cartesian & polar) enhances their rational thinking and problem solving skills for advance learners and hence enables them to compete globally.
Collaborative learning activity: Students divide themselves into groups and each group adopts a particular situation pertaining to curvature and present them in class**.**
Sort and Sequence: Activity based on mapping the curves with their parametric equations and obtain their evolutes.:
Identify and explore: Different types of problems are given to students based on their learning/problem solving abilities. They identify the algebraic equations, employ appropriate methods and find the asymptotes.

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B.Sc. MATHEMATICS

ALLIED I - C PROGRAMMING

COURSE CODE: 16UCSC301 & 16UCSC301P	**YEAR/SEMESTER: I/I**	**MAXIMUM MARKS: 60 (Theory), 40 (Practical)**
COURSE TYPE: THEORY & PRACTICAL	**CREDITS: 5**	**TOTALTEACHING HOURS: 45(Theory), 30(Practical)**

COURSE OBJECTIVES:

- To acquire conceptual knowledge & programming skills
- To create and solve modular programs.

UNIT I

Constants, Variables and Data Types - Character Set, Keywordsand Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining symbolic constants.

Operators and Expressions - Introduction, Arithmetic, Relational, Logical, Assignment, Increment and decrement, Conditional, Special Operators, Arithmetic expressions, Evaluation of expressions, Precedence of arithmetic operators. (10hours)

UNIT II

Managing input and output operations - Reading a character, Writing a character, Formatted input,Formatted output.

Decision making and Branching - Introduction, Decision making with IF statement, Simple IF…ELSE statement, The IF…ELSE statement, Nesting of IF…ELSE statements, The ELSE IF Ladder, The Switch statement, The ?: Operator, TheGOTOstatement.

Decision making and Looping -The WHILE statement, DO statement, FOR statement, Jumps in LOOPS.

(8hours)

UNIT III

Arrays

Introduction,One - dimensional Arrays,Declaration of One- dimensional Arrays, Initialization of one- dimensional Arrays, Two- dimensional Arrays, Initializing Two - dimensional Arrays.

(9 hours)

UNIT IV

Character Arrays and Strings

Introduction, Declaring and Initializing String variables, Reading strings from terminal,Writing strings to screen, Putting strings together, Comparison of two strings, String-Handlingfunctions.

(9 hours)

UNIT V

User-defined Functions:

Introduction, Need for User-defined Functions, A Multi – function program, Elements of user – defined functions, Definition of functions, Return values and their types, Function Calls, Function declaration, Category of functions, No arguments and no return values, No arguments

but returns a value, Nesting of functions, Recursion, The scope, visibility and lifetime of variables.

(9 hours)

TEXT BOOK

- E. Balagurusamy (2009), Programming in ANSI C, Tata McGraw Hill Publishing Company Ltd., New Delhi.
  Unit I: Chapter 2: 2.2, 2.4, 2.5, 2.6, 2.7, 2.8, 2.10, 2.11.
  Chapter 3: 3.1-3.7, 3.9-3.12.
  Unit II: Chapter 4: 4.2-4.5, Chapter 5: 5.1-5.9 & Chapter 6: 6.2- 6.5.
  Unit III: Chapter 7: 7.1-7.6.
  Unit IV: Chapter 8: 8.1, 8.2, 8.3, 8.4, 8.6, 8.7, 8.8.
  Unit V: Chapter 9: 9.1-9.10, 9.13, 9.15, 9.16, 9.19.

REFERENCE BOOKS

- B.W.Kernighan and D.M.Ritchie (1998), The C Programming Language, Prentice Hall of India.
- H.Schildt (2000), C: The Complete Reference, Tata McGraw Hill, New York.
- B.S.Gottfried (1996), Programming in C, Tata McGraw Hill, New York.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

MCQ Test: Fundamentals of C, syntax, operators and data types thus inducing fundamental skills needed for writing a program.

Code interpret: Find the output for the given coding and simplify the compound mathematical expressions using input/output operations, branching and looping, develops coding skills needed for employment.

Pair programing: Students work in pair to architect, code and then test their codes on arrays concepts in matrices and pattern programs.

Hands on training:On C coding to handle string functions: Sort a string array in ascending order; to separate the individual characters from a string; find maximum occurring character in a string.

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B.Sc. MATHEMATICS

ALLIED I - C PROGRAMMING –PRACTICAL

1. Summation of series
    i. sin x, cos x ,exp(x), exp(-x) and comparison with built in function.
    ii. Approximate value of π using Gregory series
2. String Functions
    i. Counting the number of vowels, consonants, words, white spaces in a line of text and array of lines.
    ii. Reverse a string and checking for palindrome.
3. Recursion
    i. nP_r and nC_r
    ii. Generation of nth terms in the Fibonacci series.
    iii. GCD of two numbers
4. Sorting and searching
    i. Insertion sort, bubble sort.
    ii. Linear search and binary search
5. Matrix manipulation
    i. Multiplication
    ii. Transpose and trace of a matrix
    iii. Determinant of a matrix

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B.Sc. MATHEMATICS

CORE III - INTEGRAL CALCULUS & FOURIER SERIES

COURSE CODE: 14UMAT308	YEAR/SEMESTER: I/II	MAXIMUM MARKS :100
COURSE TYPE:THEORY	CREDITS: 4	TOTAL TEACHING HOURS: 60

COURSE OBJECTIVES:

- To acquire skills to apply the concepts in problem solving.
- To develop mathematical continuity to learn related/advanced concepts

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UNIT I
Integrals
Integration of the form: $\int dx / ax^2 + bx + c$, $\int (lx+m)\, dx / ax^2 + bx + c$
$\int dx / \sqrt{ax^2 + bx + c}$, $\int (px + q)\, dx / \sqrt{ax^2 + bx + c}$, $\int \sqrt{ax^2 + bx + c}\, dx$, $\int dx / (a + b\cos x)$, $\int dx / (a + b\sin x)$, Integration by parts, Bernoulli's Formula.

(12 hours)

UNIT II
Integrals (contd)
Definition, Properties of definite integral, Reduction formulae $\int x^n e^{ax} dx$, $\int x^n \cos ax\, dx$, $\int x^n \sin ax\, dx$, $\int \sin^n x\, dx$, $\int \cos^n x\, dx$, $\int \sin^m x \cos^n x\, dx$, $\int \tan^n x\, dx$, $\int \cot^n x\, dx$, $\int \sec^n x dx$ $\int \operatorname{cosec}^n x\, dx$ (m,n are positive integers), $\int x^m (\log x)^n\, dx$, Simple problems.

(12 hours)

UNIT III
Beta and Gamma functions
Definition, Recurrence formula of gamma functions, Properties of beta and gamma functions, Relation between beta and gamma function, Duplication formula, Simple problems.

(12 hours)

UNIT IV
Multiple Integrals
Evaluation of Double integrals and Triple integrals, Change of order of integration, Application to Area and Volume (cartesian co-ordinates only) Simple problems.

(12 hours)

UNIT V
Fourier series
Introduction, Definition, Expansion of periodic functions of 2π, Expansion of even and odd functions, Half range series. (12 hours)

TEXT BOOKS

- S.Narayanan&T.K.Manickavachagom Pillai (2010), Calculus (Volume II , Integral Calculus), Vijay Nichole Imprints Pvt. Ltd., Chennai.
- S.Narayanan, T.K.Manickavachagom (2004), Calculus (Volume III, Differential Equations & Fourier Series), Vijay Nichole Imprints Pvt. Ltd., Chennai.

REFERENCE BOOKS

- Shanti Narayan (2001), Integral Calculus, S.Chand& Co., New Delhi.
- P.R.Vittal&V.Malini (2004), Integral Calculus, Margham Publications, Chennai.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Concept mapping: Students map the appropriate formula with procedure to evaluate various types of integrals.
Participatory learning activity: Students are encouraged to find different types of techniques to solve problems on definite integrals and reduction formulae.
Drag and Drop: Choose appropriate form of beta/gamma function, properties to solve improper integral and extend the concepts for future learning.
Worksheet: Problems on finding area of any closed region using double integration and volume of solids using triple integration.
Audio Visual Presentation: Application of Fourier series in image and signal processing in engineering sciences globally.

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B.Sc. MATHEMATICS

CORE IV - NUMBER THEORY & CRYPTOGRAPHY

COURSE CODE: 14UMAT310	**YEAR/SEMESTER: I /II**	**MAXIMUM MARKS: 100**
COURSE TYPE: THEORY	**CREDITS: 4**	**TOTALTEACHING HOURS: 60**

COURSE OBJECTIVES:

- To provide basic knowledge of number theory and their application to cryptography.
- To provide mathematical tools for study of cryptanalysis.

UNIT I
Number Theory
Decomposition of a composite number as a product of primes uniquely (without proof), Euler function φ (N) (without proof), Highest Power of prime number p contained in n*!* (Without proof), The product of r consecutive integers is divisible by r!,Congruence modulo n.
(12 hours)

UNIT II
Number Theory (contd)
Fermat's and Wilson's theorems, Simple problems.
(10 hours)

UNIT III
Cryptography
Introduction,Security goals, Cryptographic attacks - Cryptanalytic attacks, non- cryptanalytic attacks, Services and mechanism – Security Services, Security Mechanisms, Relation between services and mechanisms, Techniques – Cryptography.
Traditional Symmetric - Key Ciphers
Introduction - Kerckhoff's principle, Cryptanalysis, Substitution ciphers – Monoalphabetic ciphers, Additive Cipher, shift cipher, caesar cipher, multiplicative cipher, Affine ciphers, Monoalphabetic substitution cipher, Polyalphabeticciphers - Playfair cipher, Hill cipher.
(14 hours)

UNIT IV
Cryptography (Cont.)
Divisibility - Greatest common divisor, Euclidean algorithm, Extended Euclidean algorithm, Inverses - Additive inverse, Multiplicative inverse, Residue matrices and its multiplicative inverse, Chinese Remainder theorem (Statement only).
(12 hours)

UNIT V
Asymmetric- Key Cryptography
Introduction - Keys, plain texts/cipher text, encryption/decryption, Trapdoor one-way function, RSA Cryptosystem – Introduction, Procedure, Some Trivial Examples,Attacks on RSA- Factorization attack, chosen- cipher text attack.
(12 hours)

TEXT BOOKS

- T.K.Manicavachagom Pillai, T.Natarajan and K.S. Ganapathy (2011), Algebra (Volume II), S.Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai.
  Unit I & Unit II: Chapter 5.
- BehrouzA.Forouzan, DebdeepMukhopadhyay (2010), Cryptography and Network Security, second edition, Tata McGraw Hill, New Delhi.
  Unit III: Chapter I- Sections 1.1, 1.2 - 1.2.1, 1.2.2, 1.3- 1.3.1, 1.3.2, 1.3.3, 1.4 – 1.4.1.and Chapter III- Sections 3.1- 3.1.1, 3.1.2, 3.2- 3.2.1, 3.2.2.
  Unit IV: Chapter II -Sections 2.1.2, 2.2.5, 2.3.4 and Chapter IX- Section 9.4.
  Unit V : Chapter X -Sections 10.1- 10.1.1, 10.1.2, 10.1.4, 10.2- 10.2.1, 10.2.2, 10.2.3, 10.2.4.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Assignment: Solving challenging problems on large positive integer to compute least residue, reduce factorials and powers (modulo p), Primality test.
Problem set: Solving challenging problems on large positive integer to compute least residue, reduce factorials and powers (modulo p), Primality test - Develops lateral thinking and problem solving skills.
Real time reactions: Group interaction on public and private key cryptography, its attacks which helps students to spot trends and consider new points of view- Develops collaborative learning and reach across diverse disciplines to apply theories.
Seminar: On applications of Euclidean algorithm and Chinese reminder theorem to solve linear congruence equations and their significance in cryptography.
Project (Collaborative learning): Concepts of symmetric-key /asymmetric-key cryptosystem are linked with RSA techniques and employed to ensure authenticity of information in a global environment

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ALLIED II - COMPUTER ORIENTED NUMERICAL METHODS

COURSE CODE: 16UMAT301& 16UMAT301P	**YEAR/SEMESTER: I / II**	**MAXIMUM MARKS: 60 (Theory), 40 (Practical)**
COURSE TYPE: THEORY & PRACTICAL	**CREDITS: 5**	**TOTALTEACHING HOURS: 45(Theory), 30(Practical)**

COURSE OBJECTIVES:

- To provide an insight into the various techniques used in numerical methods.
- To enhance problem solving skills.

UNIT I
Finite differences
First Differences, Higher Differences, Difference tables, Backward differences, Central differences, Properties of the operators E, Δ, ∇ , Relation between the operators E, Δ, ∇ and D. Interpolation with equal intervals -Newton's forward and backward interpolation formula.Central difference formulae - Gauss forward and backward interpolation formulae, Stirling's formula (problems only).

(13 hours)

UNIT II
Interpolation with unequal intervals
Divided differences, Newton's divided difference formula for interpolation and Lagrange's formula for interpolation (problems only).

(8 hours)

UNIT III
Numerical Differentiation
Derivatives using Newton's forward and backward difference formulae, Stirling's formula and divided difference formulae (problems only).

(8 hours)

UNIT IV
Numerical Integration
Trapezoidal formula, Simpson's one-third rule, Simpson's three-eighth rule, Weddles's rule, Curve Fitting - Fitting of straight line and parabolic curve by the method of least squares (problems only).

(8 hours)

UNIT V
Solutions of algebraic and transcendental equations
Bisection method, Regula-Falsi method, Newton-Raphson method and Iteration method. (Problems only).

(8 hours)

TEXT BOOK

- M.K.Venkatraman (1999), Numerical methods in Science and Engineering, The National Publishing Company, Chennai.

REFERENCE BOOKS

- C.Xavier (1999), C Language and Numerical methods, New Age International Ltd., Chennai.
- Prof. P. Kandasamy, K. Thilakavathy& K. Gunavathy (1999), Numerical methods, S.Chand and Company Ltd., New Delhi.
- A.Singaravelu (1999), Numerical Methods, Meenakshi Publications, Chennai.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Class presentation: On interpolation methods to predict the effect of environmental changes for any geographical data and financial analysis in global environment.

Assignment: Exercise to write some complex programs applying various numerical integration techniques.

Programming assignment: Design a C program to forecast the unknown values and estimate functions for a given data using Lagrange's, Newton divided difference methods thus developing programming skills to solve numerical problems.

Project based learning: Focuses students to present their problems, methods and results on applications of numerical differentiation using C coding to estimate the profit and loss for certain ventures.

Code Modification: Students are assigned in groups task of coding & modifying numerical problems in engineering and technology using Bisection and Newton- Raphson methods to find the zeroes of nonlinear functions of a single variable.

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B.Sc. MATHEMATICS

ALLIED II- COMPUTER ORIENTED NUMERICAL METHODS-PRACTICAL

FINDING ROOTS OF EQUATION

1. Newton's –Raphson method
2. Bisection method

INTERPOLATION

1. Newton's forward formula for equal intervals
2. Lagrange's formula for unequal intervals

NUMERICAL DIFFERENTIATION

1. Derivatives (1^{st} and 2^{nd}) using Newton's forward interpolation formula

NUMERICAL INTEGRATION

1. Trapezoidal rule
2. Simpson's 1/3 rule
3. Simpson's $3/8^{th}$ rule

CURVE FITTING

1. Straight line
2. Parabolic curve

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B.Sc. MATHEMATICS

CORE V- DIFFERENTIAL EQUATIONS & APPLICATIONS

COURSE CODE: 15UMAT302	YEAR/SEMESTER: II/III	MAXIMUM MARKS: 100
COURSE TYPE: THEORY	CREDITS: 4	TOTAL TEACHING HOURS: 60

COURSE OBJECTIVES:

- To acquire analytical and problem solving skills to apply the concepts in all modern scientific and engineering studies.
- To formulate and solve differential equations for a given physical situation.

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UNIT I

Ordinary differential equations

Linear equation, Bernoulli's equation, Differential Equations of first order but of higher degree , Equations Solvable for p, Solvable for x, Solvable for y, Clairaut's form.

(12 hours)

UNIT II

Ordinary differential equations (Contd)

Second order differential equations with constant coefficients, Finding the complementary function and P.I of the form e^{ax} , sin ax or cos ax where a is a constant, $x^m$where m is a positive integer , Special methods for finding P.I – $e^{ax}X$ where X is any function of x, Second order differential equations with variable coefficients: $ax^2 d^2y/dx^2 + bxdy/dx + cy = X$, where X is a function of x, Finding the complementary function and P.I using z = log x, Method of variation of parameters.

(12 hours)

UNIT III

Partial differential equations

Classification of integrals – complete, singular and general integrals, Formation of P.D.E byeliminating arbitrary constants and arbitrary functions.

(12 hours)

UNIT IV

Partial differential equations (Contd)

Lagrange's method of solving linear equation Pp + Qq = R , Special methods : standard forms f(p, q) = 0, f(x ,p, q) = 0, f(y, p, q) = 0, f(z, p, q) = 0,
f(x, p) = f(y, q), Clairaut's form [simple problems].

(12 hours)

UNIT V

Applicationsof differential equations

Oscillations of spring: Free oscillations, Damped oscillations, Forced oscillations (Without Damping), Oscillatory Electrical Circuits: L-C circuit, L-C-R circuits
L-C Circuit with e.m.f. L-C-R circuit with e.m.f.

(12 hours)

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TEXT BOOKS

- S.Narayanan,T.K.Manickavachagom Pillay (2004),Calculus(volume III) (Differential equations and Fourier series), Vijay Nichole Imprints Pvt.Ltd., Chennai.
- Dr.B.S.Grewal (June 2001), Higher Engineering Mathematics, 36th edition, Khanna Publisher.
  Unit V: Chapter 14- 14.4, 14.5.

REFERENCE BOOKS

- A.Singaravelu (2002), Differential Equations, Fourier series and Laplace transforms, First edition, Meenakshiagency,Chennai.
- P.R.Vittal (2002), Differential equations and Laplace transforms, First edition, Meenakshi agency, Chennai.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Solving challenging problems: On linear differential equations of first order, Bernoulli's equation and differential equations of first order and higher degree.

Brain writing: Students think independently and form partial differential equations by eliminating arbitrary constants and functions.

Worksheets: Problems on solutions to standard types of partial differential equations of first order.

Group Discussion: On solving problems related to oscillations of spring with and without emf and to find displacement of the mass at any time t.

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B.Sc. MATHEMATICS

ALLIED III - MATHEMATICAL STATISTICS

COURSE CODE: 14UMAT316 & 14UMAT316P	**YEAR/SEMESTER: II/III**	**MAXIMUM MARKS: 80(Theory) & 20(Practical)**
COURSE TYPE: THEORY & PRACTICAL	**CREDITS: 5**	**TOTAL TEACHING HOURS: 60(Theory) & 15(Practical)**

COURSE OBJECTIVES:

- To develop analytical and problem solving skills & interpretation of data.
- To solve problems using appropriate statistical tools.

UNIT I

Distribution Functions & Mathematical Expectation

Random variable, Distribution functions, Properties of distribution function, Discrete random variable, Probability mass function, Discrete distribution function, Continuous random variable, Probability density function, Mean and variance for continuous probability distribution.

Mathematical expectation, Addition theorem of expectation, Multiplication theorem of expectation, Expectation of a linear combination of random variables, Variance of a linear combination of random variables, Moment generating function, Simple problems.

(12 hours)

UNIT II

Standard Distributions

Binomial & Poisson Distribution, Definition, Moments, Recurrence relation for the moments, Moment generating function, Fitting of distributions.

Normal Distribution

Definition, Chief characteristics, Moment generating function, Moments, Simple problems.

(10 hours)

UNIT III

Correlation

Introduction, Significance, Types of correlation**,** Scatter diagram, Karl Pearson's coefficient of correlation, Rank correlation.

Regression

Introduction, Uses of regression analysis, Difference between correlation and regression analysis, Regression lines, Regression equations.

(12 hours)

UNIT IV

Tests of Hypothesis

Procedure for testing hypothesis, Null Hypothesis , Alternative Hypothesis, Type I and Type II Errors, Critical Region , Level of Significance, One Tailed and Two Tailed Tests, standard error and its significance.

Large Sample Tests: Single Mean, Difference of Means.

Small Sample Tests: t Test for Single Mean and difference of Means, Paired "t" Test.

Non Parametric test: Chi Square test for goodness of fit and independence of attributes, (problems only). (12 hours)

UNIT V

F-Test and Analysis of Variance

The F Test or the Variance Ratio Test, Assumptions in F Test, Applications of F Test, Analysis of Variance: Definition, Assumptions, One Way and Two Way Classification (problems only). (14 hours)

TEXT BOOKS

- S.C.Gupta, V.K.Kapoor (2000), Fundamentals of Mathematical Statistics, 9th revised edition, Sultan Chand & Sons, New Delhi. (Unit I &II)
- S.P.Gupta (2008), Statistical Methods, 25th Edition, Sultan Chand & Sons, New Delhi (Unit III, IV & V).

RFERENCE BOOKS

- Probability (2007), Statistics and Random Processes – T. Veerarajan Tata McGraw,Hill Publishing Company Limited Edition, Chennai.
- P.R.Vittal (2004), Mathematical Statistics, First Edition, Margham Publications, Chennai.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Worksheets: Calculate the mean and variance of discrete/continuous random variables for data describing real-world system.

Compare and Contrast: Students use regression analysis to estimate the line of best fit for their own data sets, create scatter plots that will have a specific correlation coefficient.

Concept mapping activity : Map any practical situation with the appropriate tests of significance and derive conclusions.

Project Based Learning: Students undertake projects and apply appropriate computational techniques to draw conclusions.

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B.Sc. MATHEMATICS

ALLIED III - MATHEMATICAL STATISTICS-PRACTICAL

- **DIAGRAMMATIC REPRESENTATION**
  Column, Bar Diagram, Line, Pie and Area

- **METHODS OF CENTRAL TENDENCY**
  Mean, Median, Mode.

- **MEASURES OF DISPERSION**
  Standard deviation, Quartile deviation, Range

- **CORRELATION**
  Correlation co-efficient
  Rank Correlation (without repeated ranks)
  Regression co-efficient and Regression lines

- **TESTS OF SIGNIFICANCE**
  Small samples- t test for single mean, difference of means and paired t test.
  Chi-square for independence of attributes.

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B.Sc. MATHEMATICS

ELECTIVE I - FINANCIAL MATHEMATICS

COURSE CODE: 14UMAT320	YEAR/SEMESTER: II/III	MAXIMUM MARKS: 100
COURSE TYPE:THEORY	CREDITS: 5	TOTAL TEACHING HOURS: 75

COURSE OBJECTIVES:

- To provide a building block to learners in the field of finance.
- To expose the users to the concepts of banking and insurance.

UNIT I

Compound Interest

Accumulated value, Equivalent rates, Discounted value, Accumulated and discounted values for fractional interest periods.

(15 hours)

UNIT II

Compound Interest (Contd.)

Finding the rate, Finding the time, Equations of value.

(13 hours)

UNIT III

Simple Annuities

Definitions and notations, Accumulated value of an ordinary simple annuity, Discounted value of an ordinary simple annuity, Finding the term of an annuity, Finding the interest rate.

(16 hours)

UNIT IV

Amortization and Sinking Funds

Amortization of a debt, Outstanding principal, Mortgages, Refinancing a loan.

(14 hours)

UNIT V

Capital Budgeting and Depreciation

Net present value, Internal rate of return, Capitalised cost and capital budgeting, Depreciation – The Straight-line method, The constant-percentage method, The sum-of- digits method, The Physical-Service method and Depletion.

(17 hours)

TEXT BOOKS

- Petr Zima & Robert L.Brown (2005), Mathematics of Finance, Tata McGraw,Hill Publishing Company Limited, New Delhi.

  Unit I: Chapter 4: 4.1 – 4.4.
  Unit II: Chapter 4: 4.5 – 4.7.
  Unit III: Chapter 5: 5.1, 5.2, 5.3, 5.5, 5.6.
  Unit IV: Chapter 7: 7.1 –7.4.
  Unit V: Chapter 9: 9.1- 9.4.

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ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Assignments: Problems on Compound interest and compound discount to determine the cost of a loan or an asset by fixing the nominal rates in business environment.

Participatory learning activity: Computing the average due dates for lending in instalment and repaying in lump sum and vice versa in finance sector.

Role Play: Students play the role of a Finance Manager, explain types of Investments and perform calculations to compute Capital and Interest component (cum-interest and ex-interest) and emerge as a financial consultant.

Drag and drop: Students link the concepts of accumulated value, discounted value, and rate of interest in simple annuities which is designed to provide income at regular intervals after retirement.

Group activity on Amortization: Paying of debt through regular principal and interest payments over a time for any real life situation such as availing a house loan or a vehicle loan and emerge as an investment analyst in competitive environment.

Worksheets: Problems to compute Net Present Value of cash inflows which is used to measure the profitability of the project or investment.

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B.Sc. MATHEMATICS

CORE VI - VECTOR ANALYSIS & CO-ORDINATE GEOMETRY OF 3 DIMENSIONS

COURSE CODE: 14UMAT315	**YEAR/SEMESTER: II/IV**	**MAXIMUM MARKS: 100**
COURSE TYPE: THEORY	**CREDITS: 4**	**TOTAL TEACHING HOURS: 60**

COURSE OBJECTIVES:

- To illustrate and visualize mathematical mode of thoughts in real time situations and industry
- To analyse and apply the concepts for further studies.

UNIT I

Vector differentiation

Derivative, Partial derivative of a vector function, Gradient, definition of level surface, Directional derivative of a scalar point function (without proof) , Equations of tangent plane & normal line to level surface, Divergence & Curl of a vector point function.

(12 hours)

UNIT II

Vector integration

Integration of vector function, Line, Surface and Volume integrals,Theorems of Gauss, Stokes and Green's (without proof), Simple problems.

(10 hours)

UNIT III

Planes

Equations to planes, General first degree equation represents a plane(B. W.), Angle between two planes, perpendicular distance of a point from a plane (without proof), Distance between two parallel planes (without proof), Condition for two planes to be parallel, Perpendicular, bisector planes, Plane through the intersection of two given planes.

(13 hours)

UNIT IV

Straight Lines

Conditions for two lines to be parallel, Perpendicular **,** Condition for a line to be parallel, Perpendicular to a plane, Reduction to symmetric form of a line given by a pair of planes, Conditions for two lines to be coplanar and equations of the plane containing the lines, Length and equation of shortest distance between two parallel lines.

(13 hours)

UNIT V

Spheres

Equation of a sphere, General equation – Length of a tangent from an external point, Power of a point with respect to a sphere, Tangent plane, Section of a sphere by a plane, Orthogonal sphere.

(12 hours)

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B.Sc. MATHEMATICS

TEXT BOOKS

- P.Duraipandian&LaxmiDuraipandian (1998), Vector Analysis (Chapter I to IV), Revised Edition, Emerald Publishers.
- P.R.Vittal& V. Malini (2004), Co,ordinate geometry of 3dimensions and Probability (Chapter 1, 2, &3), First Edition, Margham Publications.

REFERENCE BOOKS

- P.R.Vittal & V. Malini (1997),Vector analysis (Chapter 1&2), First Edition, Margham Publications.
- P. Duraipandian, LaxmiDuraipandian (1995), D.Muhilan Co,ordinate Geometry of 3, Dimensions (Chapters 3, 4, 5), First Revised Edition, Emerald Publishers..
- K.Viswanathan&S.Selvaraj (1999), Vector Analysis (Chapter 1 to 4), First Edition, Emerald Publishers.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Audio Visual presentation: On physical interpretation of directional derivatives, curl and divergence of a scalar/vector point functions.
Assignment: Evaluation of challenging problems on line, surface and volume integrals using Gauss, Greens and Stokes theorems and extend it for higher learning.
Work sheet: Problems in combination of planes and straight lines emphasizing on real life situation.
Seminar: Applications of spheres and planes in spherical geometry in planning flight, cruises, satellites orbits in local/global environment.

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B.Sc. MATHEMATICS

ALLIED IV - MATHEMATICS FOR LIFE INSURANCE

COURSE CODE: 14UMAT327	YEAR/SEMESTER: II / IV	MAXIMUM MARKS: 100
COURSE TYPE: THEORY	CREDITS: 5	TOTALTEACHING HOURS: 75

COURSE OBJECTIVES:

- The course will provide an insight to Life Insurance and understand Actuarial Science.
- To provide a building block to learners in the field of Finance.

UNIT I

Mortality Table:

Life functions, Stationary Population, Expectation of Life, Selection and Select rates, Ultimate Table, Aggregate Table.

(15 hours)

UNIT II

Life Assurance Premiums:

General Considerations, Assurance Benefits, Pure Endowment Assurance, Endowment Assurance, Temporary Assurance or Term Assurance, Whole life Assurance, Endowment Assurance, Endowment Assurance, Double Endowment Assurance, Increasing Temporary Assurance, Increasing whole life Assurance, Commutation Functions, Expressions for Present values of Assurance Benefits in terms of Commutation Functions**.**

(15 hours)

UNIT III

Life Annuities and Temporary Annuities:

Introduction – Commutation Function Nx, Present value of an Annuity due, Deferred Life Annuity, Temporary Immediate life Annuity, Expression for $a_{x:n|}$ and $\ddot{a}_{x:n|}$Deferred Temporary Life Annuity, Variable Life Annuity, Increasing Life Annuity, Commutation Function S_x. Increasing Temporary Life Annuity**.**

(15 hours)

UNIT IV

Net Premiums for Assurance Plans:

Natural Premiums, Level Annual Premiums, Mathematical Expressions for level Annual Premiums for Temporary Assurance, Pure Endowment Assurance, Endowment Assurance, Whole life Assurance, Net Premiums, Premium Conversion Tables**.** (15 hours)

UNIT V

Office Premiums:

Loading in premium rates for expenses, Expressions for office premiums, Bonus loading in premium rates, Adequacy of premiums, Consistency of premiums. (15 hours)

TEXT BOOK

- S.P.Dixit, C.S.Modi, R.V.Joshi, (2000), Mathematical Basis of Life Insurance, Insurance Institute of India.

Unit I: Chapter V: 1-16.
Unit II: Chapter VIII, Chapter IX: 1-15.
Unit III: Chapter X: 1-13.
Unit IV: Chapter XI: 1- 4 (a-d), 5, Chapter XIII.
Unit V: Chapter XIV: 1-7.

REFERENCE BOOKS

- Atkinson,M.E. and Dickson,D.C.M (2000), An Introduction to Actuarial Studies, Elgar Publishing.
- Philip,M.et.al(1999), Modern Actuarial Theory and Practice, Chapman and Hall.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Role Play: Students play the role of an insurance advisor, explain the benefits and types of Assurances and emerge as an Insurance Agent.
Participative learning activity: Identify the appropriate assurance benefits and compute premiums Locally and Globally which develops Employability skills.
Team Work: Class interactive session to compute the premium for deferred annuities at different age groups, develops competency skills needed for employment.
Case Study Analysis: Students understand the purpose of bonus loading in premium rates and its effects on policy premium when an insurance company is dealing with high risky candidates.
Worksheets: Analyze the advantage of level annual premium over Natural premium for assurance plans.

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B.Sc. MATHEMATICS

ELECTIVE II - INTERDISCIPLINARY ELECTIVE-FUNCTIONAL MATHEMATICS

COURSE CODE: 11UELE302I	**YEAR/SEMESTER:II/IV**	**MAXIMUM MARKS :100**
COURSE TYPE:THEORY	**CREDITS: 5**	**TOTAL TEACHING HOURS: 75**

COURSE OBJECTIVES:

- To develop students abilities in logical, analytical and reasoning skills in problem solving.
- To enhance heuristic, systematic, critical and lateral thinking.

UNIT I

Arithmetical Ability

Arithmetic and Geometric Progressions, Permutation & Combination.

(10 hours)

UNIT II

Arithmetical Ability (contd.)

Problems on Numbers, Problems on Ages, Percentage, Ratio & Proportion.

(10 hours)

UNIT III

Arithmetical Ability (contd.)

Profit & Loss, Simple Interest & Compound Interest.

(20 hours)

UNIT IV

Arithmetical Ability (contd.)

Time & work, Time & Distance.

(15 hours)

UNIT V

Data Interpretation- Tabulation, Bar Graphs, Pie Charts.

General Mental Ability

Verbal Reasoning- Series Completion, Analogy, Coding- Decoding.

(20 hours)

TEXT BOOKS:

- Unit I: P.R.Vittal(2012), Business Mathematics, Margham Publications, Chennai – 17.
- Unit II – V: R. S. Aggarwal (2012), Quantitative Aptitude, S,Chand & Company Ltd., New Delhi.
- Unit V: General Mental Ability- R. S. Aggarwal (2012), A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company, New Delhi.

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B.Sc. MATHEMATICS

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Brainstorming: On topics arithmetic progression, geometric progression, permutation and combination

Mock test: Problems related with ages, numbers, percentages and ratio and proportion nurtures employability skill.

Quiz: On profit & loss, Simple interest, Compound interest.

Worksheets: On topics time and distance, time and work.

D**ata interpretation:** Analyse and interpret data presented in tables, bar diagrams, pie charts.

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B.Sc. Mathematics

Choice Based Credit System
Course of Study for the batch of
Candidates admitted in 2015 – 2016

M.O.P. VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS), CHENNAI-34

(Effective for the batch of candidates admitted in 2015-2016)

B.Sc. Mathematics

CORE VIII- MODERN ALGEBRA

COURSE CODE: 14UMAT322	**YEAR/SEMESTER: III/V**	**MAXIMUM MARKS: 100**
COURSE TYPE: THEORY	**CREDITS: 4**	**TOTAL TEACHING HOURS: 60**

COURSE OBJECTIVES:

- To emphasis the concepts of algebraic structures and its applications.
- To develop mathematical continuity to learn advanced / related concepts.

UNIT I

Groups

Definition of a group, Examples of groups, Some preliminary lemmas, Subgroups, Lagrange's theorem, A counting principle, Normal subgroups and quotients groups.

(12 hours)

UNIT II

Groups (Contd)

Homomorphism, Theorems related to homomorphism, Automorphism, Cayley's theorem.

(12 hours)

UNIT III

Rings

Definition and examples of rings, Some special classes of rings, Integral domain, Homomorphism, Ideals and quotient rings, More ideals and quotient rings.

(12 hours)

UNIT IV

Vector spaces

Definition and examples, subspace, Linear independence and Bases.

(12 hours)

UNIT V

Vector spaces(Contd)

Inner product spaces- Definitions and examples, Theorems.

(12 hours)

TEXT BOOK

- I.N.Herstein (2008), Topics in Algebra, (2nd Edition), Wiley Eastern, New Delhi.
  Unit I :Sections: 2.1, 2.2, 2.3, 2.4, 2.5, and 2.6.
  Unit II :Sections: 2.7 (Omitting Applications 1 & 2), 2.8, and 2.9.
  Unit III: Sections: 3.1, 3.2, 3.3, 3.4, and 3.5.
  Unit IV: Sections 4.1, 4.2.
  Unit V : Section: 4.4.

REFERENCE BOOKS

- S.Arumugam (2007), Modern Algebra, Scitech Publications, Chennai.
- M.L.Santiago (2002), Modern Algebra, Tata McGraw Hill, New Delhi.
- S.G.Venkatachalapathy (2004), Modern Algebra, Margham Publishers, Chennai.

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B.Sc. Mathematics

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Participatory Learning Activity: On abstract concepts of groups, subgroups, cosets and related problems.

Quiz: On rings, division rings, zero divisors, integral domain, ideals, ring homomorphisms and problems.

Class Seminar: On vector space over a field F, subspace, internal/external direct product of vector spaces, linearly independent/ dependent vectors, basis and extend it to prove results based on advanced concepts needed for future learning.

Assignment: On inner product spaces, norm of a vector, orthonormal vectors and construction of orthonormal vectors from a given basis.

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B.Sc. Mathematics

CORE IX - REAL ANALYSIS

COURSE CODE: 14UMAT324	YEAR/SEMESTER: III / V	MAXIMUM MARKS: 100
COURSE TYPE:THEORY	CREDITS: 4	TOTALTEACHING HOURS: 60

COURSE OBJECTIVES:

- To develop a rudimentary understanding of real valued functions.
- To develop students' abilities in logical, analytical, heuristic, systematic, critical thinking.

UNIT I

Sets and Functions

Real - valued functions, Equivalence, Countability. Real numbers, Least upper bounds.

Sequences of real numbers

Definition of sequence and subsequence, Limit of a sequence, Convergent sequences, Divergent sequences, Bounded sequences, Cauchy sequences.

(12 hours)

UNIT II

Series of real numbers

Convergence and divergence, Series with non- negative terms, Alternating series, Conditional convergence and absolute convergence, Tests for absolute convergence.

(12 hours)

UNIT III

Limits and Continuity on the Real line

Limit of a function on the real line,Functions continuous at a point on the real line, Reformulation.

(8 hours)

UNIT IV

Metric spaces

Metric spaces, Limits in metric spaces. Functions continuous on a metric space, Open sets, Closed sets**,** More about open sets.

Connected Sets, Complete Metric spaces, Compact Metric spaces (Definitions and Examples only).

(16 hours)

UNIT V

Calculus

Definition of the Riemann Integral, Existence of the Riemann Integral (Statement only),Properties of the Riemann Integral,Derivatives, Fundamental theorems of calculus.

(12 hours)

TEXT BOOK

- RichardR. Goldberg(2011), Methods of Real Analysis, Oxford & IBH Publishing Co., New Delhi.
  UNIT I: Chapter 1: Sections 1.4 -1.7.
  Chapter 2 : Sections 2.1 - 2.5, 2.10.
  UNIT II: Chapter 3: Sections 3.1-3.4, 3.6.

UNIT III:Chapter 4: Sections 4.1&Chapter 5: 5.1, 5.2.
UNIT IV:Chapter4: Sections 4.2, 4.3,Chapter 5:5.3-5.5&Chapter 6: 6.1, 6.2, 6.4, 6.5.
UNIT V: Chapter 7: Sections 7.2 - 7.5, 7.8.

REFERENCE BOOKS

- Tom M.Apostol (1974), Mathematical Analysis, 2nd Edition, Addison,Wesley Publishing Company Inc. New York.
- Rudin(1976), Principles of Mathematical Analysis, 3rd Edition, McGraw Hill Company, New York.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Concept mapping: Map the concepts of limit of a sequence toidentify whether thesequence converges or diverges.
Class interaction: On determining the absolute convergence and conditional convergence of a series using appropriate tests.
Internet surfing: Students are instructed to browse the applications of limits and continuity in real world scenario.
Team work: Group discussion on properties of Riemann integral and its application in Calculus.

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B.Sc. Mathematics

CORE X - DISCRETE MATHEMATICS

COURSE CODE: 15UMAT306	**YEAR/SEMESTER: III/V**	**MAXIMUM MARKS: 100**
COURSE TYPE:THEORY	**CREDITS: 4**	**TOTAL TEACHING HOURS: 60**

COURSE OBJECTIVES:

- To relate the mathematical techniques to computer applications.
- To develop analytical and logical skills.

UNIT I

Recurrence Relations and Generating functions

Polynomial expression, Sequences or Discrete Functions, Recurrence Relations, Generating functions, Properties of generating functions, Solution of a Recurrence Relation using Generating Function.

(12 hours)

UNIT II

Mathematical Logic

Introduction, Logical statement or proposition, Truth tables, Logical equivalence, Involved logical operators, Laws of statement Algebra.

(12 hours)

UNIT III

Posets

Antisymmetric relations, Partial ordering (Partial order relation), Poset, Hasse Diagram, Greatest and least element in a Poset.

(12 hours)

Lattices

Introduction, Upper bounds and lower bounds, Lattices, Properties of a Lattice, Greatest and least elements in a Lattice, Complement of an element, Complemented Lattice, Distributive Lattice, Modular lattice.

(12 hours)

UNIT IV

Boolean algebra

Boolean algebra, Definition of Boolean algebra, Boolean algebra through Lattices, Properties of a Boolean algebra, Boolean function and its Boolean expressions.

(12 hours)

UNIT V

Coding Theory

Introduction, Encoders and Decoders, Group Code, Hamming Codes, Basic notions of error correction using Matrices, Error correction in Group Codes, Step by step procedure for decoding Group Codes.

(12 hours)

TEXT BOOKS:

- V. Sundaresan , K.S. Ganapathy Subramanian , K. Ganesan (1998) Discrete Mathematics, A.R.Publishers,Tamil Nadu
  Unit I: Chapter 3: Sections 3.1 to 3.6.
- P. Duraipandian (2008), Discrete Mathematics For Computer Science Courses, Muhil publishers, Chennai 28.
  Unit II : Chapter 11: Sections 11.1 to 11.5.
  Unit III: Chapter 8: Sections 8.1 to 8.5
  Chapter 9: Sections 9.1 to 9.7.
  Unit IV: Chapter 10: Sections 10.1 to 10.5.
- T. Veerarajan (2007) Discrete Mathematics with Graph Theory and Combinatorics, The McGraw,Hill Education Private Ltd. New Delhi.
  Unit V : Chapter 5: Page no 290 to 307.

REFERENCE BOOKS:

- R.Johnsonbaugh,(2001) Discrete mathematics ,Pearson Education Asia.
- C.L.Liu, (1985) Elements of Discrete mathematics, McGraw Hill, New York.
- J. Truss (2000) Discrete Mathematics for Computer Scientists (2nd Edition) Pearson Education Asia.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Assignment: Formulate recurrence relations and obtain the solution using generating functions.
Presentation: Applications of recurrence relations in recursive backtracking and in complexity analysis of binary search
Concept inventories: Multiple choice questions on Logical operators, Logical equivalences, Involved logical operators.
Video screening session and discussion: On importance and application of Boolean algebra in analyzing and simplifying digital logic circuits in local and global environments
Peer teaching -Algorithmic approach of identifying errors in group codes and rectifying them.
Presentation: On applying the concepts linear algebra in coding theory.

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B.Sc. Mathematics

CORE XI - INTEGRAL TRANSFORMS & APPLICATIONS

COURSE CODE: 14UMAT321	YEAR/SEMESTER:III/V	MAXIMUM MARKS: 100
COURSE TYPE:THEORY	CREDITS: 4	TOTAL TEACHING HOURS: 60

COURSE OBJECTIVES:

- To provide an easy and effective means for the solutions of many real time problems using methods of transform.
- To obtain the solutions of differential equations with given boundary values.

UNIT I

Laplace transforms

Definition, Transforms of elementary functions, Properties of Laplace transforms, Transforms of derivatives transforms of integrals, Multiplication of t^n, Division by t, Evaluation of integrals by Laplace transforms.

(12 hours)

UNIT II

The Inverse Laplace transforms

Definition, Method of partial fraction, Other methods of finding inverse transforms, Solving linear differential equation with constants coefficients of first and second order.

(12 hours)

UNIT III

Fourier Transforms

Complex form of Fourier Integral Formula, Fourier Integral Theorem (without proof), Properties of Fourier Transforms.

(12 hours)

UNIT IV

Fourier Transforms (contd)

Fourier cosine transforms, Fourier sine transforms, Properties of Fourier sine and cosine transforms, Parseval's identity, Convolution theorem.

(12 hours)

UNIT V

Application of Transforms

Vibrations of a string, One Dimensional Heat Equation.

(12 hours)

TEXT BOOKS

- S.Narayanan, T.K.Manickavachagom Pillai(2004), Calculus (volume3) (Differential equations and Fourier series), Vijay Nichole Imprints Pvt. Ltd, Chennai.
  Unit I: Chapter 5: 1, 2, 4, 5.
  Unit II: Chapter5: 6, 7, 8, 9.
  Unit III: Chapter 6: 9, 10.
  Unit IV: Chapter 6: 11, 12, 13, 14, 15.

- Dr.B.S.Grewal (2007), Higher Engineering Mathematics, 36th edition, Khanna Publisher, New Delhi.
  Unit V: Page: 860-862.
- G Balaji(2007), Engineering Mathematics III, G Balaji Publishers, Chennai.
  Unit V: Page: 3.49-3.67.

REFERENCE BOOKS

- P.R.Vittal, V.Malini (2004), Vector Calculus, Fourier series and Laplace transforms, First edition, Margham publications, Chennai.
- A.Singaravelu (2000), Engineering Mathematics IV,Meenakshi Agency Chennai.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Concept inventories: Multiple Choice Questions on fundamental concepts of Laplace transforms and evaluation of definite integral using Laplace transforms.

Concept mapping: Identify and apply appropriate properties of Laplace transform to find inverse Laplace transform of a given function.

Seminar: On derivation of the partial differential equation governing one dimensional wave equation, finding its D'Alembert's solution and solving problems on strings.**Participatory Learning:** Students discuss and solve problems on inverse Laplace transforms utilizing the appropriate techniques.

Peer teaching: Evaluating certain integrals using Fourier sine/ cosine transforms and Parseval's identity.

Seminar: On derivation of the partial differential equation governing one dimensional heat equation, finding its solution by variable separable method and solving related problems globally.

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B.Sc. Mathematics

ELECTIVE III – FUZZY MATHEMATICS

COURSE CODE: 15UMAT305	YEAR/SEMESTER:III/V	MAXIMUM MARKS: 100
COURSE TYPE:THEORY	CREDITS: 5	TOTAL TEACHING HOURS: 75

COURSE OBJECTIVES:

- To understand the fundamental concepts in fuzzy theory and logic.
- To synthesize and relate the applications of fuzzy in real time situations.

UNIT I

Fuzzy Set Theory

Introduction, Concept of a fuzzy Set, Relation between fuzzy Sets, Operations on fuzzy sets, Properties of the standard operations, Certain numbers associated with a fuzzy Set - Height of a fuzzy set, Normal fuzzy set, Normalization of a fuzzy set.

(15 hours)

UNIT II

Fuzzy Set Theory(contd)

Certain Crisp Sets associated with a fuzzy set - Core of a fuzzy set, Support of a fuzzy set, Level set associated with a fuzzy set, α −cuts of fuzzy set, Restricted Scalar Multiplication, α −cut Decomposition Theorem, Synthesis of a fuzzy set, Certain fuzzy sets associated with a given fuzzy set - Associating a fuzzy set through RSM, Fuzzy cardinality of a fuzzy set, Fuzzification of a fuzzy set, The Power of a fuzzy set, Contrast intensification of a fuzzy set.

(15 hours)

UNIT III

Fuzzy Set Theory(contd)

Extension Principle, Fuzzy sets of Type - K and Level – K.

Non – Standard Operations on Fuzzy Sets:

T-Norms, T- Conorms, Complementation Operator, De – Morgan Pairs.

(15 hours)

UNIT IV

Fuzzy Relations

Introduction, fuzzy relations, Operations on fuzzy relations, α −cuts of fuzzy relation, Composition of fuzzy relations – Max-min Composition of two fuzzy relations, Projections of fuzzy relations, Cylindric Extensions, Cylindric Closure, Fuzzy Relation on a Domain.

(15 hours)

UNIT V

Fuzzy Logic and Applications

Introduction, Three-valued logics, Fuzzy logics, Fuzzy propositions and their interpretations in terms of fuzzy sets, Applications to Fuzzy logic in Medicine &Management and Decision making.

(15 hours)

TEXT BOOKS

- Ganesh M. (2006), Introduction to Fuzzy Sets and Fuzzy Logic, Prentice-Hall of IndiaPvt Ltd., New Delhi.
  Unit I: Chapter 6: 6.1 – 6.6.
  Unit II: Chapter 6: 6.7, 6.8
  Unit III: Chapter 6: 6.9, Annexure 6.3, 6.4.
  Unit IV: Chapter 7: 7.1 –7.9.
  Unit V: Chapter 8: 8.1, 8.2, 8.5, 8.6.
- George J. Klir, Tina A.Folger (2001), Fuzzy sets, Uncertainty and Information, Prentice-Hall of IndiaPvt Ltd., New Delhi.
  Unit V: Applications: 6 - 6.4 & 6.5 (Page nos: 246 – 260).

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

MCQs: Fundamental concepts of fuzzy sets, fuzzy operations, support/core of fuzzy sets, scalar cardinality and problems.

Brain Storming: On height of a fuzzy set, normal fuzzy set and α-cut decomposition theorem and problems.

Work Sheets: On Cartesian product of fuzzy sets using max-min principle, various level fuzzy sets and non- standard operations on fuzzy sets.

Assignment**:** On fuzzy relations, operations on fuzzy relation, cylindric extension and cylindric closure of fuzzy sets.

Group Discussions: Applications of Fuzzy logic in Management and Medicine.

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B.Sc. Mathematics

CORE XII - COMPLEX ANALYSIS

COURSE CODE: 14UMAT325	YEAR/SEMESTER:III/VI	MAXIMUM MARKS: 100
COURSE TYPE:THEORY	CREDITS: 4	TOTAL TEACHING HOURS: 60

COURSE OBJECTIVES:

- To render a modern treatment of concepts and techniques of complex function theory
- To understand methods to solve problems in pure as well as in applied mathematics

UNIT I

Analytic functions

Functions of a complex variable, Limits, Continuous Functions, Differentiability, The Cauchy-Riemann Equations, Analytic Functions, Harmonic Functions.

(12 hours)

UNIT II

Bilinear transformations

Conformal Mapping- Definitions, Elementary Transformations, Bilinear transformations, Cross ratio, Mapping by Elementary functions – $w = z^2$, $w = e^z$, $w = \sin z$.

(12 hours)

UNIT III

Complex Integration

Cauchy theorem, Cauchy Goursat's theorem (Statement only), Cauchy's integral formula, Maximum Modulus theorem (Statement only)Higher derivatives, Cauchy's inequality, Liouville's theorem, Fundamental theorem of algebra, Morera's theorem.

(12 hours)

UNIT IV

Series Expansions

Taylor's series, Laurent's series, zeros of an analytic function, Singularities (Problems only).

(12 hours)

UNIT V

Calculus of Residues

Residues, Computation of residues, Cauchy's residue theorem,Evaluation of Definite Integrals – Type 1 and Type 2 (no pole of f(z) lies on the real axis) Simple problems.

(12 hours)

TEXT BOOK

- Dr. S. Arumugam, A.Thangapandi Isaac, A. Somasundaram (2014), Complex Analysis, Scitech Publications (India) Private Ltd, Chennai.

  Unit I: Chapter 2: 2.1 – 2.2, 2.4 – 2.8.
  Unit II: Chapter 2: 2.9, Chapter 3: 3.1-3.3, Chapter 5: 5.1, 5.3-5.5.
  Unit III: Chapter 6: 6.1-6.4.
  Unit IV: Chapter 7: 7.1 – 7.4.
  Unit V: Chapter 8: 8.1-8.3.

REFERENCE BOOKS

- R.V. Churchill and J.W. Brown (1990), Complex Variables and applications, McGraw Hill International Book Co. Chennai.
- Dr.B.S.Grewal (2007), Higher Engineering Mathematics, Khanna Publishers, New Delhi.
- P. Duraipandian (2009), Complex analysis, Emerald Publishers, Chennai.
- S. Ponnusamy(2000),Foundation of Complex analysis, Narosa Publishing House, New Delhi.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

MCQ test: On analyticity of f(z), Cauchy- Riemann equations, harmonic functions construction of analytic functions which improves the skill needed for preparation of SET/CSIR exams.

Audio Visual Presentation: On applications of conformal/isogonal mapping, Students are able to choose an appropriate mapping to transform image from one plane into another.

Participatory Learning: Group activity on evaluating complex integration using Cauchy's integral formula and Cauchy's formula for nth derivative, inculcates problems solving skill**.**

Worksheets: Problems on identifying various types of singularities, expanding f(z) as Taylor's and Laurent's series.

Case Study Analysis: On Cauchy's Residue theorem, Contour integration, instils research skill in students and extend the concepts for higher learning.

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CORE XIII - OPTIMISATION TECHNIQUES

COURSE CODE: 14UMAT323	YEAR/SEMESTER:III/VI	MAXIMUM MARKS: 100
COURSE TYPE:THEORY	CREDITS: 4	TOTAL TEACHING HOURS: 60

COURSE OBJECTIVES:

- To provide an insight to formulate the strategies consistent with the constraints and the objectives.
- To enhance students ability to make a scientific and mathematical analysis of the problem situations.

UNIT I

Linear Programming

Introduction, Mathematical Formulation, Basic feasible, Unbounded and Infeasible solutions, Graphical method (maximization and minimization models), Canonical and standard forms of LPP, Simplex method, Big M method.

(12 hours)

UNIT II

Transportation Problem

Introduction, Mathematical formulation, Methods of solving a TPP - North West Corner method, Least Cost method, Vogels Approximation method, MODI Method, Degeneracy, Unbalanced Transportation problems, Maximization problems.

Assignment Problem

Introduction, Mathematical formulation, Hungarian method, Unbalanced assignment models, Maximization and restrictions in assignment models, Travelling salesman problem.

(12 hours)

UNIT III

Sequencing Problems

Introduction, Processing of - n jobs on 2 machines, n jobs on 3 machines, n jobs on m machines, 2 jobs on m machines by Graphical method.

Game Theory

Introduction, Maxmin , Minimax principle, Two person zero sum game with saddle point and without saddle point , Matrix oddment method for nxn games, Dominance property, Solving 2 x n and m x 2 game by graphical method.

(12 hours)

UNIT IV

Network Analysis

Introduction, Basic concepts, Construction of networks, Critical path method, Programme evaluation review technique (without cost considerations).

(12 hours)

UNIT V

Queueing Models

Introduction, Characteristics of queuing models, Kendal's notation, Derivation of Models (M/M/1): (∞/FCFS), (M/M/S): (∞/FCFS), simple problems.

(12 hours)

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TEXT BOOK

- Prof.V.Sundaresan, K.S.Ganapathy Subramanian and K.Ganesan (2000), Resource Management Techniques, A.R.Publications, Chennai.

REFERENCE BOOKS

- KantiSwaroop,Gupta P.K. and Manmohan (1999), Problems in Operation Research, Sultan Chand & Sons, New Delhi.
- P.R.Vittal (2003), Operations Research, Margham Publications.
- S.D. Sharma (2001), Operations Research: Theory and Applications, Macmillan, New Delhi.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Assignments : Formulation of LPP and obtain the optimal solution using graphical, simplex and Big M method.

Class presentation: On applications of transportation and assignment problems in obtaining the solution of some real-world problems.

Quiz: Features of game theory, methods of solving games, applications in relevant fields.

Case study Analysis: Construction of networks, estimation of expected project duration for real time projects from varied fields using PERT/CPM techniques..

Group discussion: On queuing models to improve service delivery in public service sectors and minimise the queue waiting time thus enhancing customer satisfaction**.**

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CORE XIV - GRAPH THEORY

COURSE CODE: 14UMAT 326	YEAR/SEMESTER: III / VI	MAXIMUM MARKS: 100
COURSE TYPE:THEORY	CREDITS: 4	TOTALTEACHING HOURS: 60

COURSE OBJECTIVES:

- To explore graphical representation of various scientific models.
- To develop mathematical models for real time problems using graphs.

UNIT I

Graphs and Sub graphs

Definition and examples, Degrees, Sub graphs, Graph Isomorphism, Matrices, Adjacency and Incidence matrix, Operations on Graphs.

(12 hours)

UNIT II

Connectedness

Walks, Trails and Paths, Connectedness and Components, Blocks.

(12 hours)

UNIT III

Trees

Introduction, Characterisation of Trees, Centre of a tree, Spanning tree, Connectivity.

(12 hours)

UNIT IV

Eulerian and Hamiltonian Graphs

Introduction, Eulerian graphs, Hamiltonian graphs.

(12 hours)

UNIT V

Planarity

Definition and properties, Characterization of planar graphs, Thickness, Crossings and Outer Planarity (only Definitions).

(12 hours)

TEXT BOOK

- S.Arumugam&S.Ramachandran (2002), Invitation to Graph Theory, Scitech Publications Pvt. Ltd., Chennai.
  UNIT I: Chapter 2: 2.1, 2.2, 2.3, 2.4, 2.8, 2.9.
  UNIT II: Chapter 4: 4.1, 4.2, 4.3.
  UNIT III: Chapters 6 & 4: 6.0, 6.1, 6.2, 4.4.
  UNIT IV: Chapter 5: 5.0. 5.1,5.2.
  UNIT V: Chapter 8: 8.0, 8.1, 8.2, 8.3.

REFERENCE BOOKS

- John Clark Holton (1991), A first look at Graph Theory, World Scientific Publishing Co. Ltd., New Jersey.
- J. A. Bondy and U.S.R Murthy (1976), Graph theory with Applications, Macmillan Press Ltd., USA.

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ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Assignments: On Graphs and Subgraphs- Representing the relationship between the objects as graphs(chemical molecules of compounds, electric circuits etc.,)to understand the significance of graph theory in real life situations

MCQs: Finding the degree, adjacency and incidence matrices for special types of graphs.

Quiz: On Connectedness of graphs, advanced concepts of Connectedness (in higher learning).

Seminar: Applications on the concepts of Eulerian and Hamiltonian graphs applicable to real life problems say Konigsberg bridge problem.

Net surfing: Students surf the net and find the applications on the concepts of planarity in research and areas of higher studies.

Cross Word: Reinforcing Graph Theory vocabulary.

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CORE XV –MATHEMATICAL MODELLING

COURSE CODE: 15UMAT 307	**YEAR/SEMESTER: III / VI**	**MAXIMUM MARKS: 100**
COURSE TYPE:THEORY	**CREDITS: 4**	**TOTALTEACHING HOURS: 60**

COURSE OBJECTIVES:

- To develop Mathematical models in Physical Sciences, Economics and Finance.
- To instill research skills in Applied Mathematics.

UNIT I

Linear Growth and Decay Models

Mathematical Modelling through Differential Equations,Linear Growth and Decay Models- Population Growth Models, Effects of Immigration and Emigration on Population Size, Interest Compounded Continuously, Decrease of Temperature, Diffusion, Change of Price of a Commodity.

(12 hours)

UNIT II

Non-Linear Growth and Decay Models

Non-Linear Growth and Decay Models- Logistic Law of Population Growth, Compartment Models- A Simple Compartment Model, Mathematical Modelling in Dynamics through Ordinary Differential Equations of First Order- Simple Harmonic Motion, Motion under Gravity in a Resisting Medium.

(12 hours)

UNIT III

Population Dynamics

Mathematical Modelling in Population Dynamics- Prey- Predator Models, Competition Models, Mathematical Modelling of Epidemics Through Systems of Ordinary Differential Equations of the First Order-A Simple Epidemic Model, A Susceptible-Infected-Susceptible (SIS) Model, SIS Model with Constant Number of Carriers,Simple Epidemic Model with Carriers, Model with Removal, Model with Removal and Immigration.

(12 hours)

UNIT IV

Planetary Motions

Mathematical Modelling of Planetary Motions- Need for the study of Motion Under Central Forces, Components of Velocity and Acceleration Vectors along Radial and Transverse Directions, Motion Under Central Forces, Motion Under the Inverse Square Law, Kepler's Law of Planetary Motions.

(12 hours)

UNIT V

Economics and Finance

The Harrod Model, The Cobweb Model, Samuelson's Interaction Models, Application to Actuarial Science.

(12 hours)

TEXT BOOKS

- J N Kapur (1988), Mathematical Modelling, Wiley Eastern Limited, New Delhi.
  Unit I: Chapter 2: 2.1, 2.2 - 2.2.1, 2.2.3, 2.2.4, 2.2.6, 2.2.7, 2.2.8.
  Unit II: Chapter 2: 2.3-2.3.1, 2.4 - 2.4.1, 2.5- 2.5.1, 2.5.2.
  Unit III: Chapter 3: 3.1-3.1.1, 3.1.2, 3.2: 3.2.1-3.2.6.
  Unit IV: Chapter 4: 4.1: 4.1.1- 4.1.5.
  Unit V: Chapter 5: 5.3: 5.3.1- 5.3.4.

REFERENCES

- J N Kapur (1985), Mathematical Models in Biology and Medicine, EWP, New Delhi.

ACTIVITY PLANNER:

List of activities for Employability / Skill Development / Entrepreneurship Skill Development

(Course faculty may conduct any, all or any other activities as well)

Assignment: Solving challenging problems related to linear growth and decay models.
Class Seminar: On Logistic law of population growth model.
Virtual discussion: On phase plane analysis of prey predator and competition model.
Knowledge sharing sessions: On application of differential equations in modelling planetary motions using Kepler's law.
Group Discussion: Students analyse and discuss on the interrelatedness of situations or events in the environment based on the Logistic law of population growth model.
Paper Presentations: On developing mathematical models in real world situations and solving them using appropriate mathematical tools.