M.O.P. VAISHNAV COLLEGE FOR WOMEN

(AUTONOMOUS)

Choice Based Credit System

Course of Study for the batch of Candidates admitted in

2018 – 2019

2017 – 2018

2016 – 2017

ACADEMIC YEAR 2018 – 2019

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 2018-2019)

B.Sc. MATHEMATICS

Choice Based Credit System
Course of Study for the batch of Candidates admitted in 2018 – 2019

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

(Effective for the batch of candidates admitted in 2018-2019)

B.Sc. MATHEMATICS

CORE I - ALGEBRA & TRIGONOMETRY

COURSE CODE: 18UMAT301	**YEAR/SEMESTER: I / I**	**MAXIMUM MARKS: 100**
COURSE TYPE:THEORY	**CREDITS: 4**	**TOTAL TEACHING HOURS: 60**

GENERAL OBJECTIVE:

To understand the fundamental concepts and solve higher degree algebraic / trigonometric equations in diversified fields.

COURSE OBJECTIVES (Co):

Co No.	Course Objective
Co1	To understand the nature of the real and complex roots, the relation between roots and coefficients of equations and to find the roots of the equations of higher degree applying the techniques of transformation of equations/Horner's method.
Co2	To determine the sum to infinity of Binomial, Exponential and Logarithmic Series.
Co3	To identify different types of real/complex square matrices, compute eigen values, eigen vectors and inverse of a square matrix using Cayley-Hamilton theorem.
Co4	To obtain the expansions of sin nθ, cos nθ using De Moivre's theorem, powers of sin θ and cosθ in terms of sine and cosine multiples of θ and use it to solve trigonometric equations.
Co5	To introduce hyperbolic, inverse hyperbolic functions, prove identities using circular functions and to obtain the general and principal value of logarithm of complex quantities.

UNIT I

Theory of equations

Polynomial equation, Imaginary and irrational roots, Relations between roots and coefficients of equations, Transformation of equations, Reciprocal equations, Increase or Decrease the roots of a given equation by a given quantity, 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, Logarithm of (x+iy), General value of logarithm of (x+iy).

(10 hours)

TEXT BOOKS

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

e-RESOURCES

Web Links

http://www.mathcentre.ac.uk/resources/workbooks/mathcentre/hyperbolicfunctions.pdf
http://www.ppup.ac.in/e-Content/_edetails.php?id=3566
http://www.wright.edu/~chaocheng.huang/lecture/mth255/mth255lect12.pdf
https://www.ucl.ac.uk/~zcahge7/files/6501-LecturesNotes-full.pdf
https://www.cuemath.com/calculus/hyperbolic-functions/

You Tube Video Links

https://www.youtube.com/watch?v=cbGWXQb3V38
https://www.youtube.com/watch?v=9M-ndkfrA8I
https://www.youtube.com/watch?v=Z1BlcU1d6Fg

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.
Participatory learning: Students need to choose the appropriate expansion(Binomial, Exponential, Logarithmic) and find the sum to infinity of the given series.
Assignment: Solving challenging problems on sum to infinity of a given series using binomial, exponential and logarithmic expansions.
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 sinnθ, cosnθ, tannθ in terms of sinθ, cosθ, tanθ
Audio Visual Presentation: Application of hyperbolic trigonometric functions in designing long transmission lines in electrical engineering and suspension bridges.

COURSE OUTCOMES:
On completion of the course, students will be able to

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL
CO1	Estimate the roots of algebraic equations of higher degree and apply them to solve problems in local/global environment.	**1, 2**	**E**
CO2	Classify the series as binomial, exponential, logarithmic series and hence find the sum to infinity.	**1, 2,4**	**An**
CO3	Determine eigen values and eigenvectors of square matrices and implement them in fields of engineering &data science.	**1,2,3,4**	**E**
CO4	Construct trigonometric functions sinnθ, cosnθ, in powers of sinθ and cosθ.	**1,2**	**C**
CO5	Select appropriate identities to solve problems on hyperbolic & inverse hyperbolic functions and obtain the principal/ general value of logarithm of complex quantities.	**1,2,5**	**E**

- **PSO – Programme Specific Outcome; Co – Course Objective; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create**

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

(Effective for the batch of candidates admitted in 2018-2019)

B.Sc. MATHEMATICS

CORE II - DIFFERENTIAL CALCULUS

COURSE CODE: 18UMAT302	YEAR/SEMESTER: I/I	MAXIMUM MARKS: 100
COURSE TYPE: THEORY	CREDITS: 4	TOTAL TEACHING HOURS: 60

GENERAL OBJECTIVE:

To provide an understanding of the fundamental principles of differential calculus, analyse the behavior of functions, develop mathematical continuity to learn advanced concepts and apply the computational tools to predict the effects of changing conditions in a global environment.

COURSE OBJECTIVES (Co):

Co No.	Course Objective
Co1	To understand the concepts of nth derivative, Leibnitz's theorem, partial derivatives, Euler's theorem and to compute Jacobian.
Co2	To enumerate the procedure for finding maxima and minima for a function of 2 variables, compute extremum values and employ Lagrange's multipliers method to obtain the maximum/minimum values for a function of 3 variables.
Co3	To understand the relationship between polar and Cartesian coordinates, compute angle between the radius vector & tangent, length of perpendicular and deduce p-r equation.
Co4	To compute radius of curvature, centre of curvature for equation of curves in Cartesian/ polar form and use it to determine evolutes.
Co5	To impart the knowledge of asymptotes, determine the equations of asymptotes for rational algebraic curves.

UNIT I

Differentiation

Successive differentiation, Formation of equations involving derivatives, n^{th} derivative, Leibnitz's theorem (without proof) and its applications, Partial differentiation-successive partial derivatives, 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, 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 curvature in Cartesian& polar coordinates, Centre of curvature, Evolute (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. ManickavachagomPillay (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.

e-RESOURCES

Web Links

- https://mathworld.wolfram.com/calculus
- http://www.calculus.org/
- http://tutorial.math.lamar.edu/Classes/CalcI/CalcI.aspx
- https://www.khanacademy.org

You Tube Video Links

- https://www.youtube.com/watch?v=oBmnt5tXRws
- https://www.youtube.com/watch?v=qGCKjuhA4eQ

ACTIVITY PLANNER:

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

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

Quiz: On successive differentiation and partial differentiation.
Think and apply: Maxima and minima principles are employed in any competitive market (global, national, local) to find the equilibrium price and revenue.

Solving challenging problems: 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.

COURSE OUTCOMES:

On completion of the course, the students will be able to

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL
CO1	Determine the nth derivative, obtain the desired results using Leibnitz theorem and apply partial derivatives &Jacobians in diversified fields.	**1,2,4**	**E**
CO2	Evaluate the critical points of f(x,y) and apply Lagrange's multipliers method to obtain the maximum/minimum value of f(x,y,z).	**1,2,3**	**E**
CO3	Explain the concepts of polar coordinates, find angle between the radius vector and tangent and deduce the pedal equation.	**1,2,4**	**E**
CO4	Determine radius of curvature, centre of curvature, evolute and realize their significance in global context.	**1,2,4,5**	**E**
CO5	Construct equations of asymptotes for algebraic curves and apply them in relevant fields.	**1,2,4**	**C**

- **PSO – Programme Specific Outcome; Co – Course Objective; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create**

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

(Effective for the batch of candidates admitted in 2018-2019)

B.Sc. MATHEMATICS

ALLIED I - C PROGRAMMING

COURSE CODE: 18UCSC301& 18UCSC301P	**YEAR/SEMESTER: I/I**	**MAXIMUM MARKS: 60 (Theory), 40 (Practical)**
COURSE TYPE: THEORY & PRACTICAL	**CREDITS: 5**	**TOTALTEACHING HOURS: 45(Theory),30(Practical)**

GENERALOBJECTIVE:

To introduce the fundamentals of C language, understand the syntax, develop programming skills, solve modular programs and expose students to problem solving through C programming.

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COURSE OBJECTIVES (Co):

Co No.	Course Objective
Co1	To introduce the fundamental concepts of C programming(constants, variables, data types, operators and expressions) and understand the syntax of writing a C program.
Co2	To familiarize with input, output operations, decision making statements-IF-ELSE,GOTO, WHILE, DO, FOR.
Co3	To establish array concepts, code and execute a well-structured C program.
Co4	To introduce one dimensional/two dimensional character arrays, its operations and various string handling functions.
Co5	To demonstrate the user defined functions, its characteristics and different types of functionswhich enable students to write reusable modulesfor a given computational problem.

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.

(10 hours)

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, The GOTO statement.

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

(8 hours)

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-Handling functions.

(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, Recursion.

(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, 9.16.

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.

e-RESOURCES

Web Links

www.learn-c.org/
nptel.ac.in/courses/106/104/106104128/

https://nptel.ac.in/courses/106/105/106105085/

You Tube Video Links

https://youtu.be/rLf3jnHxSmU?list=PLBlnK6fEyqRggZZgYpPMUxdY1CYkZtARR
https://youtu.be/-CpG3oATGIs

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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)

Syntactical & Term work: Students prepare a report on glossary in 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.

Error debugging: Identify coding errors at various development stages of C program using the concept of character arrays, string manipulations in finding the frequency of a character, removal of a character, counting the number of vowels, consonants, digits and white spaces.

Coding standards: Describes a set of coding standards and following coding practices to write programs in **C language**

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

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B.Sc. MATHEMATICS

ALLIED I - C PROGRAMMING -PRACTICAL

1. Summation of series
   i. sinx, cosx,$e^x$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. Matrix manipulation
   i. Multiplication
   ii. Transpose and trace of a matrix
   iii. Determinant of a matrix

COURSE OUTCOMES:

On completion of the course, students will be able to

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL
CO1	Build a C program utilizing the fundamental concepts of C language.	**1,2**	**Ap**
CO2	Develop programming skills using input/output operations, branching and looping needed for employment.	**1,2,5**	**Ap**
CO3	Analyse the different types of arrays and employ them in program coding.	**1,2,4,5**	**An**
CO4	Explain the concepts of character arrays, strings and employ them in C coding.	**1,2,4**	**E**
CO5	Analyse user defined functions, synchronize mathematical knowledge with coding skills and develop error debugging & testing skills to compete in a global environment.	**1,2,5**	**An**

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

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B.Sc. MATHEMATICS

CORE III - INTEGRAL CALCULUS & FOURIER SERIES

COURSE CODE: 18UMAT306	YEAR/SEMESTER: I/II	MAXIMUM MARKS :100
COURSE TYPE:THEORY	CREDITS: 4	TOTAL TEACHING HOURS: 60

GENERAL OBJECTIVE:

To provide an insight into the concepts of improper integrals, multiple integrals, Fourier series and recognize its significance in applied sciences globally.

COURSE OBJECTIVES (Co):

Co No.	Course Objective
Co1	To provide the different techniques of solving integrals of standard forms, integration by parts and Bernoulli's formula.
Co2	To evaluate integrals using reduction formulae and properties of definite integrals.
Co3	To introduce beta and gamma functions, recurrence formula, properties and solve challenging problems.
Co4	To determine the area of a closedregion/volume of solid using double/triple integrals respectively.
Co5	To compute Fourier constants using the techniques of integration and obtain the Fourier series expansion for a periodic function.

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, 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.ManickavachagomPillay (2010), Calculus (Volume II, Integral Calculus), Vijay Nichole Imprints Pvt. Ltd., Chennai.
- S.Narayanan, T.K.ManickavachagomPillay (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.

e-RESOURCES

Web Links

https://tutorial.math.lamar.edu/classes/calci/integralsintro.aspx
https://integralmaths.org
https://archive.org/

You Tube Video Links

https://www.youtube.com/watch?v=Vc8dIykQRhY

https://www.youtube.com/watch?v=vA9dfINW4Rg

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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COURSE OUTCOMES:

On completion of the course, students will be able to

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL
CO1	Choose suitable methods of integration, implement integration by parts and Bernoulli's formula to evaluate integrals.	**1,2,4**	**E**
CO2	Explain the properties of definite integrals, apply them appropriately to solve problems and deduce reduction formulae.	**1,2,4**	**E**
CO3	Estimate improper integrals using beta and gamma functions and develop skills for future learning.	**1,2,4**	**E**
CO4	Evaluate the area of surfaces/volume of solids using double and triple integrals	**1,2,4**	**E**
CO5	Determine Fourier series for periodic functions and recognize its significance in applied sciences globally.	**1,2,4,5**	**E**

- **PSO – Programme Specific Outcome; Co – Course Objective; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create**

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

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B.Sc. MATHEMATICS

CORE IV- DIFFERENTIAL EQUATIONS & APPLICATIONS

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

GENERAL OBJECTIVE:

To apply the formulae and problem solving procedures of ordinary/ partial differential equations in construction and solution ofrelevant physical models.

COURSE OBJECTIVES (Co):

Co No.	Course Objective
Co1	To recognize and solvelinear, Bernoulli and differential equations of first order but of higher degree.
Co2	To enumerate the procedures forsolvingsecond order differential equations with constant and variable coefficients and method of variation of parameters.
Co3	To formulate partial differential equationsby eliminating arbitrary constants/functions.
Co4	To classify and apply appropriate methods to solve first order partial differential equations-Lagrange's method,special methods, Clairaut's form.
CO5	To explain and solve the problems related to Oscillations of springs andOscillatory electric circuits.

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)

TEXT BOOKS

- S.Narayanan,T.K.ManickavachagomPillay (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.

e-RESOURCES

Web Links

https://www.ams.org/open-math-notes/omn-advanced-search
https://www.khanacademy.org/math/differential-equations
https://www.whitman.edu/mathematics/calculus_online/section04.11.html

You Tube Video Links

https://www.youtube.com/watch?v=dXe0-3b2fnE
https://www.youtube.com/watch?v=3c71y8N9qj0
https://www.youtube.com/watch?v=c0UQ_UD0ib0

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 but of higher degree.
Peer teaching: Procedures of obtaining the particular integral for special cases in solving differential equations of second order in real time problems globally.
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.
Class Seminar: On application of second order differential equations in governing the flow of charge in an L-C & L-C-R circuit with and without emf.

COURSE OUTCOMES:
On completion of the course, students will be able to

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL
CO1	Select the appropriate procedures to solve linear, Bernoulli, first order but of higher degree differential equations.	**1,2,4**	**E**
CO2	Determinethe solution of second order differential equations with constant and variable coefficients.	**1,2,4**	**E**
CO3	Formulate a partial differential equation by eliminating the arbitrary constants and functions.	**1,2**	**C**
CO4	Evaluate first order partial differential equations using appropriate methods in real time problems globally.	**1,2,4,5**	**E**
CO5	Analyse and determine the solution of differential equations foroscillations of spring& oscillatory electric circuits.	**1,2,3,4**	**An, E**

- **PSO – Programme Specific Outcome; Co – Course Objective; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create**

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

(Effective for the batch of candidates admitted in 2018-2019)

B.Sc. MATHEMATICS

ALLIED II - COMPUTER ORIENTED NUMERICAL METHODS

COURSE CODE: 18UMAT307 & 18UMAT307P	**YEAR/SEMESTER: I / II**	**MAXIMUM MARKS: 60 (Theory), 40 (Practical)**
COURSE TYPE: THEORY & PRACTICAL	**CREDITS: 5**	**TOTALTEACHING HOURS: 45(Theory), 30(Practical)**

GENERAL OBJECTIVE:

To provide a basic understanding of numerical differentiation, numerical integration, interpolation and develop C programs to solve numerical problems.

COURSE OBJECTIVES (Co):

Co No.	Course Objective
Co1	To introduce finite differences and solve problems for equal intervalsusingNewton forward, backward and central difference interpolation formulae.
Co2	To understand divided differences and obtain the value of a function usingNewton's divided difference formula.
Co3	To evaluate first, second and third order derivatives of a function at a point using Newton's/Gauss /Stirling's forward and backward interpolation formulae.
Co4	To evaluate definite integrals using Trapezoidal, Simpson's rules and fit a curve for given numerical data.
Co5	To find the approximate roots of algebraic/ transcendental equations correct to required decimal places by using Bisection, Newton- Raphson , Regula -falsi and iteration methods.

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 (No derivations).

(13 hours)

UNIT II

Interpolation with unequal intervals

Divided differences, Newton's divided difference formula for interpolation and Lagrange's formula for interpolation(No derivations).

(8 hours)

UNIT III
Numerical Differentiation
Derivatives usingNewton's forwardand backward difference formulae, Stirling's formula and divided difference formulae (No derivations).

(8 hours)

UNIT IV
Numerical Integration
Trapezoidal formula, Simpson's one-third rule, Simpson's three-eighth rule, Curve Fitting - Fitting of straight line and parabolic curve by the method of least squares (No derivations).

(8 hours)

UNIT V
Solutions of algebraic and transcendental equations
Bisection method, Regula-Falsi method,Newton-Raphson method and Iteration method (No derivations).

(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.

e-RESOURCES

Web Links

http://www.math.wsu.edu/kcooper/M448/resources.php
https://nptel.ac.in/courses/111/106/111106101/

https://numericalmethodstutorials.readthedocs.io/en/latest/

You Tube Video Links

https://nptel.ac.in/courses/111/101/111101003/
https://youtu.be/-wv-OERJK3M

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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)

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

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.

Worksheet: Solving problems on numerical integration in real world scenario to compute pressure-volume, work done by a piston, calculate displacement.

Code Formulation: Application oriented numerical problems in engineering and technology are solved by implementing C coding.

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(Effective for the batch of candidates admitted in 2018-2019)

B.Sc. MATHEMATICS

ALLIED II- COMPUTER ORIENTED NUMERICAL METHODS-PRACTICAL

FINDING ROOTS OF EQUATION

1. Newton –Raphson method
2. Bisection method

INTERPOLATION

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

NUMERICAL DIFFERENTIATION

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

COURSE OUTCOMES:

On completion of the course, students will be able to

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL
CO1	Explain the relationship between difference operators and apply Newton's forward/backward/central interpolation formulae in forecasting of population census datanationally/globally.	**1,2,3,5**	**E**
CO2	Implement Lagrange's and divided difference formulae forinterpolating data with unequal intervals pertaining to any physical environment.	**1,2,4**	**Ap**
CO3	Determine the derivatives of a function using techniques of Numerical differentiation wherever routine methods are not applicable.	**1,2,4**	**E**
CO4	Evaluate approximate value of a definite integral using Trapezoidal and Simpson's formulae.	**1,2,4**	**E**
CO5	Estimate the roots of algebraic and transcendental equations using iterative procedure.	**1,2,4**	**E**

- **PSO – Programme Specific Outcome; Co – Course Objective; CO – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create**

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 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)

B.Sc. MATHEMATICS

TEXT BOOKS

- S.Narayanan,T.K.ManickavachagomPillay (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 but of higher degree.
Peer teaching: Procedures of obtaining the particular integral for special cases in solving differential equations of second order in real time problems globally.
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. **Class Seminar:** On application of second order differential equations in governing the flow of charge in an L-C & L-C-R circuit with and without emf.

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B.Sc. MATHEMATICS

ALLIED III - MATHEMATICAL STATISTICS

COURSE CODE: 17UMAT303 & 17UMAT303P	**YEAR/SEMESTER: II/III**	**MAXIMUM MARKS: 80(Theory) & 20(Practical)**
COURSE TYPE: THEORY & PRACTICAL	**CREDITS: 5**	**TOTAL TEACHING HOURS: 50(Theory) & 25(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.

(10 hours)

UNIT II

Standard Distributions

Binomial & Poisson Distribution-Definition, Moment generating function, Fitting of distributions.

Normal Distribution - Definition, Chief characteristics, Moment generating function, Simple problems. (Excluding limiting case of the Binomial distribution for Poisson and Normal distribution)

(8 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 (only ungrouped data & no derivations). .

(9 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).

(9 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

- T. Veerarajan, (2007) Probability, Statistics and Random Processes,TataMcGraw,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.
Individual Learning: Students compute mean, standard deviation of the marks secured by them in the end semester examination and plot them on a normal curve using the characteristics of normal distribution.
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.
R coding is employed to obtain the association between attributes (Chi-square test).

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B.Sc. MATHEMATICS

ALLIED III - MATHEMATICAL STATISTICS-PRACTICAL (USING R)

- **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. ANOVA-One way and two- way classification

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B.Sc. MATHEMATICS

ELECTIVE I - FINANCIAL MATHEMATICS

COURSE CODE: 17UMAT302	**YEAR/SEMESTER: II/III**	**MAXIMUM MARKS: 100**
COURSE TYPE:THEORY	**CREDITS: 5**	**TOTALTEACHING 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, Finding the rate, Finding the time, Equations of value.

(15 hours)

UNIT II

Average Due Date

Meaning and uses of Average Due date, Determination of Due date, Average Due dates as basis for calculation of interest.

Investment Accounts

Meaning of Investments, Types of Investments- Fixed and Variable income securities, Cum-interest and ex-interest quotations, simple calculations to compute capital and interest component (no journal and ledger entries), simple problems.

(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

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)

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B.Sc. MATHEMATICS

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 – 4.7.
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.

- T.S.Reddy& A Murthy (2008), Financial Accounting, Margham Publications, Chennai.

Unit II: Chapter 7: Pg 7.1-7.15 &
Chapter 15: Pg15.1-15.11

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)

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.MuhilanCo,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.
Internet surfing: Students browse the net for some application of planes in different practical situations and find its solution.
Work sheet: Problems in combination ofplanes 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: 14UMAT 327	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 N_x, 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)

B.Sc. MATHEMATICS

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: 1-13.888888888888 8
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)

Assignment: Compute probabilities of survival and death at different age groups using Ultimate mortality table.

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

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B.Sc. MATHEMATICS

ELECTIVE II - INTER DISCIPLINARY 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)

Assignment: 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.

Aptitude test: Problemson verbal reasoning, series completion, analogy, coding, improves reasoning ability to excel in professional/competitive exams nationally/globally and develops employability skills.

Data interpretation: Analyseand 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 2016 – 2017

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B.Sc. MATHEMATICS

CORE VII– MECHANICS

COURSE CODE: 16UMAT302	**YEAR/SEMESTER: III /V**	**MAXIMUM MARKS: 100**
COURSE TYPE: THEORY	**CREDITS: 4**	**TOTAL TEACHING HOURS: 60**

COURSE OBJECTIVES:

- To understand mathematical formulation of the physical aspects of the problems.
- To develop skills in the formation of suitable mathematical models and problem solving techniques.

UNIT I
Forces and Moments
Newton's laws of motion - Forces, Types of Forces, Resultant of two Forces on a particle, Resultant of three Forces related to a triangle acting at a point, Equilibrium of a particle - Equilibrium of a particle under three forces. Moment of a force – Moment of a force about a line, Scalar moment.,Parallel forces-Varignon's Theorem, Parallel forces at the vertices of a triangle, Simple problems.

(12 hours)

UNIT II
Centre of Mass
Centre of Mass**,** Centre of gravity, Finding mass centre (using integration). Thin wire in the form of a circular arc, Lamina in the form of a sector of a circle, Solid hemisphere of radius a, Solid right circular cone of height h, Hemispherical shell, Related simple problems.

(12 hours)

UNIT III
Kinematics
Velocity, Velocity of a particle describing a circle, Resultant Velocity, Relative Velocity, Acceleration, Rectilinear motion,Rectilinear motion with constant acceleration.
Rectilinear motion under varying force: Simple harmonic motion - Definition, Equation of Simple harmonic motion, Projection of a particle having a uniform circular motion, Composition of two simple harmonic motions of same period, Simple problems.

(12 hours)

UNIT IV
Projectiles
Forces on a Projectile, Displacement as a combination of vertical and horizontal displacements, Nature of trajectory, Results pertaining to the motion of the projectile, Maximum horizontal range for a given velocity, Projectile projected horizontally, Simple problems.

(12 hours)

UNIT V
Moment of Inertia
Definition, Moment of inertia of uniform bodies - Circular ring, Right circular hollow cylinder, Circular lamina, Solid right circular cylinder, Solid sphere, Solid right circular cone about the axis of the cone, Spherical shell, Perpendicular and parallel axes theorems (Statement only), Related simple problems.

(12 hours)

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TEXT BOOK

- P. Duraipandian, LaxmiDuraipandian and MuthamizhJayapragasam (2015), Mechanics (Sixth Revised Edition), S.Chand and Co. Pvt, Ltd., New Delhi.

Unit I: Chapter 2: 2.1-2.1.1, 2.1.2, 2.2- 2.2.1.
Chapter 3: 3.1- 3.1.1.
Chapter 4: 4.1 - 4.1.1, 4.1.2, 4.4- 4.4.2, 4.4.3.
Unit II: Chapter 6: 6.1- 6.1.1, 6.2- 6.2.2.
Unit III: Chapter 1: 1.2 – 1.2.1,1.2.2,1.2.3, 1.3 - 1.3.1, 1.3.2.
Chapter 12: 12.1- 12.1.1, 12.1.2.
Unit IV: Chapter 13: 13.1-13.1.1,13.1.2, 13.1.3,13.1.4, 13.1.6.
Unit V: Chapter 17: 17.1 – 17.1.1.

REFERENCE BOOKS

- K. V. Naik and M. S. Kasi (2007), Statics and Dynamics, Emerald Publishers, Chennai.
- S.G.Venkatachalapathy (2003), Mechanics, 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)

Group discussion: Group discussion on recall and analyze the principles of forces, applications of Lami's theorem and moments to solve real life physical problems.
Brain writing: Brain storming session on inducting innovative ideas pertaining to projectile motion of an object in real life situations and obtain the desired results.
Seminar: On describing the physical situation based on principles of different Kinematics motion and solve problems linking the applications of simple harmonic motion.
Exhibition: Students display their creative thinking by developing mathematical models using the underlying principles of Projectile motion.
Concept mapping: Map the concepts and application of parallel & perpendicular axis theorems in finding the moment of inertia for certain geometrical bodies.

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CORE VIII- MODERN ALGEBRA

COURSE CODE: 16UMAT303	**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 quotient groups.

(12 hours)

UNIT II
Groups (Contd.)
Homomorphism, Theorems related to homomorphism, 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.

(13 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.

(11 hours)

TEXT BOOK

- I.N.Herstein (2017), 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) 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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ACTIVITY PLANNER:

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(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.
Multiple Choice Questions: On normal subgroups, group homomorphism, finding kernel of homomorphism, isomorphism 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: 16UMAT304	**YEAR/SEMESTER: III / V**	**MAXIMUM MARKS: 100**
COURSE TYPE: THEORY	**CREDITS: 4**	**TOTAL TEACHING 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, 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(2017), 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: 6.2, 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 to identify whether the sequence 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.
Class Presentation: Presentation on metric spaces, compactness and connectedness.
Team work: Group discussion on properties of Riemann integral and its application in Calculus.

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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.
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)

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B.Sc. MATHEMATICS

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.
Identify and explore: Identify the given set as poset/ lattice, modular/complemented/distributive lattice and explore its properties.
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 and step by step procedure for decoing group codes.

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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.
Audio visual presentation: Application of fuzzy sets, fuzzy relation and fuzzy logic in home appliances/Management decision making /medicine in global environment.

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CORE XI - INTEGRAL TRANSFORMS & APPLICATIONS

COURSE CODE: 16UMAT307	**YEAR/SEMESTER: III/VI**	**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, Simple problems.

(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 (no derivations).

(12 hours)

UNIT V
Applications
Solution of one dimensional wave equation - Derivation and solution by method of separation of variables. Problems on vibrating string with zero initial velocity. One dimensional equation of heat conduction - Derivation and solution by method of separation of variables. Problems with zero boundary values.

(12 hours)

TEXT BOOKS

- S.Narayanan, T.K.ManickavachagomPillay (2004), Calculus (volume III) (Differential equations and Fourier series), Vijay Nichole Imprints Pvt. Ltd, Chennai.

Unit I: Chapter 5: 1, 2, 4, 5.
Unit II: Chapter 5: 6, 7, 8, 9.
Unit III: Chapter 6: 9, 10.

Unit IV: Chapter 6: 11, 12, 13, 14, 15.

- Dr. G. Balaji, Transforms and Partial Differential Equations, 12th edition.
  Unit V: 3.9-3.46, 3.70-3.85.

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.

Audio Visual Presentation: On real time applications of Fourier transform for analysing signals in engineering and physical sciences environment.

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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CORE XII - COMPLEX ANALYSIS

COURSE CODE: 16UMAT305	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 and Laurent's series (Statement only), 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: 16UMAT308	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.
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.
Participatory learning: Students discuss on selection of an appropriate order in which a number of tasks can be assigned to a finite number of service facilities so as to optimize the outputs in terms of time, cost or profit using principles of sequencing models.
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: 14UMAT326	YEAR/SEMESTER: III / VI	MAXIMUM MARKS: 100
COURSE TYPE: THEORY	CREDITS: 4	TOTAL TEACHING 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).
Class presentation: Applications of connectivity in routing, network and image processing, etc.,
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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B.Sc. MATHEMATICS

CORE XV- MATHEMATICAL MODELLING

COURSE CODE: 16UMAT306	YEAR/SEMESTER: III/VI	MAXIMUM MARKS: 100
COURSE TYPE: THEORY	CREDITS: 4	TOTAL TEACHING 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 First Order-A Simple Epidemic Model, A Susceptible-Infected-Susceptible (SIS) Model, SIS Model with Constant Number of Carriers, Simple Epidemic Model with Carriers.

(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)

B.Sc. MATHEMATICS

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: 3.2.1-3.2.4.
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.
Case study Analysis: Students **t**ake up real time biological systems formulate mathematical model, analyse and solve using differential equations.
Paper Presentation: On developing mathematical models in real world situations and solving them using appropriate mathematical tools.