SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS) CHENNAI - 600044.

Re accredited with A+ Grade by NAAC

AFFILIATED TO UNIVERSITY OF MADRAS

BACHELOR OF MATHEMATICS

AIDED

CHOICE BASED CREDIT SYSTEM (CBCS)

OUTCOME BASED EDUCATION (OBE)

(Effective from the Academic Year 2020-21)

DEPARTMENT OF MATHEMATICS

COURSE FRAMEWORK (Aided)
SEMESTER I

PART	COURSE	TITLE OF THE PAPER	COURSE CODE	HRS	CREDITS	CA	SE	T
I	Paper-I	Tamil-I/Hindi-I/Sanskrit-I	20ULTFC1001/ 20ULHFC1001/ 20ULSFC1001/	6	3	40	60	100
II	Paper-I	Foundation English-I	20UGEFC1001	6	3	40	60	100
III	Core Paper-I	Trigonometry and Analytical Geometry of 2 Dimensions	20UMACT1001	6	4	40	60	100
	Core Paper-II	Differential Calculus	20UMACT1002	6	4	40	60	100
	Allied Paper-I	Allied Physics-I	20UMAAT1D01	6	4	40	60	100
IV	Soft Skill	Essentials of Language and Communication Skills	18USSLC1001	-	3	50	-	100
	Value Education(as applicable)	Environmental Studies	20USTVE1001	-	2	50	-	100
	TOTAL				23			700

**PAPER I TRIGONOMETRY AND ANALYTICAL GEOMETRY OF
2 DIMENSIONS**

TOTALHOURS: 6   **SUB CODE: 20UMACT1001**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To learn techniques of solving algebraic and trigonometric equations.
- To provide a comprehensive and clear description of geometry
- To study the various properties of geometrical figures in two dimensions.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To learn about the expansions of trigonometric functions and related problems.
CO2	The learner will become proficient in various types of hyperbolic functions.
CO3	The learners will acquire skills of solving problems in logarithm of complex quantities.
CO4	To learn about the summation of Trigonometric series and related problems.
CO5	To acquire knowledge of polar of point, pair of tangents, equation of chord with respect to parabola and ellipse.

SYLLABUS

UNIT– 1:   **18 hours**

Expansions: Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, $\sin^n \theta$, $\cos^n \theta$ and $\sin\theta$, $\cos\theta$, $\tan\theta$ in powers of θ.

Book 1: Chapter 3: Sections: 1, 2, 3, 4, 5

UNIT– 2:   **18 hours**

Hyperbolic Function: Relation between circular and hyperbolic functions, Inverse

hyperbolic functions – Simple problems.

Book 1: Chapter 4: Sections: 2.1, 2.2

UNIT– 3:   **18 hours**

Logarithms of Complex Quantities: Logarithm of complex numbers; General value

of complex numbers –Simple problems.

Book 1: Chapter 5: Sections: 5.1, 5.2

UNIT– 4:   **18 hours**

Summation of Series: Summation of trigonometric series using complex quantities

– C+iS form, Gregory series –Simple problems.

Book 1: Chapter 6: Sections: 3, 3.1

UNIT– 5:   **18 hours**

Conics: Polar of a point (x_1, y_1) with respect to a Parabola. Equation of the pair of

tangents to the Parabola. The pole of the line with respect to the Parabola. Equation

of the chord of the Parabola having (x_1, y_1) as its middle point. Polar of the point

(x_1, y_1) with respect to the Ellipse. The pole of the line with respect to the Ellipse.

Equation of the pair of tangents to the Ellipse. Equation of a chord in terms of its

middle point to the Ellipse –Simple problems.

Book 2: Chapter 6: Sections: 6, 6.1, 7, 13
Chapter 7: Sections: 7, 7.1, 8, 14

TEXT BOOK(S):
1. Narayanan S., Manicavachagom Pillay T. K., Reprint 2008, Trigonometry S. Viswanathan (Printers and Publishers), Pvt. Ltd.

2. Natarajan T., Manicavachagom Pillay T. K., Reprint 2009Analytical Geometry S. Viswanathan (Printers and Publishers), Pvt. Ltd.

BOOKS FOR REFERENCE:

1. Vittal P.R., Malini V, Reprint 2007, Algebra and Trigonometry, Margham Publications.
2. Vasistha A. R., & Pandey A. K., 2019, Geometry (2D& 3D) ,Krishna's Educational Publishers.
3. Duraipandian P., Udhayabaskaran S., Reprint: 2016, Allied Mathematics Volume I, S.Chand& Company pvt.Ltd.
4. Venkatachalapathy S. G., Reprint: 2016 Allied Mathematics, Margham Publications.
5. Kandasamy P., Thilagavathy K., Reprint: 2004, Mathematics–I, S.Chand & Company Pvt.Ltd.

E-LEARNING RESOURCES:

1. https://www.khanacademy.org/math/trigonometry
2. https://www.britannica.com/science/trigonometry
3. https://www.learncbse.in/trigonometry-formulas/
4. https://www.askiitians.com/revision-notes/maths/trigonometric-functions/
5. https://www.slideshare.net/mobile/PakRose1/math-lecture-8-introduction-to-trigonometry

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	3	3	2	2	2
CO2	2	3	2	2	2	2
CO3	2	2	2	2	2	1
CO4	2	2	2	2	1	1
CO5	3	3	2	2	1	1
Average	**1.2**	**1.6**	**1.2**	**2**	**1.6**	**1.4**

PEDAGOGY (TEACHING METHODOLOGY):
Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

PAPER II DIFFERENTIAL CALCULUS

TOTALHOURS: 6   **SUB CODE: 20UMACT1002**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To recognize the appropriate tools of calculus to solve applied problems
- To provide fundamentals of differentiation and show their applications in other fields
- To learn various techniques to solve different types of asymptotes

COURSE OUTCOMES:

CO No.	CO Statement
CO1	Acquire knowledge on successive differentiation and its properties
CO2	Applying the concept of successive differentiation and solving problems related to Jacobian, maxima, minima of two variables , Lagrange's method of multipliers.
CO3	Acquire adequate knowledge on the concept of curvature and applying the same to solve the related problems.
CO4	To examine and identify the properties of curvature in polar coordinates and develop problems solving skills
CO5	The learner will gain proficiency in understanding the concepts of linear asymptotes and solving the problem

SYLLABUS

UNIT–1:   **18 hours**

Successive Differentiation -n^{th} derivative, standard results, Leibnitz Theorem

(without proof) and its applications– Simple problems.

Chapter 3: Sections: 1.1 to 1.6, 2.1, 2.2

UNIT–2   **18 hours**

Jacobians, Maxima and Minima of functions of 2 variables– Necessary and

Sufficient conditions (without proof), Lagrange's method of undetermined

multipliers(without proof) – Simple problems.

Chapter 5: Sections: 1.1 to 1.3
Chapter 8: Sections: 4,5

UNIT– 3:   **18 hours**

Definition of a curvature, Cartesian formula for the radius of curvature – Simple

problems

Chapter 10: Sections: 2.1 to 2.3

UNIT– 4:   **18 hours**

Co-ordinates of the centre of curvature, Radius of curvature in polar coordinates,

p-r equations, Pedal equation of a Curve– Simple problems.

Chapter 10: Sections: 2.4, 2.6, 2.7

UNIT– 5:   **18 hours**

Definition of Asymptotes - Asymptotes parallel to the axis, $F_n+P_{n-2}=0$ form,

Intersection of a curve with its asymptotes (proofs are not included).Asymptotes

by inspection– Simple problems

Chapter 11: Sections: 1, 2, 3, 4, 5, 6

TEXT BOOK(S):

Narayanan S., Manicavachagompillay T. K., Reprint 2009, Calculus-Volume I, Viswanathan (printers and publishers) Pvt. Ltd.

BOOKS FOR REFERENCE:

1. Vittal P. R., Malini V., Reprint 2007, Calculus, Margham Publications.
2. Kandasamy P., Thilagavathy K., Reprint: 2004, Mathematics – I, II, S.Chand & Company   Pvt. Ltd.
3. Mitta P. K.,& Shanti Narayan, 2014, Differential Calculus, S.Chand Publishing.
4. Singaravelu A., Reprint: 2018, Allied Mathematics, Meenakshi Agency.
5. Vasistha A. R., & Vasistha A. K., 2019, Calculus, Krishna's Educational Publishers.

E-LEARNING RESOURCES:

1. https://www.khanacademy.org/math/differential-calculus
2. https://www.studocu.com/en-us/document/northern-illinois-university/calculus-for-business-and-social-science/lecture-notes/lecture-notes-lecture-asymptotes-and-optimization/818149/view
3. file:///C:/Users/Lenovo/Downloads/AnElementaryTreatiseontheDifferentialandIntegralCalculus_10449393.pdf
4. http://www.math.nagoya-u.ac.jp/~richard/teaching/f2016/BasicCalculus.pdf
5. http://loja.nproducoes.com.br/cgibin/content/view.php?q=differential+and+integral+calculus+vol+2&filetype=pdf&id=a3bcd7b5a639e08b0d042c748ba25c1

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	3	3	2	2	2
CO2	3	3	3	2	2	3
CO3	2	3	3	2	2	2
CO4	2	3	3	2	1	2
CO5	2	3	3	1	1	1
Average	2.2	3	3	1.8	1.6	2

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

SEMESTER - II

PART	COURSE	TITLE OF THE PAPER	COURSE CODE	HRS	CREDITS	CA	SE	T
I	Paper-II	Tamil-II/Hindi- II / Sanskrit-II/	20ULTFC2002/ 20ULHFC2002/ 20ULSFC2002/	6	3	40	60	100
II	Paper-II	Foundation English-II	20UGEFC2002	6	3	40	60	100
III	Core Paper-III	Classical Algebra	20UMACT2003	6	4	40	60	100
	Core Paper-IV	Integral Calculus and Fourier Series	20UMACT2004	6	4	40	60	100
	Allied Paper-II	Allied Physics-II	20UMAAT2D02	4	4	40	60	100
	Allied Practical-I	Allied Physics Practical	20UMAAP2001	2	2	40	60	100
IV	Soft Skill	Essentials of Spoken and Presentation Skills	20USSSP2002	-	3	50	-	100
	Value Education	Yoga and Values in Daily Life	20UESVE2002	-	2	-	-	100
	TOTAL				25			800

PAPER III CLASSICAL ALGEBRA

TOTALHOURS: 6   **SUB CODE: 20UMACT2003**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To impart skills in the various applications of algebraic methods.
- To orient the students to solve the equations using algebraic operations and develop problem solving skills.
- To learn techniques to solve various types of matrices and problems on Number theory

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To learn about the summation of Binomial, Exponential and Logarithmic series.
CO2	Understanding the concepts of roots and coefficient of equations.
CO3	The learners will acquire skills of solving problems in transportation of equations and reciprocal equations.
CO4	Recognize the concept of certain types of matrices, Cayley Hamilton theorem and finding the eigenvalues , corresponding Eigenvectors for a square matrix.
CO5	To orient the students, to understand the basic tools of Number theory.

SYLLABUS

UNIT– 1:   **18 hours**

   Summation of Binomial, Exponential and Logarithmic series (Theorems without proof)

Vol.1: Chapter 3:Section 10, Chapter 4 :Section 3&9

UNIT– 2:   **18 hours**

   Theory of Equations: Polynomial equations - Imaginary and irrational roots, Relation between roots and coefficients,.

Vol.1: Chapter 6:Sections 9,10,11

UNIT– 3:   **18 hours**

   Theory of Equations (Contd.): Reciprocal equations, Transformations of equations. Increasing or decreasing the root by a given number

Vol.1: Chapter 15,16,17

UNIT– 4:   **18 hours**

   Matrices: Types of Matrices - Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, Orthogonal, Unitary matrices. Eigenvalues and Eigenvectors, Diagonalization of matrices, Cayley-Hamilton theorem (without proof), Verification and Computation of Inverse of a Matrix,

Vol.2: Chapter 2:Sections 6.1-6.3
Chapter 9:Sections 9.1&9.2, Chapter 16

UNIT– 5:   **18 hours**

   Number Theory: Prime number, Composite number, Divisors of a given number N, Euler's function, Congruence, Fermat's and Wilson's theorem (without proof).

Vol.2: Chapter 5:Sections 1,7,8,12,16,17

TEXT BOOK(S):

   Manicavachagom Pillay T. K., Natarajan T., K., Ganapathy K. S., Reprint 2009 Algebra, Volume I, II S. Viswanathan(Printers and Publishers), Pvt. Ltd.

BOOKS FOR REFERENCE:

1. Singaravelu A., Reprint: 2018, Allied Mathematics, Meenakshi Agency.
2. Kandasamy P., K. Thilagavathy K., Reprint: 2004, Mathematics – I, II, S.Chand& Company Pvt.Ltd.
3. Vittal P. R., Malini V., Reprint 2007, Algebra and Trigonometry, Margham Publications.
4. Venkatachalapathy S. G., Reprint 2016, Allied Mathematics, Margham Publications.
5. Duraipandian P., Udhayabaskaran S., Reprint: 2016, Allied Mathematics Volume I, S.Chand & Company Pvt. Ltd.

E-LEARNING RESOURCES:

1. http://www2.trinity.unimelb.edu.au/~rbroekst/Notes/Ch1.pdf
2. https://www.scribd.com/document/416624053/Notes
3. http://math.mit.edu/~gs/linearalgebra/ila0601.pdf
4. https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear-algebra-introduction-to-eigenvalues-and-eigenvectors
5. https://www.msuniv.ac.in/Download/Pdf/61c9e52d1886451

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	3	1	2	2	2
CO2	2	1	2	2	1	2
CO3	3	3	2	2	1	2
CO4	2	2	2	2	1	3
CO5	2	3	2	2	1	1
Average	**1.2**	**1.4**	**1.8**	**2**	**1.2**	**2**

PEDAGOGY (TEACHING METHODOLOGY):
Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material andvideos, e-learning resources

PAPER IV INTEGRAL CALCULUS AND FOURIER SERIES

TOTALHOURS: 6   **SUB CODE: 20UMACT2004**

 CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To provide the fundamentals of differentiation and integration and show their significations in various fields.
- To orient students to derive Fourier series of a given periodic function by evaluating coefficients.
- To understand the nature of the Fourier series that represent even and odd functions and how derivatives of Fourier can be simplified.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To examine various techniques of integration and applied them to solve problems in definite and improper integrals, reduction formulae, Bernoulli's formula.
CO2	Ability to solve problems in multiple integrals by applying various integral formulae.
CO3	Acquire knowledge about special functions like beta and gamma to evaluate multiple integrals.
CO4	Understand the properties of Fourier series of periodic functions in the interval $[0,2\pi]$ and $[-\pi,\pi]$ and solve the related problems.
CO5	Ability to solve problems in Fourier series of periodic functions in the interval $[0, \pi]$.

SYLLABUS

UNIT– 1:   **18 Hours**

Reduction formulae $\int x^n e^{ax}\, dx$, $\int x^n \cos ax\, dx$, $\int x^n \sin ax\, dx$, $\int \sin^m x \cos^n x\, dx$, $\int x^m (\log x)^n\, dx$, $\int \cos^m x \sin x\, dx$ (m, n being positive integers), Bernoulli's formula, Integrals of the form $\int e^{ax} \sin bx\, dx$, $\int e^{ax} \cos dx$.

Volume II: Chapter 1: Sections 13.1,13.2,13.5.13.10, 14, 15.1

UNIT– 2:   **18 Hours**

Double integrals, Change of order of integration, Triple integrals

Volume II: Chapter 5: Sections: 2.1, 2.2, 3.1, 4

UNIT– 3:   **18 Hours**

Beta, Gamma functions

Volume II: Chapter 7: Sections: 2.1, 2.2, 2.3, 3, 4, 5

UNIT– 4:   **18 Hours**

Fourier series of periodic functions of period 2π , Fourier series of odd and even functions.

Volume III: Chapter 6: Sections: 1, 2, 3

UNIT– 5:   **18 Hours**

Half range Fourier series, Change of Interval

Volume III: Chapter 6: Sections: 4,5,6

TEXT BOOK(S):

S.Narayan S., T.K.ManicavachagomPillay T. K., 2009, Calculus Volume – II & III S.Viswanathan Pvt. Ltd .

BOOKS FOR REFERENCE:

1. Mohd. Arif, 2013, Calculus, Narosa Publishing House,
2. Duraipandian P., S. Udhayabaskaran S., Reprint: 2016, Allied Mathematics Volume II, S.Chand& Company Pvt.Ltd.
3. S. Bala S., Vector Calculus, 2015,Fourier series and Fourier Transforms A.R.S. Publications.
4. Dass H. K., Reprint: 2006, Advanced Engineering Mathematics, S.Chand& Company Pvt. Ltd.
5. A.R.Vasistha A. R., Vasistha A. K., 2019, Calculus,Krishna's Educational Publishers, Chennai

E-LEARNING RESOURCES:

1. https://www.khanacademy.org/math/integral-calculus
2. https://www.sakshieducation.com/Engg/EnggAcademia/CommonSubjects/MathMethods-Fourier_Series.pdf
3. https://www.narajolerajcollege.ac.in/document/sub_page/20200427_221142.pdf
4. file:///C:/Users/Lenovo/Downloads/AnElementaryTreatiseontheDifferentialandIntegralCalculus_10449393.pdfhttp://www.math.nagoya-u.ac.jp/~richard/teaching/f2016/BasicCalculus.pdf
5. http://loja.nproducoes.com.br/cgi-bin/content/view.php?q=differential+and+integral+calculus+vol+2&filetype=pdf&id=a3bcd7b5a639e08b0d042c748ba25c1

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	2	2	3
CO2	3	3	3	2	2	1
CO3	3	3	3	2	2	3
CO4	2	2	2	2	1	1
CO5	2	2	2	2	1	1
Average	2.6	3	2.6	2	1.6	2

PEDAGOGY (TEACHING METHODOLOGY)

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

SEMESTER III

PART	COURSE	TITLE OF THE PAPER	COURSE CODE	HRS	CREDITS	CA	SE	T
I	Paper-III	Tamil-III/Hindi-III/ Sanskrit- III	20ULTFC3003/ 20ULHFC3003/ 20ULSFC3003/	6	3	40	60	100
II	Paper-III	Foundation English-III	20UGEFC3003	6	3	40	60	100
III	Core Paper-V	Differential Equations and Laplace Transforms	20UMACT3005	5	4	40	60	100
	Core Paper-VI	Three Dimensional Geometry	20UMACT3006	5	4	40	60	100
	Allied Paper-III	Mathematical Statistics-I	20UMAAT3003	6	4	40	60	100
IV	NME-Offered to other department students	Mathematics for Competitive Examinations	20UMANT3001	2	2	40	60	100
	TOTAL				20			600

PAPER V DIFFERENTIAL EQUATIONS ANDLAPLACE TRANSFORMS

TOTAL HOURS: 6   **SUB CODE: 20UMACT3005**

CREDIT: 4   **L-T-P: 4-2-0**

COURSE OBJECTIVES:

- To introduce the various techniques involved in ordinary differential equations
- To enhance knowledge in partial differential equations
- To learn about Laplace transforms and its applications

COURSE OUTCOMES:

CO No.	CO Statement
CO1	Broad classification of Differential equations and learning the different standard modules to identify the type of a differential equation.
CO2	Apply suitable procedure to find the solution of first order, second and specific higher order ordinary differential equations with constant and variable coefficients.
CO3	Solving the Mathematical models using higher order differential equations to solve application problems in the field of Applied Physics.
CO4	Familiarize the students with the Laplace Transform Techniques and properties. Defining mathematically and describing the properties of the Laplace transform such as linearity, time shifting, time scaling, convolution.
CO5	Equip and enhance their knowledge to deal with equations with differential coefficients.

SYLLABUS

UNIT-1:   **18 hours**

    Ordinary Differential Equations:Differential equations solvable for p, solvable for x, solvable for y, Clairaut's form - Simple problems

Chapter: 1 Sections: 5.1, 5.3, 5.4, 6.1, 6.2, 7.1, 7.2

UNIT-2:   **18 hours**

    Second Order Equations with constant coefficients: Particular integral for $e^{ax}V$, where V is x^m, cos mx, sin mx (m is a positive integer). Second order differential equation with variable coefficients of the form. $Ax^2 (d^2y/dx^2) + Bx(dy/dx) + Cy = Q$. Method of variation of parameters, Total differential equation of the form $Pdx + Qdy + Rdz = 0$ - Simple problems.

Chapter: 2   Sections: 4, 8, 8.1,10,
Chapter: 3   Section: 7

UNIT-3:   **18 hours**

    Partial Differential Equation:Formation of Partial Differential Equation by eliminating arbitrary constants and arbitrary functions. Complete, singular and general integral solution of standard types: 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); Lagrange's equation Pp + Qq = R - Simple problems.

Chapter: 4   Sections: 2.1, 2.2, 3, 5, 5.1, 5.2, 5.3, 5.4, 6

UNIT-4:   **18 hours**

    The Laplace Transforms: Definitions and piecewise continuity, Basic properties, some general theorems, evaluation of definite integrals- Simple problems

Chapter: 5   Sections: 1, 2, 4, 5

UNIT-5:18 hours

    Inverse Laplace Transforms: The Inverse transforms,basic properties and results. Application of Laplace Transforms: Solution of second order linear differential equations with constant coefficient - Simple problems.

Chapter: 5 Sections: 6, 7, 8

TEXT BOOK(S):

    Narayanan S, Manicavachagom Pillay T.K, Reprint 2008, Calculus - Volume III, S.Viswanathan(Printers and Publishers), Pvt. Ltd.

BOOKS FOR REFERENCE:

1. Kandasamy P,Thilagavathy K, Reprint 2014, Mathematics - II, S.ChandPvt.Ltd.
2. Vittal P.R, Malini V, Reprint 2004, Differential Equations and Laplace Transforms , Margham Publications.
3. Duraipandian P,Udhayabaskaran S, Reprint 2016, Allied Mathematics Volume II ,S.Chand Pvt Ltd.
4. Raisinghania D, Differential Equations , S.Chand Pvt.Ltd.
5. Khanna M.L, Reprint 2012, Differential Equations , Jai Prakash Nath & Co.

E-LEARNING RESOURCES:

1. https://tutorial.math.lamar.edu/classes/de/de.aspx
2. https://tutorial.math.lamar.edu/classes/de/intropde.aspx
3. https://www.khanacademy.org/math/differential-equations
4. https://tutorial.math.lamar.edu/classes/de/LaplaceIntro.aspx
5. https://web.stanford.edu/~boyd/ee102/laplace.pdf\

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	2	2	2	1	2
CO3	3	2	3	3	1	1
CO4	2	2	2	2	2	1
CO5	2	3	3	2	2	1
Average	**2.6**	**2.2**	**2.4**	**2.2**	**1.4**	**1.4**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

PAPER VI THREE DIMENSIONAL GEOMETRY

TOTALHOURS: 6   **SUB CODE: 20UMACT3006**

CREDIT: 4   **L-T-P: 4-2-0**

COURSE OBJECTIVES:

- To provide a comprehensive and clear description of geometrical objects.
- To introduce equations for various geometric shapes.
- To analyze characteristics and properties of three-dimensional geometric shapes.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	Understand the concepts of planes and formation of equations and understanding various properties involved in it.
CO2	Acquire knowledge of representing straight lines in symmetrical form and understanding the concepts of coplanar and skew lines.
CO3	Solve problems related to the sphere in terms of general equation of a sphere, length of the tangent from a point, equation of the tangent plane to the sphere.
CO4	Acquire knowledge of cone and right circular cone and its properties as three-dimensional objects.
CO5	Solve problems related to cylinder and right circular cylinder.

SYLLABUS

UNIT-1: 18 Hours

Planes: General Equation of the first degree in x, y, z, Intercept form, Normal form, Direction cosines of normal to a plane, Angle between two planes, Parallelism and Perpendicularity of two planes, Plane through three points, Equation of a plane through the intersection of two planes, Length of perpendicular from a point to a plane, Equation of the planes bisecting the angle between the planes- Simple problems.

Chapter 2 : Sections : 1 to 11

UNIT-2: 18 Hours

Straight lines: Equation of a straight line (general form), Equation of a straight line (symmetrical form),To convert general equation of a line to symmetrical form, Angle between a line and a plane, Coplanar lines, The shortest distance between two lines, Magnitude and the equation of shortest distance- Simple problems.

Chapter 3 : Sections : 1 to 8

UNIT-3: 18 Hours

Spheres: Definition, The equation of a sphere with centre and radius, General equation, The sphere through four points, Length of the tangent from a point, The plane section of a sphere is a circle, Equation of a circle on a sphere, Equation of a sphere passing through a given circle, Intersection of two spheres is a circle, Equation of the tangent plane to the sphere- Simple problems.

Chapter 4 : Sections : 1 to 8

UNIT-4: 18 Hours

Cone: Equation of a cone with vertex at the origin, Equation of a quadric cone given the vertex and the guiding curve, Condition for a general second degree equation to represent a cone, Right circular cone, Equation of a right circular cone with given vertex, axis and semi-vertical angle- Simple problems.

Chapter 5: Sections: 2, 2.1

UNIT-5: 18 Hours

Cylinder:Equation of a cylinder-general form, Right circular cylinder, Equation of a right circular cylinder when axis and radius are given- Simple problems.

Chapter 5: Sections: 8,8.1,8.2

TEXT BOOK(S):

Manicavachagom Pillay T.K, Natarajan T, Reprint 2008, Analytical Geometry - 3 Dimensions, S.Viswanathan(Printers and Publishers) Pvt. Ltd.

BOOKS FOR REFERENCE:

1. Venkatachalapathy S.G, Reprint 2010, Analytical Geometry (2 Dimensions& 3 Dimensions) , Margham Publications.
2. Duraipandian P, KayalalPachaiyappa, Reprint 2009, Analytical Geometry 3-D , Muhil Publishers.
3. Vittal P.R, Malini V, Reprint 2004, CoordinateGeometry of 3 Dimensions & Probability, Margham Publications.
4. Santha S, Pathinathan T, Reprint 2005, 3-D Analytical Geometry & Probability, Vijay Nicole Imprints Private Ltd.
5. Vasistha and Others, 2014, Geometry of 2 & 3 Dimensions, Krishna's Educational Publishers.

E-LEARNING RESOURCES:

1. http://www.numbertheory.org/book/cha8.pdf
2. https://core.ac.uk/download/pdf/80294889.pdf
3. https://www.slideshare.net/SeyidKadher1/three-dimensional-geometry-68070109
4. https://www.youtube.com/watch?v=a2mt2L0e06Y
5. http://fhscastormath.weebly.com/uploads/1/2/4/7/12476962/chapter11_precal.pdf

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	3	3	2	1	2
CO2	2	3	3	2	1	1
CO3	2	3	3	2	1	1
CO4	2	3	3	2	1	1
CO5	2	3	3	2	1	1
Average	**2**	**3**	**3**	**2**	**1**	**1**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

SEMESTER IV

PART	COURSE	TITLE OF THE PAPER	COURSE CODE	HRS	CREDITS	CA	SE	T
I	Paper-IV	Tamil-IV/ Hindi-IV/ Sanskrit-IV	20ULTFC4004/ 20ULHFC4004/ 20ULSFC4004/	6	3	40	60	100
II	Paper-IV	Foundation English-IV	20UGEFC4004	6	3	40	60	100
III	Core Paper-VII	Vector Calculus and Fourier Transforms	20UMACT4007	5	4	40	60	100
	Core Paper-VIII	Statics	20UMACT4008	5	4	40	60	100
	Allied Paper-IV	Mathematical Statistics-II	20UMAAT4004	4	4	40	60	100
	Allied Practical-II	Mathematical Statistics Practical	20UMAAP4002	2	2	40	60	100
IV	NME-Offered to other department students	Mathematics for Competitive Examinations	20UMANT4002	2	2	40	60	100
	TOTAL				22			700

PAPER VII VECTOR CALCULUS AND FOURIER TRANSFORMS

TOTALHOURS: 6   **SUB CODE: 20UMACT4007**

CREDIT: 4   **L-T-P: 4-2-0**

COURSE OBJECTIVES:

- To enhance basic skills in the areas of vector calculus with applications.
- To expose the technique of solving problems in Fourier transforms.
- To learn about the power of Fourier components by means of special properties.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	Familiarize the students with the notion of vectors as representing quantities that have directions as well as magnitude in advanced level of learning.
CO2	Extend the basic vector concepts to learn about Gradient fields and path- independent fields, Calculating directional derivatives, gradients and curl.
CO3	Evaluate line integral as work over a closed curve including parameterized curves. Evaluating integrals using applications of Green's theorem and Stokes theorem.
CO4	To compute surface and volume integrals through surfaces such as Cylinders, Cuboids, Spheres etc.. Evaluating surface integral using Gauss Divergence in a plane.
CO5	Understand the technique to convolute simple functions. To apply Parseval's theorem and to know about its physical significance in terms of the power of the Fourier components.

SYLLABUS

UNIT-1:   **18 hours**

     Vector Differentiation: Definition, Gradient, Divergence, Curl, Directional derivative, Unit normal to surfaces, Tangent and normal planes to surfaces - Simple problems.

        Chapter 1: VC 1-39

UNIT-2:   **18 hours**

     Vector Integration: Line and Surface integrals, Green's theorem (without proof) - Simple problems.

        Chapter 1: VC 40-53,57-69

UNIT-3:   **18 hours**

     Vector Integration: Volume integrals, Gauss theorem, Stoke's theorem (without proof) - Simple problems

        Chapter 1: VC 54-56, 70-102

UNIT-4:   **18 hours**

     Fourier Transform: Fourier transform (Complex form without derivation), sine and cosine transform, the inverse Fourier transform, Simple properties of Fourier Transforms-Unit step function, Unit impulse function-Simple problems.

        Chapter 3: FT 1-24

UNIT-5:   **18 hours**

     Fourier Transform: Convolution theorem, Parseval's Identity Properties of Fourier Sine and Cosine Transforms, Integral Equations- Simple problems.

        Chapter 3: FT 25-57

TEXT BOOK(S)

     Sankarappan S and Arulmozhi G, 2006,Vector Calculus, Fourier Series and Fourier Transforms, Vijay Nicole Imprints Private limited.

BOOKS FOR REFERENCE:

1. Vittal P.R, Malini V, Reprint 2015, Vector Calculus, Fourier Series and FourierTransforms, Margham Publications.
2. Dass H.K,Reprint 2006, Advanced Engineering Mathematics, S.Chand& Company Pvt.Ltd.
3. Duraipandian P, Udhayabaskaran S, Reprint 2016, Allied Mathematics -Volume II , S.Chand& Company Pvt.Ltd.
4. Kandasamy P, Thilagavathy K, Reprint 2014, Mathematics – II, S.Chand& Company Pvt.Ltd.
5. Singaravelu A, Reprint 2018, Allied Mathematics, Meenakshi Agency.

E-LEARNINGRESOURCES:

1. https://www.khanacademy.org/math/multivariable-calculus
2. http://sites.science.oregonstate.edu/math/home/programs/undergrad/CalculusQuestStudyGuides/vcalc/vcalc.html
3. https://math.hmc.edu/calculus/hmc-mathematics-calculus-online-tutorials/multivariable-calculus/
4. https://www.thefouriertransform.com/
5. https://betterexplained.com/articles/an-interactive-guide-to-the-fourier-transform/

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	3	2	2	2	2
CO2	2	3	3	2	2	1
CO3	2	3	3	2	2	1
CO4	2	3	3	2	1	1
CO5	2	3	3	2	1	1
Average	**2**	**3**	**2.8**	**2**	**1.6**	**1.2**

PEDAGOGY (TEACHING METHODOLOGY):
Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

PAPER VIII   STATICS

TOTALHOURS: 6   **SUB CODE: 20UMACT4008**

CREDIT: 4   **L-T-P: 4-2-0**

COURSE OBJECTIVES:

- T**o** learn the basic principles of statics covering resultants,equilibrium,friction.
- To promote conceptual understanding and problem-solving skills in statics and to develop the ability to describe position, forces and moments.
- To prepare students for further study in dynamics.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	Understand the concepts of basic principles of forces, resultant of several forces acting on a particle.
CO2	Proficient in static equilibrium of a particle under three or more forces and on an inclined plane.
CO3	Know about the concepts in statics such as moments.
CO4	Analyse systems that include moments and couples .
CO5	Understand the theory behind the centre of gravity.

SYLLABUS

UNIT-1:   **18 hours**
　　Forces: Forces, Newton's laws of motion, Resultant of two forces on a particle, Resultant of several forces acting on a particle, Resultant of three forces related to a triangle acting at a point   Simple problems

Chapter 2

UNIT-2 :   **18 hours**
　　Equilibrium of a particle: Laws of Friction, Equilibrium of a particle under three or more forces, Equilibrium of a particle on an inclined plane - Simple problems.

Chapter 3

UNIT-3:   **18 hours**
　　Forces on a rigid body : Moment of a force, Definition of a rigid body , Conditions following equilibrium of a rigid body (statement only), Equivalent systems of forces, Parallel forces, Point of application of resultant of many parallel forces, Varignon's theorem -Simple problems.

Chapter 4(From Sec 4.1 to 4.4) (Except 4.2.1, 4.2.3,4.4.3)

UNIT-4:   **18 hours**
　　Forces on a rigid body(contd.,): Forces along the sides of a triangle , Couples, Moment of a couple, Arm and Axis of a couple, Resultant of several coplanar forces, Moment of a certain couple as an area, Resultant of an couple and a force - Simple problems.

Chapter 4 (From sec 4.5 to 4.7)(Except 4.7.2)

UNIT-5:   **18 hours**
　　Centre of mass**:** Centre of mass of simple uniform bodies, Triangular lamina, Rods forming a triangle, Circular arc, Segment of a circular lamina, Elliptic quadrant, Solid and hollow hemisphere , Solid and hollow cone - Simple problems.

Chapter 6 (Sec 6.1 and 6.2)(Except 6.2.3 and 6.2.4)

TEXT BOOK(S):

　　Duraipandian P, Laxmi Duraipandian, Reprint 2010, Mechanics, S.Chand& Company Pvt Ltd.

BOOKS FOR REFERENCE:

1. Venkatachalapathy S.G, Reprint 2002, Mechanics, Margham Publications.
2. Vittal P.R, Reprint 2016 , Statics , Margham Publications.
3. Dharmapadam A,V, Reprint 2006, Statics , S.Viswanathan(Printers and Publishers) Pvt. Ltd.
4. Russell Hibbeler, 2019, Engineering Mechanics: Statics & Dynamics, Amazon Warehouse.
5. Venkataraman M.K, 2004, Statics, Agasthiar Publications.

E-LEARNING RESOURCES

1. https://www.researchgate.net/publication/322738790_Engineering_Mechanics_-_Statics_Lecture_Notes_Handwritten
2. http://emweb.unl.edu/NEGAHBAN/EM223/Intro.htm
3. https://www.slideshare.net/AhmedMomtaz3/lecture-notes-on-engineering-statics
4. https://www.youtube.com/watch?v=vyCIiWZ-iwc
5. https://www.youtube.com/watch?v=x1ef048b3CE

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	3	3	2	1	1
CO2	2	3	3	2	1	1
CO3	3	3	2	2	1	1
CO4	3	3	2	2	1	1
CO5	3	3	2	2	1	1
Average	**2.6**	**3**	**2.4**	**2**	**1**	**1**

PEDAGOGY (TEACHING METHODOLOGY):
Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos

NON-MAJOR ELECTIVE: OFFERED TO OTHER DEPARTMENT STUDENTS
MATHEMATICS FOR COMPETITIVE EXAMINATIONS

TOTALHOURS: 2   **SUB CODE: 20UMANT4002**

CREDIT: 1   **L-T-P: 2-0-0**

COURSE OBJECTIVES:

- The primary objective of teaching Mathematics for Competitive Examination is to make the students think logically and objectively

- To expose the technique of solving problems in topics needed for taking competitive examinations

- To prepare students for further study in order to equip themselves to attend competitive examination

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To learn about the familiar concepts of problems related to numbers and multiplication properties
CO2	To provide a comprehensive and clear description of properties concerning surds and indices
CO3	To acquire knowledge on the concept of finding missing characters in a sequence
CO4	To enhance problem solving skills using the formulae based on Time and Work
CO5	To study the techniques of solving problems in Time and distance

NON-MAJOR ELECTIVE

MATHEMATICS FOR COMPETITIVE EXAMINATIONS

UNIT I

Problems on numbers, Simplification

UNIT II

Surds and Indices, Inserting the missing characters

UNIT III

Time and Work, Time and Distance, Speed

TEXT BOOK:

1. R.S.Agarwal-A Modern Approach to Logical Reasoning, S.Chand & co.
2. R.V.Praveen- Quantitative Aptitude and Reasoning, Second Edition-PHI Learning Private Limited, Delhi
3. Abhijit Guha-Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill Education Pvt Ltd., Fourth Edition
4. Vijay Shankar Shrivatsva-Quantitative Aptitude for Bank Exams, S.Chand

E-LEARNING RESOURCES:

1. https://youtu.be/KE7tQf9spPg
2. https://youtu.be/7DJ-lzPnv8I
3. https://youtu.be/vsBpWgNYjtQ
4. https://youtu.be/STaokT5d9Q4
5. https://youtu.be/HbuMwVGtn80

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	3	3	3	3	2
CO2	2	3	3	3	3	2
CO3	2	3	3	3	3	2
CO4	2	3	3	3	3	2
CO5	2	3	3	3	3	2
Average	2	3	3	3	3	2

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos.

SEMESTER V

PART	COURSE	TITLE OF THE PAPER	COURSE CODE	HRS	CREDITS	CA	SE	T
III	Core Paper-IX	Modern Algebra	20UMACT5009	6	4	40	60	100
	Core Paper-X	Real Analysis	20UMACT5010	6	4	40	60	100
	Core Paper-XI	Dynamics	20UMACT5011	6	4	40	60	100
	Core Paper-XII	Graph Theory	20UMACT5012	6	4	40	60	100
	Elective Paper-I	Numerical Methods	20UMAET5001	6	5	40	60	100
IV	Skill Enhancement Course	ESRM	20USSSE5003	-	3	50	-	100
	TOTAL				24			600

PAPER IX MODERN ALGEBRA

TOTALHOURS: 6   **SUB CODE : 20UMACT5009**

CREDIT: 4   **L-T-P : 5-1-0**

COURSE OBJECTIVES:

- To acquire the students with basic concepts of fundamental algebraic structures.
- Able to construct and analyze mathematical proofs in algebra.
- Knowledge about set theory, functions and groups.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To understand the concepts of groups, subgroups and its basic properties
CO2	To understand the types of morphism and use them to classify groups.
CO3	To learn about the structure of rings and Integral domains
CO4	To acquire basic algebraic methods in quotient rings
CO5	Understand the concepts of Euclidean rings and its properties

SYLLABUS

UNIT– 1:   **18 Hours**

Groups, Subgroups, Counting principle, Normal subgroups and Quotient Groups

Chapter: 2 Sections 2.4 - 2.6

UNIT– 2:   **18 Hours**

Homomorphisms, Automorphisms, Cayley's theorem, Permutation Groups.

Chapter: 2 Sections 2.7- 2.10

UNIT– 3:   **18 Hours**

Definition and examples of rings, some special classes of rings, Homomorphisms

Chapter: 3 Sections 3.1- 3.3

UNIT– 4:   **18 Hours**

Ideals and Quotient Rings. More Ideals and Quotient Rings

Chapter: 3 Sections 3.4, 3.5

UNIT– 5:   **18 Hours**

The field of Quotients of an Integral Domain, Euclidean Rings.

Chapter: 3 Sections 3.6, 3.7

TEXT BOOK:

Herstein I.N., Reprint 2014, Topics in Algebra, Second Edition, Wiley India Pvt. Ltd., New Delhi.

BOOKS FOR REFERENCE:

1. Santiago, M.L., 2009, Modern Algebra, Tata McGraw-Hill Publishing Co,Ltd,
2. Arumugam S., ThangapandiIsaac A., Reprint 2006, Scitech Publications(India) Pvt.Ltd.
3. A.R.Vasistha&A.K.Vasistha, 2014, Abstract Algebra, Krishna's Educational Publishers, 2014
4. Joseph A. Gallian, 1999, Contemporary Abstract Algebra, Narosa Publishing House
5. Bhatt V.K., 2014, Modern Algebra and Applications, Narosa Publishing House

E-LEARNING RESOURCES:

1. https://www.britannica.com/science/modern-algebra/Rings
2. http://users.metu.edu.tr/serge/courses/116-2015/Textbook116.pdf
3. http://www2.math.umd.edu/~jcohen/402/Pinter%20Algebra.pdf
4. https://ocw.mit.edu/courses/mathematics/18-703-modern-algebra-spring- 2013/lecture-notes/
5. https://en.wikibooks.org/wiki/Abstract_Algebra

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	1	2	2	2	3
CO2	2	2	2	2	1	3
CO3	2	2	2	1	2	3
CO4	2	1	2	2	2	3
CO5	2	1	2	2	2	3
Average	2	1.4	2	1.8	1.8	3

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

PAPER X: REAL ANALYSIS

TOTAL HOURS: 6   **SUB CODE : 20UMACT5010**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To develop the basic material in a systematic and rigorous manner in the context of real valued functions of a real variable through various examples.
- Able to construct, analyze mathematical proofs in analysis.
- To understand and apply the concepts of derivatives.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To know the concepts of convergent and limits of sequences.
CO2	Analyse the precise proofs of results that arise in the context of sequence and series.
CO3	Able to identify, formulate and solve problems in metric spaces.
CO4	Analyse the completeness and connectedness of metric spaces.
CO5	Understand and apply the concepts of derivatives.

SYLLABUS

UNIT– 1:   **18 Hours**

Sets and functions: Equivalence, Countability, Real Numbers, Least Upper Bounds. Sequences of Real Numbers: Definition of a sequence and subsequence, Limit of a sequence, Convergent sequences, Divergent sequences, Bounded sequences, monotone sequences.

Chapter :1 Sections 1.5 - 1.7 & Chapter :2 Sections 2.1-2.6

UNIT– 2:   **18 Hours**

Sequences of Real Numbers, Limit superior and Limit inferior, Cauchy sequences, Series of Real Numbers: Convergence and divergence, Series with non-negative terms, Alternating series, Conditional convergence and absolute convergence, Tests for absolute convergence.

Chapter :2 Sections 2.9 & 2.10 & Chapter :3 Sections 3.1-3.4, 3.6

UNIT– 3:   **18 Hours**

Limits and Metric spaces: Limit of a function on a real line, Metric spaces, Limits in metric spaces. Continuous functions on Metric spaces: Functions continuous at a point on the real line, Reformulation, Functions continuous on a metric space (Theorems without proof), Open sets, Closed sets

Chapter: 4   Sections 4.1-4.3   Chapter: 5 Sections 5.1 - 5.5

UNIT– 4:   **18 Hours**

Connectedness and completeness: Connected sets, bounded sets and totally bounded sets, Complete metric spaces.

Chapter: 6 Sections 6.1 – 6.4

UNIT– 5:   **18 Hours**

Calculus: Derivatives, Rolle's theorem, The Law of the mean, Fundamental theorems of calculus.

Chapter: 7 Sections 7.5 - 7.8

TEXT BOOK:

Richard. R. Goldberg, Reprint 2020, Methods of Real Analysis, Oxford and IBH

Publishing Co. Pvt. Ltd., New Delhi.

BOOKS FOR REFERENCE:

1. Venkatachalapathy S.G., 2005, Real Analysis, Margham Publications.
2. Chandrasekhara Rao K., Narayanan K.S., 2009, Real Analysis, Volume I and II - S.Viswanathan (Printer &Publishers) Pvt. Ltd.
3. Bali N.P., 2016, Golden Real Analysis, Laxmi Publications
4. Narayan Shanti, Mittal P.K., 2005, A Course of Mathematical Analysis, S. Chand.
5. Shanti Narayan, Raisinghania S, 2003, Elements of Real Analysis, S.Chand.

E-LEARNING RESOURCES:

1. https://www.math.lsu.edu/~sengupta/4031f06/IntroRealAnalysNot es.pdf
2. https://www.math.ucla.edu/~awertheim/Bootcamp/Notes/Real%20Analysis% 20Lecture%20Notes.pdf
3. https://ocw.mit.edu/courses/mathematics/18-100c-real-analysis- fall-2012/lecture-summaries/
4. https://www.freebookcentre.net/maths-books- download/Introduction-to-Real-Analysis-by-Liviu-I.- Nicolaescu.html
5. http://econ.upf.edu/~piotr/docs/RealAnalysisNotes.pdf

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	2	1	1	1	3
CO2	2	1	1	2	1	3
CO3	2	1	1	2	1	3
CO4	2	2	1	1	1	3
CO5	2	2	1	1	1	3
Average	**2**	**1.6**	**1**	**1.4**	**1**	**3**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

PAPER XI   DYNAMICS

TOTALHOURS: 6   **SUB CODE : 20UMACT5011**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To develop an understanding of the principles of dynamics and the ability to analyze problems in a systematic and logical manner.
- To develop working skills in the dynamic analysis of both particles and rigid bodies.
- To learn the mathematical formulations of dynamics problems.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To learn about basic kinematic concepts.
CO2	Understand the theory behind SHM and its properties.
CO3	To become proficient and work with problems related to projectiles.
CO4	To understand and analyse the concepts involved in direct impact of elastic bodies.
CO5	To understand and calculate moments of Inertia of areas and rigid bodies.

SYLLABUS

UNIT-1:   **18 Hours**

Kinematics: Velocity – Velocity of a particle describing a circle, Resultant velocity, Relative velocity. Acceleration - Rectilinear motion, Rectilinear motion with a constant acceleration. Coplanar motion -Velocity and acceleration in a coplanar motion, Angular velocity, Relative angular velocity – Simple problems**.**

Chapter: 1

UNIT-2:   **18 Hours**

Rectilinear motion under varying force: Simple Harmonic Motion, Simple Harmonic Motion along a horizontal line, Simple Harmonic Motion along a vertical line - Simple problems**.**

Chapter: 12 Sections 12. 1- 12. 3

UNIT-3:   **18 Hours**

Projectiles: Forces on a projectile-Nature of trajectory, Results pertaining to the motion of a projectile, Maximum horizontal range for a given velocity, Projectile projected horizontally, Projectiles projected on an inclined plane-Maximum range on an inclined plane - Simple problems**.**

Chapter: 13 Sections 13.1.1 to 13.1.4, 13.1.6 & 13.2.1

UNIT-4:   **18 Hours**

Impact: Impulsive force-Conservation of linear momentum, Impact of Sphere- Laws of impact, Direct impact of two smooth spheres, Direct impact of a   smooth sphere on a plane - Simple problems.

Chapter: 14 Sections 14. 1 to 14.3,14.4.1

UNIT-5:   **18 Hours**

Moment of Inertia: Perpendicular and Parallel axes theorems, Moment of Inertia of a rod, Triangular lamina, Circular lamina, Elliptic lamina, Circular ring, Right circular cylinder (hollow and solid), Solid right circular cone and Sphere (hollow and solid) –Simple problems.

Chapter: 17

TEXT BOOK:

Laxmi Duraipandian, Duraipandian P. & Muthamizh Jayapragasam, 2010, Mechanics, S.Chand Publishing

BOOKS FOR REFERENCE:

1. Vasistha and others, 2019, Mechanics, Krishna's Educational Publishers
2. Raisinghania M.D., 2006, Dynamics, S.Chand Publishing
3. Vittal P.R., Reprint: 2009, Dynamics, Margham Publications
4. Dharmapadam A.V., 2006, Dynamics, Viswanathan (Printers and Publishers), Pvt. Ltd.
5. Venkataraman M.K., 2004, Dynamics, Agasthiar Publications

E-LEARNINGRESOURCES:

1. https://ocw.mit.edu/courses/mechanical-engineering/2-003j-dynamics-and- control-i-spring-2007/lecture-notes/
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjf1ITRr47vAhWyzjgGHQ0kDJIQFjABegQIAxAD&url=http%3A%2F%2Fwww.damtp.cam.ac.uk%2Fuser%2Fpo242%2Fpdfs%2FMech2015%2FL9.pdf&usg=AOvVaw18-oK9WnjG-Zzuh8geDtUn
3. http://www.khanacademy.org/
4. https://web.mst.edu/~reflori/be150/Dyn%20Lecture%20Videos/Particle%20Pr ojectile%20Notes%201.pdf
5. https://www.youtube.com/watch?v=Qw15_rvZ9AM

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	2	2	1	1	2
CO2	2	2	2	1	1	2
CO3	2	3	3	1	1	2
CO4	2	3	3	1	1	2
CO5	2	2	3	1	1	1
Average	**2**	**2.4**	**2.6**	**1**	**1**	**1.8**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz,
Group discussion, reference material and videos, e-learning resources

PAPER XII GRAPH THEORY

TOTALHOURS: 6   **SUB CODE: 20UMACT5012**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To introduce graph theory concepts.
- To solve the applied problems.
- Knowledge of matrices and partitions.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To acquire knowledge of different types and models of graphs.
CO2	To understand and apply the fundamental concepts of Eulerian and Hamiltonian graphs and its properties.
CO3	To understand and how to solve problems involved in real life
CO4	To learn about concepts of dual and planar graphs.
CO5	To understand different colouring parameters and be able to describe and apply to develop algorithms.

SYLLABUS

UNIT– 1:   18 Hours

Graphs and subgraphs, Isomorphism and degrees, Walks and Connected graphs, Cycles in graphs, Cut vertices and Cut edges.

Chapter: 1 Sections :1.1, 1.3 to 1.7

UNIT– 2:   18 Hours

Eulerian graphs, Hamiltonian graphs and weighted graphs.

Chapter: 2 Sections:2.1, 2.3, 2.4

UNIT– 3:   18 Hours

Bipartite graphs, Marriage problem, Trees, Connector problems.

Chapter: 3 Sections: 3.1, 3.2, 3.3
Chapter: 4 Section 4.1

UNIT– 4:   18 Hours

Planar graphs, Euler formula, Dual of a plane graph, Characterization of planar graphs.

Chapter: 5 Sections :5.1, 5.2, 5.4, 5.5

UNIT– 5:   18 Hours

Vertex colouring, Edge colouring and an algorithm for vertex colouring.

Chapter: 6 Sections: 6.1, 6.2, 6.3

TEXT BOOK:

Choudum S.A., Reprint 2007, A First Course in Graph Theory, MacMillan India Ltd.
.

BOOKS FOR REFERENCE:

1. Arumugam S., Ramachandran S., Reprint 2001, Invitation to Graph Theory –, Scitech Publications (India) Pvt. Ltd.
2. Bondy J.A., Murty U.S.R., Reprint 2013, Graph Theory, Springer International.
3. Balakrishnan V.K., Reprint 2012, Graph Theory, Tata Mc Graw Hill Education Pvt. Ltd.
4. Murugan M., Reprint 2005, Introduction to Graph Theory, Mithali Publishing House
5. Rajagopalan S.P., Sattanathan R, Reprint 2009, Graph Theory, Margham Publications.
6. P.Geetha, Reprint 2012, Graph Theory, Scitech Publications(India) Pvt. Ltd.,

E-LEARNING RESOURCES:

1. http://www-th.ucdenver.edu/~wcherowi/courses/m4408/gtln.html
2. Graph Theory Lecture Notes by NPTEL | Download book
3. https://www.studocu.com/en-ca/document/ryerson-university/discrete- mathematics-ii/lecture-notes/lecture-notes-lectures-introductory-graph- theory/352148/view
4. https://youtu.be/Fxa-Uw1CtYQ
5. https://youtu.be/MiCsFcI_0ss

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	1	2	2	1	0
CO2	1	2	2	1	1	0
CO3	2	2	3	2	2	0
CO4	2	3	3	2	1	0
CO5	2	3	3	3	1	0
Average	**1.6**	**2.2**	**2.6**	**2**	**1.2**	**0**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

ELECTIVE PAPER I NUMERICAL METHODS

TOTALHOURS: 6

CREDIT: 5

SUB CODE : 20UMAET5001

L-T-P : 4-2-0

COURSE OBJECTIVES:

- To provide the necessary basic concepts of numerical methods
- To give procedures for solving numerically different kinds of problems in scientific computing.
- To learn solving differential equations of first order numerically.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	Understanding and demonstrating the available Numerical to obtain approximate solutions by possible techniques
CO2	Apply suitable procedure to find the solution of Algebraic, Transcendental and system of equations which cannot be solved analytically
CO3	Solving the Mathematical problems of finding derivatives and evaluating integrals withNumerical formulas
CO4	Analyze the problems on first order differential equations with known initial conditions and apply an effective method to reach an approximate solution
CO5	Equip and enhance their Knowledge to deal with and obtain an approximate solution problem which has a real valued solution

SYLLABUS

UNIT-1:   **18 hours**

Algebraic and Transcendental equations: Introduction, Errors in numerical computation, Iteration method, Bisection method, Regula-falsi method, Newton-Raphson method.

Chapter 3: Sections 3.0-3.5

UNIT-2 :   **18 hours**

Simultaneous equations: Introduction, Simultaneous equations, Back substitution, Gauss Elimination method, Gauss –Seidel iteration method.

Finite Differences: Introduction, Forward, Backward and Central difference operators, Fundamental theorem for finite differences, Shift Operator, Relation between operators.

Chapter 3: Sections 4.0-4.3,4.8
Chapter 6: Sections 6.0-6.1(upto Theorem 6.1), 6.2

UNIT-3:   **18 hours**

Interpolation: Introduction, Newton's interpolation formulae, Lagrange's interpolation formula, Divided differences, Newton's divided difference formula, inverse interpolation.

Chapter 7: Sections 7.0,7.1,7.3-7.6

UNIT-4:   **18 hours**

Numerical Differentiation: Introduction, Derivatives using Newton's Forward and Backward formulae.

Numerical Integration: Newton's Cotes' quadrature formula, Trapezoidal rule, Simpson's one - third rule, Simpson's three - eighth rule.

Chapter 8: Sections 8.0-8.2, 8.5

UNIT-5:   **18 hours**

Numerical solutions of Ordinary differential equations: Introduction, Taylor's series method, Picard's method, Euler's method and Runge-Kutta method of fourth order, Predictor Corrector method, Milne's method, Adams-Bashforth method (no derivations).

Chapter 8: Sections 8.0-8.2, 8.5

TEXT BOOK:

Arumugam S., Thangapandi Isaac A., Somasudaram A., 2002, Numerical Methods, Scitech Publications(India) Pvt. Ltd.

BOOKS FOR REFERENCE:

1. E.Balagurusamy, 2017, Numerical Methods, Mc.Graw hill Education,
2. Baburam, 2009, Numerical methods, Pearson Education India
3. Satteluri R K Iyengar, Rajinder Kumar Jain, , 2020, Numerical Methods, New Age International (P) Ltd Publishers
4. Gopal Pathak, 2013, Numerical methods, JBC Publishers, 2013
5. Jeffery J. Leader, 2004, Numerical Analysis and Scientific Computation 1st Edition, Pearson Education

E-LEARNING RESOURCES:

1. https://perhuaman.files.wordpress.com/2014/07/metodos-numericos.pdf
2. http://www.ohiouniversityfaculty.com/youngt/IntNumMeth/book.pdf
3. https://www.math.unipd.it/~mrrusso/Didattica/NA-Yaounde/Manual.pdf
4. https://www.sjsu.edu/me/docs/hsu-Chapter%2010%20Numerical%20solution%20methods.pdf
5. https://stemez.com/subjects/maths/SNumericalAnalysis/SNumericalAnalysis.php

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	2	3	2	1	2
CO2	2	2	3	3	1	1
CO3	1	2	3	3	1	1
CO4	2	2	2	2	1	1
CO5	2	2	2	2	1	1
Average	**1.6**	**2**	**2.6**	**2.4**	**1**	**1.2**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

SEMESTER VI

PART	COURSE	TITLE OF THE PAPER	COURSE CODE	HRS	CREDITS	CA	SE	T
III	Core Paper-XIII	Linear Algebra	20UMACT6013	6	4	40	60	100
	Core Paper-XIV	Complex Analysis	20UMACT6014	6	4	40	60	100
	Core Paper-XV	Programming Language 'C'	20UMACT6015	4	3	40	60	100
	Elective Paper-II	Formal Languages and Automata Theory	20UMAET6002	6	5	40	60	100
	Elective Paper -III	Operations Research	20UMAET6003	6	5	40	60	100
	Major Practical-I	Practical - C Language	20UMACP6001	2	1	40	60	100
IV	Skill Based Elective	Offered to students of same department SWAYAM-MOOC	20USSCS6004		3	50	-	100
	TOTAL				25			700

SEMESTER VI

PAPER XIII LINEAR ALGEBRA

TOTALHOURS: 6   **SUB CODE: 20UMACT6013**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To understand the concept of the algebraic properties of vector spaces, vector subspace
- To understand various types of mappings
- To learn the concept of matrices and transformations

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To recognize the basic concepts of vector spaces and study their properties.
CO2	Apply the knowledge of vector spaces to identify and formulate its basis and dimension.
CO3	To learn about Inner product space and its properties.
CO4	To understand the algebra of transformation and characteristic roots.
CO5	Demonstrate the relationship between the operation on linear transformation and matrices.

SYLLABUS

UNIT– 1:   **18 Hours**

Vector Spaces: Elementary Basic Concepts, Linear Independence and Bases.

Chapter: 4 Sections 4.1, 4.2 (upto Corollary 3 of Theorem 4.2.1)

UNIT– 2:   **18 Hours**

More on Bases, Dual Spaces.

Chapter: 4 Sections 4.2 (from lemma 4.2.4), 4.3

UNIT– 3:   **18 Hours**

Inner Product Spaces.

Chapter: 4 Section 4.4

UNIT– 4:   **18 Hours**

Linear transformations: The Algebra of Linear Transformations, Characteristic roots.

Chapter: 6 Sections 6.1 & 6.2

UNIT– 5:   **18Hours**

Matrices, Canonical forms: Triangular form.

Chapter: 6 Sections 6.3 & 6.4

TEXT BOOK:

Herstein I.N., Reprint: 2014, Topics in Algebra, Second Edition, Wiley India Pvt. Ltd New Delhi

BOOKS FOR REFERENCE:

1. Santiago M.L. 2009, Modern Algebra, Tata McGraw-Hill Publishing Co,Ltd,
2. Arumugam S, Thangapandi Isaac A., 4th Reprint June 2006, Modern Algebra, Scitech Publications (India) Pvt.Ltd.
3. Vasistha and others, 2019, Linear Algebra and Matrices, Krishna's Educational Publishers
4. Arora P.N., 2005, Topic in Algebra, Sultan Chand and Sons
5. Devendra Kumar, 2012, Linear Algebra concepts and Applications, Narosa Publishing House

E-LEARNING RESOURCES:

1. https://www.khanacademy.org/math/linear-algebra
2. https://towardsdatascience.com/linear-algebra-for-deep-learning- f21d7e7d7f23
3. https://www.engineer4free.com/linear-algebra.html
4. https://www.khanacademy.org/math/linear-algebra
5. https://www.thelearningpoint.net/home/mathematics/basic-concepts-in-linear- algebra-and-vector-spaces

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	1	2	1	1	3
CO2	2	2	2	2	2	3
CO3	2	1	2	2	1	2
CO4	2	2	3	2	2	3
CO5	3	1	3	2	2	3
Average	2.2	1.4	2.4	1.8	1.6	3

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

PAPER XII COMPLEX ANALYSIS

TOTALHOURS: 6   **SUB CODE: 20UMACT6014**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- This course aims to introduce the basic ideas of analysis for complex functions in complex variables through relevant examples.
- Develop a clear understanding of analytic functions,complex integral and a range of skills which will allow students to work effectively with the concepts.
- Emphasis has been laid on Cauchy's theorem, series expansions and calculation of residues.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To learn the significance of differentiability of complex functions leading to the understanding of Cauchy- Riemann equations
CO2	To learn some elementary functions and evaluate the contour integrals and understand the role of Cauchy-Goursat theorem and Cauchy integral formula.
CO3	To understand and classify the nature of singularities and expand some simple functions as their Taylor's and Laurent's series.
CO4	To acquire skills of finding integral values of complex functions using residues.
CO5	The learner will acquire basic knowledge about conformal mapping and Bilinear transformation.

SYLLABUS

UNIT-I: **18 Hours**

Regions in the complex plane, Functions of a complex variable, Limits, Limits involving the point at infinity, Continuity, Derivatives, Differentiation formulas, Cauchy-Riemann Equations, Sufficient conditions for Differentiability, Cauchy- Riemann equations in polar form, Analytic Functions and Harmonic Functions - Simple problems.

Chapter: 1 Section 10
Chapter: 2 Sections 11, 14, 16, 17, 18, 19, 20, 21, 22, 23 & 25

UNIT-II: **18 Hours**

Definite Integrals of Functions w(t) , Contours, Contour Integrals, Examples, Upper Bounds for Moduli of Contour Integrals, Cauchy- Goursat theorem (only statement),Simply and Multiply Connected Domains and Cauchy Integral formula - Simple problems.

Chapter 4: Sections 37, 38, 39, 40, 41, 44, 46, 47.

UNIT-III: **18 Hours**

Derivatives of Analytic Functions, Liouville's theorem and the Fundamental theorem of Algebra, Taylor series, Laurent series - Simple problems.

Chapter : 4 Sections 48 & 49.
Chapter : 5 Sections 53 & 55

UNIT-IV: **18 Hours**

Residues, Cauchy's Residue Theorem, Using a single Residue, The three types of isolated singular points, Residues at Poles, Examples - Simple problems.

Chapter: 6 Sections 62, 63, 64, 65, 66, 67.

UNIT-V: **18 Hours**

Linear Transformation, The transformation $w = \dfrac{1}{z}$, Mappings by $\dfrac{1}{z}$, Linear fractional transformations, An implicit form, Mappings of the upper half plane, The transformation w= sin z and mapping by z^2 and branches of $z^{\frac{1}{2}}$, Applications of Conformal Mapping- Two dimensional fluid flow.

Chapter: 8 Sections 83,84,85,86,87,88,89,90.
Chapter :10 Section 106.

TEXT BOOK:

James Ward Brown, Ruel.V.Churchill, 2003, Complex Analysis and Applications - McGraw - Hill,Inc,Seventh Edition

BOOKS FOR REFERENCE:

1. Shanti Narayan & Mittal P.K., Reprint 2019, Theory of Functions of a Complex variable, S.Chand Publishing
2. Vasistha A.R., 2019, Complex Analysis, , Krishna's Educational Publishers
3. Mathews H.H., Howell R.W., 2018, Complex Analysis, Narosa Publishing House
4. Ponnusamy S., 2019, Foundations of Complex Analysis, Narosa Publishing House,2019
5. Sharma J.N., Reprint 2004, Functions of Complex Variables. Krishna's Educational Publishers

E-LEARNINGRESOURCES:

1. http://link.springer.com/content/pdf/bfm%3A978-1-4614-0195-7%2F1.pdf
2. http://www.math.iitb.ac.in/~ars/revbook.pdf
3. http://www.maths.lth.se/~olofsson/CompHT06.pdf
4. https://youtu.be/zUxUkK45yvE
5. https://youtu.be/rlfHWgDzDB8

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	2	1	1	1	3
CO2	2	2	1	1	1	3
CO3	2	2	1	1	1	3
CO4	2	2	1	1	1	3
CO5	2	2	1	1	1	3
Average	**2**	**2**	**1**	**1**	**1**	**3**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching,Assignment, Seminar, Quiz, Group discussion, reference material and videos.

PAPER XV PROGRAMMING LANGUAGE C

TOTALHOURS: 6   **SUB CODE: 20UMACT6015**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To develop object oriented programming skills in 'C'.
- To become proficient in interfaces, decision making and looping.
- To acquire knowledge of basic computational objectives
  using available mathematical libraries.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To acquire knowledge about basic data types, various operators and functions in C.
CO2	To get the basic idea of decision making using control statements with and without loops.
CO3	To learn about user defined functions. Acquire the knowledge about call by value and call by reference.
CO4	To learn about C programming with strings and arrays upto two dimensions.
CO5	To understand pointers, structures and unions.

SYLLABUS

UNIT– 1:   **18 Hours**

Character set, C tokens, Keywords and Identifiers, constants, variables, data types, declaration of variables, declaration of storage class, assigning values to variables, defining symbolic constants, declaring a variable as constant. Operators and Expressions: Arithmetic operators, relational operators, logical operators, assignment operators, Increment and decrement operator, conditional operators, bitwise operators, special operators, arithmetic expressions, evaluation of expressions, precedence of arithmetic operators, some computational problems, type conversions in expressions, operator precedence and associativity, mathematical functions. Managing input and

output operations: Reading a character, writing a character, formatted input, formatted output.

Chapter: 2,3,4

UNIT– 2:   18 Hours

Decision making and branching: Decision making with if statement, simple if statement, The if…else statement, nesting of if…else statements, the else if ladder, the switch statement, the ?: operator, the goto statement. The while statement, do statement, for statements, jumps in loops, nested loops and comma operator, selection, switch, break and continue statements.

Chapter: 5,6

UNIT– 3:   18 Hours

User-Defined Functions: 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, arguments but no return values, no arguments but returns a value, functions that return multiple values, nesting of functions, recursion, passing arrays to functions, passing strings to functions.

Chapter: 9

UNIT– 4:   18 Hours

Arrays: One dimensional arrays, Declaration of One dimensional arrays, initialization of One dimensional arrays, Two dimensional arrays, initializing Two-dimensional arrays, Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to screen, Arithmetic operations on Characters, putting Strings together, comparison of two Strings, String- Handling functions, Table of Strings.

Chapter: 7, 8

UNIT– 5:   18 Hours

Pointers: Pointer operators, Declaring a pointer variable, Initialization of pointers, Passing pointers to a function, Call by value, Call by reference, Pointers and Arrays.Definition of a structure, Declaring a structure, The period operator, Initializing a structure, Structure operations, Array of structures, Arrays within structures, Structures within structures, Structures and pointers, Structures and functions.

Chapter: 8

TEXT BOOK:

Balagurusamy E., 2008. Programming Language C with Practicals, Programming in ANSI C, Tata Mcgraw Hill pub.Co.Ltd., New Delhi,

BOOKS FOR REFERENCE:

1. Ananthi Sheshasaayee and Sheshasaayee G., Reprint 2002, Margham Publications, Chennai
2. Pandiarajan P., 2005, Programming in C ,Vijay Nicole Imprints Pvt. Ltd.
3. Mandeep Mittal, Shardha Porwal, 2016, C Programming- Narosa Publications,
4. Arunesh Goyal, 2009, C Programming Language, Narosa Publications
5. Brian W. Kernighan , Dennis M. Ritchie, Reprint 2000, C Programming Language - Pearson Publishing company

E-LEARNING RESOURCES:
1. http://en.wikibooks.org/wiki/C_Programming
2. http://www.planetpdf.com/codecuts/pdfs/ooc.pdf
3. http://www.cs.rit.edu/~ats/books/ooc.pdf
4. https://www.freebookcentre.net/programming-books-download/Lecture-Notes- On-C-Programming-by-L.-V.-Narasimha-Prasad-and-E.-Krishnarao-Patro.html
5. https://www.freebookcentre.net/programming-books-download/Computer- Programming-Fundamentals-Using-C-Part2.html
6. https://www.freebookcentre.net/programming-books-download/Lecture-Note- On-Programming-In-C.html

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	2	3	3	1	0
CO2	2	2	3	3	1	0
CO3	2	3	3	3	1	1
CO4	1	2	3	3	1	1
CO5	1	2	2	2	1	1
Average	**1.4**	**2.2**	**2.8**	**2.8**	**1**	**0.6**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

PRACTICALS IN C

SUB CODE: 20UMACP6015

1. Write a program that asks the user to enter two integers and prints all the prime numbers between them.
2. Generate the series for the following functions and check the result using the corresponding built- in function :
   - (i) sin x
   - (ii) cos x
   - (iii) e^x.
3. Perform
   - (i) Transpose of a Matrix
   - (ii) Determinant of a Matrix.
4. Write a program to compute the roots of a quadratic equation $ax^2 + bx + c = 0$.
5. Develop code for function Fibonacci to find the nth Fibonacci number for an integer n. Use recursion and the ternary operator.
6. Write a program to compute the binomial coefficient nC_r, where n and r are positive integers using a user-defined function.
7. To add complex numbers using functions
8. Sorting a given set of numbers in the ascending order.
9. Write a function that exchanges two character strings via pointers.
10. Write a program to read the name, grade and ten test scores into the structure and print them out along with the high, low and average.

TEXT BOOK:

Ananthi Sheshasaayee and G.Sheshaayee, Reprint 2016, Programming Language C with praticals, Margham Publications Chennai.

BOOKS FOR REFERENCE:

Balagurusamy E., 2008. Programming Language C with Practicals ,

Programming in ANSI C, Tata Mcgraw Hill pub.Co.Ltd., New

ELECTIVE PAPER II FORMAL LANGUAGES AND

AUTOMATA THEORY

TOTALHOURS: 6 **SUB CODE: 20UMAET6002**

CREDIT: 5 **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To learn the basics of theory of computation and analyze the types involved in Formal Language.
- To enhance the skills needed for understanding the design of finite state Automata and its properties.
- To develop finite state automata for various regular languages.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	Introduction to Grammars, Classification of Grammars and Languages with Chomsky hierarchy
CO2	Understanding the basic properties of different grammars. Learning to generate grammars and produce strings from a specific language and vice versa.
CO3	Learning the different representation concepts of context free grammar
CO4	Understanding Finite Automaton, Designing a FSA. Conversion of NFA to DFA, representing through regular expressions
CO5	Key understanding the basics of machine language with designing and Analyzing the output of Finite State Machines.

SYLLABUS

UNIT-1:   **18 Hours**

Introduction, Phrase Structure Languages, Chomsky hierarchy.

Book 1: Chapter: 1, 2

UNIT-2:   **18 Hours**

Closure properties on Languages, Context-free Language- Derivation trees and Ambiguity-Related theorems and problems.

Book 1: Chapter: 3, Chapter: 4 Sections 4.1 to 4.2

UNIT-3:   **18 Hours**

Context-free Languages, Reduced grammar, Chomsky normal form, Greibach normal form-Related theorems and simple problems.

Book 1: Chapter: 4 Sections 4.3 to 4.4

UNIT-4:   **18 Hours**

Finite automata: Finite state systems, Basic definitions, Non-deterministic finite automata, Finite automata with ε – Moves- Related theorems and simple problems.

Book 2: Chapter: 2 Sections 2.1 to 2.4

UNIT-5:   **18 Hours**

Regular expressions, definitions and notations, Pumping lemma for regular sets-- Related theorems and simple problems

Book 2: Chapter: 2 Sections 2.5, Chapter: 3 Sections 3.1

TEXT BOOK(S):

1. RaniSiromoney, Revised Edition 1984, Formal Languages and Automata theory, CLS Publishers, Chennai
2. John E. Hopcroft and Jeffery D. Ullman, Nineteenth Reprint 2002 Introduction to Automata theory, Languages and Computation' Narosa Publishing House.

BOOKS FOR REFERENCE:

1. Sunitha K.V.N., Kalyani N., 2011, Theory of computation, McGraw hill Publications
2. Peter Linz, Reprint 2016, An Introduction to Formal languages and Automata, Narosa Publishing House
3. Martin JC, 2011, Introduction to Languages and the Theory of Computation McGraw-Hill
4. Kamala Krithivasan, Rama R, 2009, Introduction to Formal languages and Automata theory and Computation, Pearson Publication
5. Mishra K.L.P., Chandrasekaran N., Third edition 2007, Theory of Computer Science Automata, Languages and Computation, Prentice Hall India

E-LEARNINGRESOURCES:

1. https://www.javatpoint.com/finite-automata
2. https://www.tutorialspoint.com/automata_theory/index.htm
3. https://www.includehelp.com/toc/
4. https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/
5. https://lecturenotes.in/notes/28305-note-for-formal-languages-and-automata- theory-flat-by-priyanka-gupta

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	2	2	3	1	0
CO2	1	2	2	3	1	0
CO3	1	2	2	2	1	0
CO4	2	3	2	2	1	1
CO5	2	3	3	3	1	1
Average	**1.4**	**2.5**	**2.2**	**2.6**	**1**	**0.4**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Teaching, Assignment, Seminar, Quiz, Group discussion, reference materials and videos

ELECTIVE PAPER III OPERATIONS RESEARCH

TOTALHOURS: 6   **SUB CODE: 20UMAET6003**

CREDIT: 5   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To present students the elements and importance of understanding the meaning, purpose and tools of operations Research.
- To enable the students to know the applications and the limitations of operation Research.
- To learn about formulation, solution techniques, Basic optimality condition.
- To understand the theory of linear programming, computational methods for solving linear programming problems

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To learn the mathematical formulation of LPP and discuss the graphical solution.
CO2	To understand the theory of the simplex method used to solve Linear programming problems.
CO3	To understand and solve transportation.
CO4	To learn the methods of sequencing, to optimize the objective functions.
CO5	To apply systematic scientific approach for network scheduling Techniques.

SYLLABUS

UNIT– 1:   **18 Hours**

Introduction, Formulation of Linear Programming Problem, Graphical solution.

Chapter: 1, 2 Sections 1.1 to 1.9, 2.1to 2.8.

UNIT– 2:   **18 Hours**

Solving Linear Programming Problem by Simplex method. Solving Linear Programming Problem by Artificial variable method and Two- phase-method.

Chapter: 3 Sections 3.1 & 3.2

UNIT– 3:   **18 Hours**

Transportation problem, Assignment problem.

Chapter: 7,8 Sections 7.1 to 7.4, 8.1to 8.9.

UNIT– 4:   **18 Hours**

Sequencing Problem: Introduction, n jobs through 2 machines, n jobs through 3 machines, 2 jobs through m machines and n jobs through m machines.

Chapter: 14   Sections 14.1 to 14.7.

UNIT– 5:   **18 Hours**

CPM: Introduction, Basic terminologies, Rules for constructing network, Network computation (CPM), Floats.
PERT:.Programme Evaluation Review Technique(PERT), Basic difference between PERT and CPM.

Chapter: 15 Sections 15.1 to 15.7

TEXT BOOK:

Sundaresan V., Ganapathy Subramanian K.S. & Ganesan, K., Fourth Edition 2007, Resource Management Techniques'(Operations Research) A. R. Publications

BOOKS FOR REFERENCE:

1. Ramamurthy P., 2007, Operations Research, New Age International (p)Ltd
2. Hira D.S., Gupta P.K., 2015, Operations Research, S.Chand& co.
3. Sharma J.K., 2017, Operation Research Theory and Applications Laxmi Publications
4. Kanti Swarup, Gupta P.K., Man Mohan, 2019, Operations Research— Introduction to Management Science Sultan Chand and sons
5. Sankara Iyer P, 2008, Operations Research, Tata McGraw Hill Publishing Company

E-LEARNING RESOURCES:

1. https://www.cs.toronto.edu/~stacho/public/IEOR4004-notes1.pdf
2. http://karthik.ise.illinois.edu/courses/or/ie310-fa-18.html
3. http://www.maths.qmul.ac.uk/~ffischer/teaching/mor/index.html
4. https://www.wichita.edu/academics/engineering/ime/esrabuyuktahtak in/document s/IME550_syllabus_Fall2011_3.pdf
5. http://www.notes4free.in/admin/postimages/OR%20NOTES.pdf

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	2	3	3	1	2
CO2	1	2	3	3	2	3
CO3	2	3	3	3	1	3
CO4	2	3	3	3	1	3
CO5	3	3	3	3	1	3
Average	**1.8**	**2.6**	**5**	**5**	**1.6**	**2.8**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

ALLIED PAPERS OFFERED TO OTHER DEPARTMENT STUDENTS

SEMESTER –I

S NO.	SUBJECT	SUBJECT CODE	TITLE OF THE PAPER	C	CIA	ESE	T
PART III							
1	ALLIED THEORY I	20USTAT1001	Allied Mathematics - I	5	40	60	100
2	ALLIED THEORY- I	20UCHAT1001	Allied Mathematics - I	5	40	60	100
3	ALLIED THEORY I	20UCSAT1001	Allied Mathematics - I	5	40	60	100

SEMESTER-II

S NO.	SUBJECT	SUBJECT CODE	TITLE OF THE PAPER	C	CIA	ESE	T
PART III							
1	ALLIED THEORY-II	20USTAT2002	Allied Mathematics - II	5	40	60	100
2	ALLIED THEORY- II	20UCHAT2002	Allied Mathematics - II	5	40	60	100
3	ALLIED THEORY II	20UCSAT2002	Allied Mathematics - II	5	40	60	100

SEMESTER – III

S NO.	SUBJECT	SUBJECT CODE	TITLE OF THE PAPER	C	CIA	ESE	T
			PART III				
1	ALLIED THEROY- III	20UPHAT3003	Allied Mathematics - I	5	40	60	100

SEMESTER – IV

S NO.	SUBJECT	SUBJECT CODE	TITLE OF THE PAPER	C	CIA	ESE	T
			PART III				
1	ALLIED THEORY- IV	20UPHAT4004	Allied Mathematics - II	5	40	60	100

ALLIED PAPER I ALLIED MATHEMATICS I
(I B.Sc. Statistics)

TOTALHOURS: 6   **SUB CODE: 20STAT1001**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To inspire the students to get the knowledge in basic mathematical concepts.
- To present a basic study on summation of series, Differential calculus, Trigonometry and integral calculus
- To enhance problem solving skills on various above said fields.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To find sum of Binomial, Exponential and Logarithmic infinite series using acquired knowledge on summation of series.
CO2	To apply Leibnit'z formula to obtain n^{th} derivative of product.
CO3	To acquire knowledge to obtain Jacobian and maxima and minima of function of two variables.
CO4	To apply analytical techniques to find the expansion of various trigonometric functions.
CO5	To evaluate integration of various types of functions using reduction formulas.

SYLLABUS

UNIT– 1:   **18 hours**
    Algebra: Summation of Binomial, Exponential and Logarithmic series

(without proof)

Chapter 2: Sections: 2.1.3, 2.2.1, 2.3.3

UNIT– 2:   **18 hours**
    Differential Calculus: n^{th} derivative, Leibnitz's formula for the nth derivative of a
Product (without proof).

Chapter 1: Sections: 1.1.1 & 1.1.2

UNIT–3:18 hours   **18 hours**
    Differential Calculus: Jacobians, Maxima and Minima of function of two variables

Chapter 1: Sections: 1.2 & 1.3.1

UNIT– 4:   **18 hours**
    Trigonometry: Expansions of $\sin n\theta$, $\cos n\theta$, $\sin^{n}\theta$, $\cos^{n}\theta$ and $\sin\theta$, $\cos\theta$,
$\tan\theta$ in powers of θ.
.

Chapter 6: Sections: 6.1.1 to 6.1.3.

UNIT– 5:   **18 hours**
    Integral Calculus: Reduction formula **:** $\int Sin^{n}x\,dx$, $\int Cos^{n}x\,dx$, $\int Sin^{m}x\,Cos^{n}x\,dx$,

$\int x^{n}e^{ax}\,dx$, $\int x^{n}\cos ax\,dx$, $\int x^{n}\sin ax\,dx$, $\int x^{m}(\log x)^{n}\,dx$,

$\int_{0}^{\frac{\pi}{2}}\cos^{m}x\cos nx\,dx$ **,** $\int_{0}^{\frac{\pi}{2}}\cos^{m}x\sin nx\,dx$

Chapter 2: Sections: 2.9 (Related to only above formulae)

TEXT BOOK(S):

    Duraipandian P.,Udayabaskaran S., Reprint: 2016, Allied Mathematics
    Volumes I&II   Muhil Publishers, Chennai.

BOOKS FOR REFERENCE:

1. Abdul Rasheed A., Reprint: 2004, Allied Mathematics, Vijay Nicole Imprints Private Limited, Chennai.
2. Singaravelu A.,2016, Allied Mathematics Meenakshi Agency, Chennai.
3. Vittal P. R., Malini V., Reprint 2007, Algebra and Trigonometry Margham Publications.
4. Shanthi Narayanan and P.K. Mittal P. K., 2018, Differential Calculus, S.Chand & co,
5. Vasistha A. R., Vasistha A. K., 2019, Calculus, Krishna's Educational Publishers.

E-LEARNING RESOURCES:

1. https://www.britannica.com/science/trigonometry
2. https://www.math.wisc.edu/~keisler/calc.html
3. https://kullabs.com/class-12/mathematics-1/binomial-theorem/exponential-and-logarithmic-function-and-seriesexpansion-of-exax-and-log1+x#:~:text=Things%20to%20remember-,Exponential%20and%20Logarithmic%20Function%20and%20Series%2CExpansion%20of%20e%5Ex,and%20log(1%2Bx)&text=is%20called%20an%20exponential%20function,index%20x%20is%20a%20variable.&text=If%20we%20have%20an%20exponential,by%20x%3Dlogay%20.
4. http://people.ucalgary.ca/~aswish/MATH267L15_ReducFor.pdf
5. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjVt_nX3vzuAhUFT30KHfC-Cg4QwqsBMAJ6BAgWEAM&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DytNYAtzC3Gc&usg=AOvVaw14pDOUtVknXTB5QuB2JQa6

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	3	1	2	2	2
CO2	2	3	3	2	2	2
CO3	3	3	3	2	2	3
CO4	2	3	3	2	2	1
CO5	2	3	3	2	1	1
Average	**2.2**	**3**	**2.6**	**2**	**1.8**	**1.8**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

ALLIED PAPER IALLIED MATHEMATICS I
(I B.Sc. Chemistry)

TOTALHOURS: 6   **SUBCODE : 20CHAT1001**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To inspire the students to get knowledge in basic Mathematical concepts.
- Introducing the need for Mathematics to recognize appropriate investigative procedures in various fields.
- To present a study on summation of series, Matrices, Trigonometry, Finite differences.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To learn about summation of Binomial, Exponential and Logarithmic infinite series.
CO2	Recognize the concept of certain types of matrices, Eigenvalues, Eigen vectors and Cayley Hamilton theorem.
CO3	The learner will become proficient in expansion of trigonometric series.
CO4	To understand the basic theory in Interpolation and applications.
CO5	To demonstrate knowledge in various types of hyperbolic functions.

SYLLABUS

UNIT-1:   **18 hours**

Algebra: Summation of Binomial, Exponential and Logarithmic series (without proof)

Chapter 2: Sections: 2.1.3, 2.2.1, 2.3.3

UNIT-2:   **18 hours**

Matrices: Symmetric matrix, Skew -Symmetric matrix, Hermitian matrix, Skew-Hermitian matrix, Orthogonal matrix and Unitary matrix. Eigenvalues and Eigenvectors, Cayley- Hamilton theorem (without proof), Inverse of a matrix using
Cayley-Hamilton theorem

Chapter 4: Sections: 4.1.1 to 4.1.6, 4.5, 4.5.2 , 4.5.3

UNIT-3:   **18 hours**

Trigonometry: Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, $\sin^{n}\theta$, $\cos^{n}\theta$ and $\sin\theta$, $\cos\theta$, $\tan\theta$ in powers of θ.

Chapter 6: Sections: 6.1.1, 6.1.2, 6.1.3.

UNIT-4:   **18 hours**

Trigonometry**:** Hyperbolic functions, Relation between circular and hyperbolic functions, Formulae in hyperbolic functions, Real and Imaginary parts and Inverse hyperbolic functions.

Chapter 6: 6.2, 6.2.1, 6.2.2, 6.2.3, 6.3.

UNIT-5:   **18 hours**

Finite differences: Interpolation, Interpolation formulae

Chapter 5: 5.1,5.2

TEXT BOOK(S):

Duraipandian P., Udayabaskaran S., Reprint: 2016, Allied Mathematics-Volume I Muhil Publishers, Chennai.

BOOKS FOR REFERENCE:

1. Abdul Rasheed A., Reprint: 2004, Allied Mathematics, Vijay Nicole Imprints Private Limited, Chennai
2. Singaravelu A., Reprint: 2018Allied Mathematics, Meenakshi Agency, Chennai.
3. Venkatachalapathy S. G., Reprint: 2016, Allied Mathematics Margham Publications()
4. Kandasamy P., K. Thilagavathy K., Reprint: 2004, Mathematics – I, II, S.Chand & Company Pvt. Ltd.
5. ChandraSekaran, Nithya, Reprint: 2017, Allied Mathematics I, Dhanam Publications,

E-LEARNINGRESOURCES:

1. https://www.learncbse.in/trigonometry-formulas/
2. https://www.askiitians.com/revision-notes/maths/trigonometric-functions/
3. http://www.khullakitab.com/binomial-theorem-exponential-and-logarithmic-series/notes/mathematics/grade-12/30/practices
4. https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear-algebra-introduction-to-eigenvalues-and-eigenvectors
5. https://global.oup.com/uk/orc/biosciences/maths/reed/01student/numerical_tutorials/

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	3	1	2	2	2
CO2	2	2	2	2	1	3
CO3	2	3	3	2	2	2
CO4	2	3	3	3	2	1
CO5	2	3	2	2	2	2
Average	**2**	**2.8**	**2.2**	**2.2**	**1.8**	**2**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

ALLIED PAPER I ALLIED MATHEMATICS I
(I B.Sc. Computer Science)

TOTALHOURS: 6   **SUBCODE : 20UCSAT1001**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To inspire the students to get the knowledge in basic Mathematical concepts.
- To present a study on a summation of series, Matrices, Trigonometry, Finite Differences.
- To learn basic numerical calculations using arithmetic operations.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To learn about summation of Binomial, Exponential and Logarithmic series.
CO2	Recognize the concept of certain types of matrices, Eigenvalues, Eigen vectors and Cayley-Hamilton theorem.
CO3	The learner will become proficient in expansion of trigonometric series.
CO4	To understand the basic concepts of Laplace transforms
CO5	To learn the basic concepts of Inverse Laplace transforms

SYLLABUS

UNIT– 1: 18hours
Algebra: Summation of Binomial, Exponential and Logarithmic series(without proof)
Vol 1:Chapter 2: Sections: 2.1.3, 2.2.1, 2.3.3

UNIT– 2: 18hours
Matrices:Symmetric, Skew symmetric, Orthogonal and Unitary matrices, Eigen roots & Eigen vectors, Cayley- Hamilton theorem (without proof), verification and computation of inverse matrix.

Vol 1: Chapter 4: Sections: 4.1.1 to 4.1.6, 4.5.1 to 4.5.3

UNIT– 3: 18hours
Trigonometry : Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, $\sin^n \theta$, $\cos^n \theta$ and $\sin\theta$, $\cos\theta$, $\tan\theta$ in powers of θ.

Vol 1: Chapter 6: Sections: 6.1.1 to 6.1.3.

UNIT– 4: 18hours
Laplace Transforms: Laplace transforms of standard functions and properties

Vol 2: Chapter 7: Sections: 7.1.1 to 7.1.6.

UNIT– 5: 18hours
Inverse Laplace Transforms: Inverse Laplace transforms of standard functions and properties.

Vol 2: Chapter 7: Sections: 7.2.1, 7.2.3

TEXT BOOK(S):

Duraipandian P., Udayabaskaran S., 2016, Allied Mathematics-Volumes I&II

Muhil Publishers, Chennai.

BOOKS FOR REFERENCE:

1. Manicavachagom Pillay T. K., Natarajan T. K., Ganapathy K. S., Algebra, Reprint 2009, Volume I, II S. Viswanathan(Printers and Publishers), pvt. Ltd.
2. Kandasamy P., K. Thilagavathy K., Reprint: 2004, Mathematics – I, II , S.Chand & Company Pvt. Ltd.
3. Vittal P. R., Malini V., Reprint 2007, Algebra and Trigonometry, Margham Publications.
4. Venkatachalapathy S. G., Reprint: 2016, Allied Mathematics, Margham Publications.
5. Abdul Rasheed A., Reprint: 2004 Allied Mathematics, Vijay Nicole Imprints Private Limited, Chennai.

E-LEARNING RESOURCES:

1. https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear-algebra-introduction-to-eigenvalues-and-eigenvectors
2. https://youtu.be/dsM_WRbHS48
3. https://resources.saylor.org/wwwresources/archived/site/wp-content/uploads/2013/04/ME401-1.2.2-LaplaceTransform.pdf
4. https://www.askiitians.com/revision-notes/maths/trigonometric-functions/
5. http://www.khullakitab.com/binomial-theorem-exponential-and-logarithmic-series/notes/mathematics/grade-12/30/practices

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	2	2	2	1	1
CO2	2	3	3	1	1	2
CO3	2	3	3	2	2	1
CO4	2	3	3	2	2	2
CO5	2	3	3	3	2	1
Average	**2**	**2.8**	**2.8**	**2**	**1.6**	**1.4**

PEDAGOGY (TEACHING METHODOLOGY):
Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

ALLIED PAPER II ALLIED ATHEMATICS II

(I B.Sc. Statistics)

TOTALHOURS: 6   **SUB CODE: 20USTAT2002**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- The primary objective of teaching Real Analysis is to make the students think logically and objectively.
- The secondary objective is to impact Mathematical training.
- To present a study on Laplace and inverse Laplace transform.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To analyze various concepts of countability in the context of real valued functions
CO2	To examine convergent, divergent using limits of sequence and series of real numbers
CO3	To prove theorems related to Derivatives, Rolle's theorem, Law of the mean,Taylor's formula with various form of reminders and solve and analyse the continuous functions and real numbers of Laplace transforms
CO4	To apply analytical techniques in solving many real life problems.
CO5	To apply various properties involved in the Inverse Laplace transform formula.

SYLLABUS

UNIT– 1:   **18 hours**
    Functions, Real valued functions, Equivalence, Countability, Real numbers

Chapter 1: Sections: 1.3 to1.6

UNIT– 2:   **18 hours**
    Sequences of real numbers: Definition of Sequence and subsequence, Limit of a sequence, Convergent sequences, Divergent sequences, Bounded Sequences and Monotone sequences. Series of real numbers: Convergence and Divergence, Series with non-negative terms, Alternating series.

Chapter 2: Sections: 2.1 to 2.6,
Chapter 3: Sections: 3.1to 3.3

UNIT– 3:   **18 hours**
    Calculus: Derivatives, Rolle's theorem, The Law of the Mean, Taylor's Theorem.

Chapter 7: Sections: 7.5 to7.7
Chapter 8: Section: 8.5

UNIT– 4:   **18 hours**
    Laplace Transforms:Laplace transforms of standard functions and properties.

Chapter 7: Sections: 7.1.1 to 7.1.6

UNIT– 5:   **18 hours**
    Inverse Laplace Transforms:Inverse Laplace transforms of standard functions and properties.

Chapter 7: Sections: 7.2.1 to 7.2.3

TEXT BOOK(S):

1. Gold Berg, Reprint-2020, Methods of Real Analysis, R. R. Oxford and IBH Publishing Company.
2. Duraipandian P.,Udayabaskaran S., Reprint-2016, Allied Mathematics-Volume II   Muhil publishers, Chennai.

BOOKS FOR REFERENCE:

1. Venkatachalapathy S. G., 16th edition 2005, Real Analysis, Margham Publications, Chennai.
2. Abdul Rasheed A., 2008, Allied Mathematics, Vijay Nicole Imprints Private Limited, Chennai.
3. Shanti Narayan., Raisinghania., Reprint: 2008,   Elements of Real Analysis, S. Chand & Co.,
4. Singaravelu A., Reprint: 2018, Allied Mathematics, Meenakshi Agency.
5. Venkatachalapathy S. G., Reprint: 2016, Allied Mathematics, Margham Publications.

E-LEARNING RESOURCES:

1. https://www.math.lsu.edu/~sengupta/4031f06/IntroRealAnalysNotes.pdf
2. https://www.math.ucla.edu/~awertheim/Bootcamp/Notes/Real%20Analysis%20Lecture%20Notes.pdf
3. https://ocw.mit.edu/courses/mathematics/18-100c-real-analysis-fall-2012/lecture-summaries/
4. https://tutorial.math.lamar.edu/classes/de/LaplaceIntro.aspx
5. https://web.stanford.edu/~boyd/ee102/laplace.pdf\

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3	3	3	1	2
CO2	1	3	3	3	1	3
CO3	1	3	3	3	1	3
CO4	2	2	2	3	2	1
CO5	2	2	2	3	2	1
Average	**1.4**	**2.6**	**2.6**	**3**	**1.4**	**2**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

ALLIED PAPER II ALLIED ATHEMATICS II

(I B.Sc. Chemistry)

TOTALHOURS: 6   **SUB CODE: 20UCHAT2002**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- Introducing the need for Mathematics to recognize appropriate investigative procedures in various fields.
- To understand the nature of the Fourier series that represent even and odd functions and how derivation of a Fourier series can be simplified.
- To introduce students to the fundamentals of vector calculus, Laplace and inverse Laplace transform.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To orient the students to understand the concept of Fourier series and solving problems defined in $[0,2\pi]$ and $[-\pi,\pi]$.
CO2	To understand the elementary theory of Partial Differential equations and solving it using standard forms and Lagrange's method.
CO3	To determine solutions by applying Laplace transform methods.
CO4	To demonstrate the properties of Inverse Laplace transform and find solutions by applying the same.
CO5	To determine and apply the important quantities associated with Vector calculus

SYLLABUS

UNIT– 1:   **18 hours**
    Fourier Series: Fourier series in the interval $[0,2\pi]$, Fourier series for even and odd functions definedin $[-\pi, \pi]$

Chapter 4: Sections: 4.1,4.1.1

UNIT– 2:   **18 hours**
    Partial Differential Equation: Formation of partial differential equations, Solutions of partial differential equation. Five standard forms, Lagrange's linear equations

Chapter 6: 6.1,6.2,6.3, 6.4

UNIT– 3:   **18 hours**
    Laplace Transforms: Laplace transforms of standard functions and properties

Chapter 7: Sections: 7.1.1 to 7.1.4

UNIT– 4:   **18 hours**
    Inverse Laplace Transforms: Inverse Laplace transforms of standard functions and properties.
Chapter 7: Sections: 7.2,7.2.1 to 7.2.3

UNIT-5:   **18 hours**
    Vector Analysis: Scalar and vector point function, level surfaces, directional derivative of a scalarpoint function, Gradient of a scalar point function, Divergence and Curl of a vector point function, Line integrals, surface integrals, Green's theorem in the plane (without proof)

Chapter 8: Sections 8.2, 8.2.1, 8.2.2, 8.3, 8.4, 8.5.1, 8.5.3, 8.6.1

TEXT BOOKS:
    Allied Mathematics-Volume I&II by P.Duraipandian and Dr. S. Udayabaskaran, Muhilpublishers, Chennai, 2016

BOOKS FOR REFERENCE:

1. Vasistha A.R.., 2019, Differential Equations, Krishna's Educational Publishers.
2. Narayanan S, Manicavachagom Pillay T. K., Reprint 2008, Calculus, Volume III, S. Viswanathan (Printers and Publishers), Pvt. Ltd.
3. Vittal P. V, Malini V., Reprint 2004, Differential Equations and Laplace Transforms Margham Publications.
4. Vasistha A. R., and others, 2019, Geometry and Vector Calculus, Krishna's Educational Publishers.

5. Duraipandian P., KayalalPachiappa, 2014, Vector Analysis, S.Chand Publishing.

E-LEARNING RESOURCES:

1. https://www.sakshieducation.com/Engg/EnggAcademia/CommonSubjects/MathMethods-Fourier_Series.pdf
2. https://tutorial.math.lamar.edu/classes/de/intropde.aspx
3. https://www.khanacademy.org/math/differential-equations
4. https://tutorial.math.lamar.edu/classes/de/LaplaceIntro.aspx
5. https://web.stanford.edu/~boyd/ee102/laplace.pdf\

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	2	2	2	1	1
CO2	2	3	3	1	1	2
CO3	2	3	3	2	2	1
CO4	2	3	3	2	1	1
CO5	2	3	3	1	1	1
Average	**2**	**2.8**	**2.8**	**1.6**	**1.2**	**1.2**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

ALLIED PAPER II ALLIED ATHEMATICS II

(I B.Sc. Computer Science)

TOTALHOURS: 6   **SUB CODE: 20UCSAT2002**

CREDIT: 4   **L-T-P: 4-2-0**

COURSE OBJECTIVES:

- To be proficient to solve any Algebraic or transcendental equations
- To find numerical solutions to problems where the exact relationship between the variables are not known.
- To comprehend various computational techniques to find approximate value for possible roots of non-algebraic equations, to find the approximate solutions of a system of linear equations and to enhance the problem-solving skills.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	The learner will analyze the different methods of numerical solutions of Algebraic and Transcendental equations.
CO2	The learner will acquire knowledge in finding the interpolation values for equally spaced intervals by Newton's method.
CO3	The learner will acquire knowledge in finding the interpolation values for unequal intervals by Newton's and Lagrange's method and to compute inverse interpolation values.
CO4	To orient toward learning the basic concepts of Numerical Differentiation and Integration.
CO5	The learner will become efficient in finding the Numerical solution of ordinary differential equations.

SYLLABUS

UNIT– 1:   **18 hours**
   Solving algebraic and transcendental equation by Bisection method, Iteration method, Regula-Falsi method and Newton-Raphson method

Chapter 3: Sections 3.0 to3.5

UNIT– 2:   **18 hours**
   Forward differences, backward differences, shift operator, relation between operators, Interpolation with equal intervals: Newton's forward and backward interpolation formula

Chapter 3: Sections 4.0to 4.3, 4.8
Chapter 6: Sections 6.0 , 6.1(upto Theorem 6.1), 6.2

UNIT– 3:   **18 hours**
   Interpolation with unequal intervals: Divided differences and their properties, Newton's divided difference formula, Lagrange's formula for interpolation
Inverse Interpolation: Lagrange's method

Chapter 7: Sections 7.0, 7.1, 7.3 to 7.6

UNIT– 4:   **18 hours**
   Numerical Differentiation: Numerical Differentiation upto second order solution using Newton's Forward and Backward formula, Numerical Integration: Trapezoidal rule, Simpson's one- third rule, Simpson's Three - eighth rule.

Chapter 8: Sections 8.0 to 8.2, 8.5

UNIT– 5:   **18 hours**
   Numerical solution of Ordinary differential equations: Taylor's series, Euler method and Runge - Kutta method of fourth order.

Chapter 10: Sections: 10.0 to10.4

TEXT BOOK(S):

   Arumugam S., Thangapandi Isaac A., A.Somasudaram A., 2002, Numerical Methods, Scitech Publications(INDIA) Pvt. LTD..

BOOKS FOR REFERENCE:

1. Balagurusamy E., 2017, Numerical Methods, Mc.Graw hill Education.
2. Baburam., 2009, Numerical methods, Pearson Education India.
3. Satteluri., Iyengar R. K., Rajinder Kumar Jain, 2020, Numerical Methods, New Age International (P) Ltd Publishers.
4. Gopal Pathak., 2013, Numerical methods, JBC Publishers.
5. Jeffery J. Leader. , 2004, Numerical Analysis and Scientific Computation, 1st Edition, Pearson Education.

E-LEARNING RESOURCES:

1. https://perhuaman.files.wordpress.com/2014/07/metodos-numericos.pdf
2. http://www.ohiouniversityfaculty.com/youngt/IntNumMeth/book.pdf
3. https://www.math.unipd.it/~mrrusso/Didattica/NA-Yaounde/Manual.pdf
4. https://www.sjsu.edu/me/docs/hsu-Chapter%2010%20Numerical%20solution%20methods.pdf
5. https://stemez.com/subjects/maths/SNumericalAnalysis/SNumericalAnalysis.php

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	2	3	1	1	2
CO2	2	2	2	2	1	1
CO3	2	2	2	2	1	1
CO4	2	3	3	2	1	1
CO5	2	2	3	3	1	1
Average	**2**	**1.2**	**1.6**	**2**	**1**	**1.2**

PEDAGOGY (TEACHING METHODOLOGY):

Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

ALLIED PAPER I ALLIED MATHEMATICS I
(II B.Sc. Physics)

TOTALHOURS: 6   **SUB CODE: 20UPHAT3003**

CREDIT: 4   **L-T-P : 4-2-0**

COURSE OBJECTIVES:

- To inspire the students to get the knowledge in basic Mathematical concepts.
- To present a study on a summation of series, Matrices, Trigonometry, Finite differences.
- To enhance problem solving skills on above said various fields

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To learn about summation of Binomial, Exponential and Logarithmic series.
CO2	Recognize the concept of certain types of matrices, Eigenvalues, Eigenvectors and Cayley's Hamilton theorem.
CO3	The learner will become proficient in expansion of trigonometric series.
CO4	To understand the basic theory in Interpolation and applications.
CO5	To demonstrate knowledge in various types of hyperbolic functions.

SYLLABUS

UNIT– 1:   **18 hours**

 Algebra: Summation of Binomial, Exponential and Logarithmic series (without proof)

Chapter 2: Sections: 2.1.3, 2.2.1, 2.3.3

UNIT– 2:   **18 hours**

 Matrices: Symmetric matrix, Skew -Symmetric matrix, Hermitian matrix, Skew- Hermitian matrix, Orthogonal matrix and Unitary matrix. Eigenvalues and Eigenvectors, Cayley-Hamilton theorem (without proof), Inverse of a matrix using Cayley-Hamilton theorem

Chapter 4: Sections: 4.1.1 to 4.1.6, 4.5, 4.5.2 , 4.5.3

UNIT– 3:   **18 hours**

 Trigonometry: Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, $\sin^n \theta$, $\cos^n \theta$ and $\sin\theta$, $\cos\theta$, $\tan\theta$ in powers of θ .

Chapter 6: Sections: 6.1.1, 6.1.2, 6.1.3.

UNIT– 4:   **18 hours**

 Finite differences: Interpolation, Interpolation formulae

Chapter 5: 5.1, 5.2

UNIT– 5:   **18 hours**

 Trigonometry**:** Hyperbolic functions, Relation between circular and hyperbolic functions, Formulae in hyperbolic functions, Real and Imaginary parts and Inverse hyperbolic functions.

Chapter 6: 6.2, 6.2.1, 6.2.2, 6.2.3, 6.3.

TEXT BOOK(S):

 Duraipandian P, Udayabaskaran S, Reprint 2016, Allied Mathematics-Volume I, Muhil Publishers,Chennai .

BOOKS FOR REFERENCE:

1. Abdul Rasheed A, 2008, Allied Mathematics, Vijay NicoleImprints Private Limited, Chennai.
2. Singaravelu A, Reprint 2018, Allied Mathematics, Meenakshi Agency, Chennai.
3. Venkatachalapathy S.G, Reprint 2016, Allied Mathematics , Margham Publications.
4. Kandasamy P, Thilagavathy K, Reprint 2004, Mathematics – I, II , S.Chand& Company Pvt.Ltd.
5. ChandraSekaran, Nithya, Reprint 2017, Allied Mathematics I, Dhanam Publications.

E-LEARNINGRESOURCES:
1. https://www.learncbse.in/trigonometry-formulas/
2. https://www.askiitians.com/revision-notes/maths/trigonometric-functions/
3. http://www.khullakitab.com/binomial-theorem-exponential-and-logarithmic-series/notes/mathematics/grade-12/30/practices
4. https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear-algebra-introduction-to-eigenvalues-and-eigenvectors
5. https://global.oup.com/uk/orc/biosciences/maths/reed/01student/numerical_tutorials/

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	3	1	2	2	2
CO2	2	2	2	2	1	3
CO3	2	3	3	2	2	2
CO4	2	3	3	3	2	1
CO5	2	3	2	2	2	2
Average	**2**	**2.8**	**2.2**	**2.2**	**1.8**	**2**

PEDAGOGY (TEACHING METHODOLOGY):
Chalk and Talk, Online Coaching, Assignment, Seminar, Quiz, Group discussion, reference material and videos, e-learning resources

ALLIED PAPER II ALLIED MATHEMATICS II
(II B.Sc. Physics)

TOTALHOURS: 6   **SUB CODE: 20UPHAT4004**

CREDIT: 4   **L-T-P: 4-2-0**

COURSE OBJECTIVES:

- Introducing the need for Mathematics to recognize appropriate investigative procedures in various fields.
- To understand the nature of the Fourier series that represent even and odd functions and how derivation of a Fourier series can be simplified.
- To introduce students to the fundamentals of vector calculus, Laplace and inverse Laplace transform.

COURSE OUTCOMES:

CO No.	CO Statement
CO1	To orient the students to understand the concept of Fourier series and solving problems defined in $[0,2\pi]$ and $[-\pi,\pi]$.
CO2	To understand the elementary theory of Partial Differential equations and solving it using standard forms and Lagrange's method.
CO3	To determine solutions by applying Laplace transform methods.
CO4	To demonstrate the properties of Inverse Laplace transform and find solutions by applying the same.
CO5	To determine and apply the important quantities associated with Vector calculus

SYLLABUS

UNIT-I: **18 hours**
        Fourier Series: Fourier series in the interval $[0,2\pi]$, Fourier series for even and odd functions defined in $[-\pi, \pi]$

Chapter 4: Sections: 4.1,4.1.1

UNIT-II: **18 hours**
        Partial Differential Equation**:** Formation of partial differential equations, Solutions of partial differential equation. Five standard forms, Lagrange's linear equations

Chapter 6: 6.1,6.2,6.3, 6.4

UNIT-III: **18 hours**
        Laplace Transforms: Laplace transforms of standard functions and properties

Chapter 7: Sections: 7.1.1 to 7.1.4

UNIT-IV: **18 hours**
        Inverse Laplace Transforms**:** Inverse Laplace transforms of standard functions and properties.

Chapter 7: Sections: 7.2,7.2.1 to 7.2.3

UNIT-V: **18 hours**
        Vector Analysis: Scalar and vector point function, level surfaces, directional derivative of a scalar point function, Gradient of a scalar point function, Divergence and Curl of a vector point function, Line integrals, surface integrals, Green's theorem in the plane (without proof)

Chapter 8: Sections 8.2, 8.2.1,8.2.2,8.3,8.4,8.5.1,8.5.3,8.6.1

TEXT BOOK(S):

    Duraipandian P, Udayabaskaran S, 2016, Allied Mathematics-Volume I&II, Muhil Publishers,Chennai.

BOOKS FOR REFERENCE:

1. A.R.Vasistha, 2019, Differential Equations , Krishna's Educational Publishers.
2. Narayanan S, Manikkavachagom Pillay T.K, Reprint 2008, Calculus - Volume III, S. Viswanathan   (Printers and Publishers) Pvt. Ltd.
3. Vittal P.R, Malini V, Reprint 2004, Differential Equations and Laplace Transforms, Margham Publications.
4. A.R.Vasistha and Others, 2019, Geometry and Vector Calculus, Krishna's Educational Publishers.
5. Duraipandian P,KayalalPachaiappa, 2014, Vector Analysis, S.Chand Publishing.

E-LEARNING RESOURCES:

1. https://www.sakshieducation.com/Engg/EnggAcademia/CommonSubjects/Math Methods-Fourier_Series.pdf
2. https://tutorial.math.lamar.edu/classes/de/intropde.aspx
3. https://www.khanacademy.org/math/differential-equations
4. https://tutorial.math.lamar.edu/classes/de/LaplaceIntro.aspx
5. https://web.stanford.edu/~boyd/ee102/laplace.pdf\

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	2	2	2	1	2
CO3	3	2	3	3	1	1
CO4	2	2	2	2	2	1
CO5	2	3	3	2	2	1
Average	**2**	**2.2**	**2.2**	**2.2**	**1.4**	**1.4**

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