ANNAMALAI UNIVERSITY

201 - B.Sc. MATHEMATICS

Programme Structure and Scheme of Examination (under CBCS)
(Applicable to the candidates admitted in Affiliated Colleges
in the academic year 2022 -2023 ONLY)

Course Code	Part	Study Components & Course Title	Hours/ Week	Credit	Maximum Marks		
					CIA	ESE	Total
		SEMESTER – I					
22UTAML11	I	Language Course - I : Tamil-I	5	3	25	75	100
22UENGL12	II	English Course - I : Communicative English I	5	3	25	75	100
22UMATC13	III	Core Course - I : Classical Algebra	5	4	25	75	100
22UMATC14		Core Course - II : Differential Calculus and Trigonometry	5	4	25	75	100
		Allied - I : Paper – 1: Numerical Methods using Python I / Physics-I	4	4	25	75	100
		Allied Practical – I: Numerical Methods with Python/ Physics Practical	4	-	-	-	-
22UENVS18	IV	Environmental Studies	2	2	25	75	100
		Total	**30**	**20**			**600**
		SEMESTER – II					
22UTAML21	I	Language Course - II : Tamil-II	5	3	25	75	100
22UENGL22	II	English Course - II : Communicative English II	5	3	25	75	100
22UMATC23	III	Core Course – III : Integral Calculus	4	4	25	75	100
22UMATC24		Core Course – IV : Analytical Geometry 3D	4	4	25	75	100
		Allied – I : Paper -2: Numerical Methods using Python – II / Physics – II	3	3	25	75	100
		Allied Practical – I : Numerical Methods with Python/ Physics Practical	2	3	40	60	100
22UMATE26		Internal Elective – I :	2	3	25	75	100
22UVALE27	IV	Value Education	2	1	25	75	100
22USOFS28		Soft Skill	1	1	25	75	100
22UNMSD01	IV	Language Proficiency for Employability: EFFECTIVE ENGLISH	2	2	25	75	100
		Total	**30**	**27**			**1000**

Course Code	Part	Study Components & Course Title	Hours/ Week	Credit	Maximum Marks		
					CIA	ESE	Total
		SEMESTER – III					
22UTAML31	I	Language Course – III : Tamil-III	5	3	25	75	100
22UENGL32	II	English Course – III : English Through Literature-I	5	3	25	75	100
22UMATC33	III	Core Course – V : Abstract Algebra	5	4	25	75	100
22UMATA03 22UCOMA25		Allied - II : Paper -1 (Choose any 1 out of 2) Mathematical Statistics-I (or) Principles of Accountancy – I	7	3	25	75	100
22UMATE36		Internal Elective – II :	3	3	25	75	100
22UMATN37	IV	Non-Major Elective – I : Basic Mathematics – I	2	2	25	75	100
22UMATS38		Skill Based Subject – I : Quantitative Aptitude I	3	2	25	75	100
		Total	**30**	**20**			**800**
		SEMESTER – IV					
22UTAML41	I	Language Course - IV: Tamil-IV	5	3	25	75	100
22UENGL42	II	English Course – IV : English Through Literature-II	5	3	25	75	100
22UMATC43	III	Core Course – VI : Real Analysis – I	4	4	25	75	100
22UMATC44		Core Course – VII : Statics	4	3	25	75	100
22UMATA04 22UCOMA26		Allied – II : Paper – 2 (Choose any 1 out of 2) Mathematical Statistics-II (or) Principles of Accountancy – II	3	3	25	75	100
		Allied Practical – II :					
22UMATA46		Mathematical Statistics Practical Using R-Programming	3	3	40	60	100
22UMATN47	IV	Non-Major Elective – II : Basic Mathematics - II	2	2	25	75	100
22UMATS48		Skill Based Subject – II : Quantitative Aptitude II	2	2	25	75	100
22UNMSD02	**IV**	MS-Office Essentials	2	2	25	75	100
		Total	**30**	**25**			**1000**

		SEMESTER – V					
22UMATC51	III	Core Course – VIII : Linear Algebra	5	4	25	75	100
22UMATC52		Core Course – IX : Real Analysis – II	5	4	25	75	100
22UMATC53		Core Course – X : Dynamics	4	4	25	75	100
22UMATC54		Core Course – XI : Differential Equations	4	4	25	75	100
22UMATP55		Core Practical – I : Scientific Computing Lab	4	4	40	60	100
		Internal Elective – III : (Choose any 1 out of 3)					
22UMATE58-1		1. Discrete Mathematics	4	3	25	75	100
22UMATE58-2		2. Stochastic Process					
22UMATE58-3		3. Mathematical Modeling					
22UMATS59	IV	Skill Based Subject – III : Quantitative Aptitude III	2	2	25	75	100
22UGENS57		Gender Studies	2	1	25	75	100
		Total	**30**	**26**			**800**
		SEMESTER – VI					
22UMATC61	III	Core Course – XII : Vector Analysis	6	4	25	75	100
22UMATC62		Core Course – XIII : Complex Analysis	6	4	25	75	100
22UMATC63		Core Course – XIV : Operations Research	5	3	25	75	100
22UMATC64		Core Course – XV : Graph Theory	5	3	25	75	100
		Internal Elective – IV : (Choose any 1 out of 3)					
22UMATE65-1		1. Laplace and Z Transform	5	3	25	75	100
22UMATE65-2		2. Astronomy					
22UMATE65-3		3. Special Functions					
22UMATS66	IV	Skill Based Subject – IV : Quantitative Techniques	3	2	25	75	100
22UEXTA67	V	Extension Activities	-	1	100	-	100
22UNMSD03	IV	Advanced Platform Technology PBL I: Salesforce Associate / Data Analytics with Advanced Tools		2	25	75	100
		Total	**30**	**22**			**800**
		Grand Total	**180**	**140**			**5000**

Internal Elective Courses

22UMATE26-1	Internal Elective – I	Fourier Series and Fourier Transform
22UMATE26-2		Matrix Theory
22UMATE26-3		Number Theory
22UMATE36-1	Internal Elective – II	Fuzzy Sets and Fuzzy Logic
22UMATE36-2		Programming in C Language
22UMATE36-3		R-Programming
22UMATE58-1	Internal Elective – III	Discrete Mathematics
22UMATE58-2		Stochastic Process
22UMATE58-3		Mathematical Modeling
22UMATE65-1	Internal Elective – IV	Laplace and Z Transform
22UMATE65-2		Astronomy
22UMATE65-3		Special Functions

Allied Courses

22UNUMA01	Semester I	Theory	Numerical Methods using Python - I
22UPHYA01			Physics – I
22UNUMA02		Theory	Numerical Methods using Python - II
22UPHYA02			Physics – II
22UNUMP02		Practical	Practical – Numerical Methods with Python
22UPHYP02			Physics Practical
22UMATA03	Semester III	Theory	Mathematical Statistics-I
22UCOMA25		Theory	Principles of Accountancy - I
22UMATA04	Semester VI	Theory	Mathematical Statistics-II
22UCOMA26			Principles of Accountancy - II
22UMATAP01		Practical	Mathematical Statistics Practical Using R-Programming

Allied Courses offered by the Department of Mathematics

22UNUMA01	Theory	Numerical Methods using Python - I
22UNUMA02	Theory	Numerical Methods using Python - II
22UNUMP02	Practical	Numerical Methods using Python
22UMATA01	Theory	Mathematics – I (For B.Sc. Physics, Chemistry, Statistics and Computer Science)
22UMATA02	Theory	Mathematics – II (For B.Sc. Physics, Chemistry, Statistics and Computer Science)
22UMFOA01	Theory	Mathematical Foundations
22UMAFA01	Theory	Mathematical Foundations – I (For B.Sc Computer Science only)
22UMAFA02	Theory	Mathematical Foundations – II (For B.Sc Computer Science only)
22UBUMA01	Theory	Business Mathematics (For All B.Com. Programmes Except B.Com. (Cooperation)

Non-Major Electives

22UMATN37	Theory	Basic Mathematics-I
22UMATN47	Theory	Basic Mathematics-II

YEAR - I SEMESTER -I CORE- I	22UMATC13: CLASSICAL ALGEBRA	HRS/WK – 5 CREDIT – 4

COURSE OBJECTIVES

In this course students are exposed to topics like Theory of Equations, Summation of Series, Matrices and Elementary Number Theory. The stress is on the development of problem solving skills.

Unit-1: Theory of Equations

Polynomial Equations - Symmetric Functions of roots in terms of Coefficients - Sum of r-th powersof roots - Reciprocal Equations - Transformation of Equations.

Unit-2: Theory of Equations (Contd...)

Descartes Rule of Signs - Approximate Solutions of Polynomials by Horner's method - Newton -Raphson method of Solution of a Cubic Polynomial.

Unit-3: Summation of Series

Summation of series using Binomial - Exponential and Logarithmic series (Theorems withoutproofs) - Approximation using Binomial & Exponential series.

Unit-4: Elementary Number Theory

Prime Number - Composite Number - Decomposition of a Composite Number as a Product of Primes uniquely (without proof) - Divisors of a Positive Integer - simple problems.

Unit-5: Elementary Number Theory (Contd.)

Congruence Modulo n - Euler Function (without Proof) - Highest Power of a Prime Number pcontained in n! - Fermat's and Wilson's Theorems (statements only).

COURSE OUTCOMES

On successful completion of the course, the student will be able to:

1) Apply the fundamental concept of theory of equations and to find solutions.
2) Apply Descarte's rule, Horner's method, Newton Raphson methods for finding approximate solutions.
3) Apply summation of series using Binomial, Exponential and Logarithmic series for finding approximations.
4) Apply the elementary number theory for highest power of prime number.
5) Apply the elementary number theory for Fermat's and Wilson's theorem.

Text Books

1) P. Kandasamy, K. Thilagavathy, Content and treatment as in the book Mathematics for B.Sc.Vol-I, II, III & IV, S.Chand & Company Ltd., New Delhi-55 (2004).
2) S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay and Dr. P. Kandaswamy, Ancillary Mathematics, Volume-I, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2009.

Supplementary Readings

1) T.K. Manicavachagom Pillay, T.Natarajan and K.S.Ganapathy, Algebra, Volume I & II, S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai, 2004.
2) S. Arumugam , Algebra, New Gamma Publishing House, Palayamkottai, 2003.
3) A. Singaravelu, Algebra and Trigonometry, Vol.-I & II, Meenakshi Agency, Chennai, 2003.
4) S. Sudha, Algebra and Trigonometry, Emerald Publishes, Chennai. B.Sc. Mathematics: Syllabus (CBCS), 1998.

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	3	3	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	3	3	3	2

Low 2-Moderate 3- High

YEAR - I SEMESTER -I CORE- II	22UMATC14: DIFFERENTIAL CALCULUS AND TRIGONOMETRY	HRS/WK – 5 CREDIT – 4

COURSE OBJECTIVES

To inculcate the basics of differentiation and their applications, the notion of curvatures, radius of curvature in Cartesian and polar coordinates ,Evolutes & Involutes, students can be trained to understand the basic concepts of Trigonometry.

UNIT I

Methods of Successive Differentiation – Leibnitz,s Theorem and its applications Increasing & Decreasing functions –Maxima and Minima of functions of two variables.

UNIT II

Curvature – Radius of curvature in Cartesian and in Polar Coordinates – Centre of curvature–Evolutes & Involutes

UNIT III

Expansions of sin (nx), cos (nx), tan (nx) – Expansions of sin nx, cos nx –Expansions of sin(x), cos(x), tan(x) in powers of x.

UNIT IV

Hyperbolic functions – Relation between hyperbolic & Circular functions- Inverse hyperbolic functions.

UNIT V

Logarithm of a complex number –Summation of Trigonometric series – Difference method- Angles in arithmetic progression method –Gregory's series

COURSE OUTCOMES

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

1) To know the basic concepts of Successive approximations and Lebnitz's theorem
2) Know the principles of Maxima and Minima for 2 variables.
3) Find the radius of curvature for Cartesian and Polar coordinates,Evolutes and Involutes.
4) Know the expansions of Trigonometric functions.
5) Understand the concepts of Hyperbolic and Inverse Hyperbolic functions, Logarithm of Complex numbers, summation of Trigonometry series, Gregory series.

Text Books

1) S.Narayanan and T.K.Manicavachagom Pillai, Calculus Volume I, S.Viswanathan (Printers&Publishers) Pvt Limited , Chennai -2011.
2) S.Arumugam & others, Trigonometry and Fourier series, New Gamma Publications - 1999

UNIT-I	Chapter III	Sections 1.1 to 2.2 & Chapter IV Section 2.1 2.2 and Chapter V 1.1 to 1.4 of [1]
UNIT-II	Chapter X	Sections 2.1 to 2.6 of [1]
UNIT-III	Chapter 1	Sections 1.2 to 1.4 of [2]
UNIT-IV	Chapter 2	Sections 2.1& 2.2 of [2]
UNIT V	Chapter 3 & 4	Sections 4.1,4.2 & 4.4 of [2]

Supplementary Readings

1) S.Arumugam and Isaac, Calculus, Volume1, New Gamma Publishing House, 1991.
2) S. Narayanan, T.K. Manichavasagam Pillai, Trigonometry, S. Viswanathan Pvt Limited, and Vijay Nicole Imprints Pvt Ltd, 2004.

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	3	3	3	3	2
CO3	3	3	3	3	2
CO4	3	3	2	3	2
CO5	3	3	2	3	2

1-Low 2-Moderate 3- High

SEMESTER -I ALLIED- I	22UNUMA01: NUMERICAL METHODS USING PYTHON - I	HOURS – 4 CREDITS – 4

COURSE OBJECTIVES

In this course students are exposed to topics interpolation for equal & unequal intervals. It also makes the students abreast with the programming concepts and to master them in python.

UNIT - I

Interpolation – Gregory Newton forward & backward formulae for interpolation (no derivations of formula, simple problems only) (Book –1*, Chapter. VI – Sec. 1–5*)

UNIT - II

Central differences formulae: Gauss Forward and Backward formulae - Sterling's formula - Bessel's formula (no derivations of formula, simple problems only) (Book –1*, Chapter. VII – Sec. 3–6*)

UNIT - III

Divided differences - Newton's divided differences formula and Lagrange's (no derivations of formula, simple problems only) (Book –1*, Chapter. VIII – Sec. 1, 3, 4*)

Unit-IV

Introduction -Python Overview - Getting Started with Python - Comments -Python Identifiers - Reserved Keywords - Variables - Standard Data Types - Operators - Statement and Expression - String Operations - Boolean Expressions (Book –2, Sec. 3.1 – 3.12)

Unit-V

Control Statements -Iteration – while Statement - Input from Keyboard (Book –2, Sec. 3.13 – 3.15)

COURSE OUTCOMES

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

3) Understand the basic concepts of interpolation for equal and unequal intervals.
4) Find the Finite differences and Central differences
5) Inculcate the basics of python.
6) Know the variables, Standard data types, Operators
7) Understand the control statements, iteration and input and output statements.

Text Books

8) M.K. Venkataraman. (1992) *Numerical methods for Science and Engineering* National Publishing Company, Chennai.
9) E Balagurusamy(2017), *Problem Solving and Python Programming,* McGraw Hill India; 1st edition, Chennai.

Supplementary Readings

10) S. Arumugham. (2003) *Numerical Methods*, New Gamma Publishing, Palamkottai.
11) H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand& Co., Delhi.
12) A.Singaravelu (2004). *Numerical Methods* Meenakshi Agency, Chennai.
13) P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite difference & Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.
14) K.V. Namboothiri, Python for Mathematics Students, Version 2.1, March 2013.
15) R. Thareja,(2017) Python Programming: Using Problem Solving Approach, Oxford.

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	2	3	3	3	2
CO3	3	3	2	3	2
CO4	3	3	3	3	2
CO5	3	2	3	3	2

1-Low 2-Moderate 3- High

SEMESTER: I / III PART: III	22UPHYA01: PHYSICS - I	CREDIT: 3 HOURS: 4

COURSE OBJECTIVES

1. To understand the concept of elasticity and strength of solid materials, viscous properties of liquids and surface tension.
2. To acquire knowledge on centre of gravity, state of equilibrium and stability of floating.
3. To study the heat capacity, conduction, convection, and radiation
4. To understand conversion of heat into mechanical work.
5. To know the phenomena of light such as interference, diffraction, polarization, and their applications

UNIT I :Properties of matter **12 Hours**

Elasticity: Hooke's Law – Elastic Constants – bending of beam – Bending moment – Cantilever Depression at the loaded end of a cantilever – determination of Young's modulus by non-uniform bending and uniform bending.

Viscosity: Turbulent and streamline flow - Viscous force – Coefficient of viscosity of a liquid –Poiseuille's formula.

Surface Tension: Surface Tension – Surface Tension and interfacial surface tension by the method of drops.

UNIT II : Mechanics **12 Hours**

Centre of Gravity – solid hemisphere – Hollow hemisphere – solid cone – solid tetrahedron.

States of Equilibrium: Equilibrium of a rigid body – Stable, unstable and neutral equilibrium – Example - Stability of Floating bodies – Metacenter – Determination of Metacentric height of a ship.

UNIT III :Heat **12 Hours**

Specific heat capacity of solids and liquids – Dulong and Petit's law – Newton's law of cooling – Specific heat capacity of a liquid by cooling - Heat conduction – coefficient of thermal conductivity by Lee's disc method – Convection- Land and sea breeze- Black body radiation – Wien's distribution law, Rayleigh Jeans law, Wien's displacement law – Planck's radiation law – Stefan's law of radiation

UNIT IV: Thermodynamics **12 Hours**

Laws of thermodynamics(zeroth, first and second) – isothermal and adiabatic processes - Carnot's engine and Carnot's cycle – Efficiency of a Carnot's engine – Third law of Thermodynamics-Entropy – Change in entropy in reversible and irreversible process – change in entropy of a perfect gas – change in entropy when ice is converted into steam.

UNIT V: Optics **12 Hours**

Interference – conditions for interference maxima and minima – Air wedge –thickness of a thin wire – Newton's rings – determination of wavelength using Newton's rings.

Diffraction – Difference between Fresnel and Fraunhofer diffractions – Theory of transmission grating – normal incidence.

Polarization - optical activity – Biot's law –Specific rotatory power – determination of specific rotatory power using Laurent's half shade polarimeter.

COURSE OUTCOMES

Students studying this coursewould understand the following:

1. Fundamentals of elasticity, theory of bending, flow of liquids and viscous forces and surface tension
2. centre of gravity of bodies of different shapes, equilibrium of states and forces involved in stability of floating.
3. transmission of heat by the processof conduction, convection, and radiation.
4. various laws involved in heat transformation, thermodynamics, and the concept of entropy
5. the phenomena like interference diffraction, and polarization, optical activity of liquids and its uses

Text Books

1. Brijlal and Subramanyam M, (1983),*Properties of matter*, Eurasia Publishing co., III Edition
2. Brijlal& Subramanyam M, (2005),*Heat and Thermodynamics*, S.Chand & Co, 16th Edition
3. Subramanyam M &Brijlal, (2004),*A Textbook of Optics*, S. Chand and co., New Delhi, 22nd Edition

Supplementary Readings

1. Mathur D S, (1976), *Element of properties of matter*, S. Chand & Company Ltd,10th Edition
2. Mathur D S, (2014) *Heat and Thermodynamics,* SultanChand & Sons, 5th Edition.
3. Murugeshan R, (2008),*Optics and Spectroscopy*, S. Chand and co., New Delhi

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	3	2	2	2
CO4	2	2	3	3	2
CO5	3	3	2	2	3

CORRELATION LEVELS: 1- LOW, 2- MODERATE, 3- HIGH

SEMESTER -II ALLIED PRACTICAL- I	22UNUMP02: NUMERICAL METHODS USING PYTHON	HRS/WK – 2 CREDIT – 3

COURSE OBJECTIVES

To introduce the techniques of Python programming. To solve numerical problems using Python programming.

Using Python Programming develop the programmes in the following topics:

16) Lagrange's method of interpolation
17) Bisection method
18) Newton – Raphson method of solving equations
19) Regula-falsi method
20) Trapezoidal rule of integration
21) Simpson's 1/3 rule of integration
22) Simpson's 3/8 rule of integration
23) Gauss – elimination method of solving simultaneous equations
24) Gauss – Seidal method of solving simultaneous equations
25) Runge-Kutta fourth order method of solving differential equations

- Mathematics faculty alone should be appointed as examiners

YEAR - I SEMESTER -II CORE- III	22UMATC23: INTEGRAL CALCULUS	HRS/WK – 4 CREDIT – 4

COURSE OBJECTIVES

In this paper the student is exposed to the idea of integration and different methods of integration. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage. The application of integration to the evaluation of areas and volumes is also introduced.

Unit I :

Introduction, Definite integral-Methods of integration-Integrals of functions of the form

$$\int \frac{f'(x)}{f(x)}dx,\ \int [f(x)]^n f'(x)dx,\ \int F[f(x)]f'(x)dx,\ \int \frac{dx}{ax^2+bx+c},\ \int \frac{lx+m}{ax^2+bx+c}dx$$

Unit II :

Reduction formulae-Bernoulli's formula

$$I_n = \int x^n e^{ax}$$

$$I_n = \int \cos^n x\, dx$$

$$I_n = \int sin^n x\, dx$$

$$I_{m,n} = \int sin^m x cos^n x dx$$

Unit III :

Change of order of integration – Properties of definite integrals.

Unit IV:

Double integrals – Double integrals in Polar coordinates – Triple integrals.

Unit V:

Application of double and triple integrals – area- volume.

COURSE OUTCOMES

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

1) Solve problems using the different methods of integration.
2) Solve problems in techniques of Reduction formulae and Bernoulli's formula.
3) Solve problems in Change of order of integration and Properties of definite integrals.
4) Solve problems in double and triple integrals.
5) Apply double and triple integrals in finding area and volume.

Text Books

1.S. Narayanan and T.K. Manicavachogam Pillay, Calculus Vol. II, Ananda Book Depot, 2021.

Unit-I Chapter 1: Sections 1 to 4

Unit-II Chapter 1: Sections 13 to 15.

Unit-III Chapter 1: Sections 11

Chapter 5: Section 2

Unit-IV Chapter 5: Section 3

Chapter 5: Sections 1 to 5.

Unit-V Chapter 5: Sections 4 to 6.

Supplementary Readings

1) G.B.Thomas and R.L.Finney. (1998) Calculus and Analytic Geometry,
2) Addison Wesley (9th Edn),Mass. (Indian Print).
3) M.K.Venkataraman. (1992) Engineering Mathematics-Part B. National Publishing Company,Chennai.
4) T, Veerarajan, Engineering Mathematics [For Semester I and II], 3rd Edition, Tata McGraw Hill Education Private Limited, New Delhi.

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	3	3	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	2	2
CO5	3	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - I SEMESTER -II CORE- IV	22UMATC24: ANALYTICAL GEOMETRY 3D	HRS/WK – 4 CREDIT – 4

COURSE OBJECTIVES

This paper aims to understand the fundamental concepts of Analytical Geometry in Three Dimension, such as Distance between points,Projections,Angle between planes,Line of intersection of two planes,Length of perpendicular,Symmetrical form of the equations of a line,Coplanar lines, Shortest distance between two given lines,Centre and radius of Sphere,Equation of a circle on a sphere, The equation of Right circular cone and cylinder, Central quadrics

Unit-1

Rectangular Cartesian Co-ordinates: Direction Cosines of a line.

Unit-2

The Plane.

Unit-3

The Straight Line.

Unit-4

The Sphere.

Unit-5

The Central Quadrics and Cone.

COURSE OUTCOMES

On successful completion of the course, the students will able to:

1) Explain fundamental concepts of analytical geometry in 3D, about direction cosines of a line and the plane, equation and plane.
2) Know the straight line, symmetric form of equation of a line, equation of a line passing through two given points, the plane and the straight line, intersection of three planes.
3) Understand the Length of perpendicular distance, Coplanar lines.
4) Solve problems on Symmetrical form of the equations of a line, Shortest distance between two given lines,Centre and radius of Sphere
5) Find the equation of Sphere, the length of the tangent form of point to sphere, equation of a circle on a sphere, intersection of two spheres, cone, cylinder and central quadrics.

Text Books

T.K. Manickavachagom Pillay and T. Natarajan, Content and treatment as in the book Analytical Geometry, (Part-II – Three Dimensions), S.Viswanathan Printers & Publishers Pvt. Ltd., Chennai, Reprint 2011

Unit – I:Chapter 1 (Fully) (Pages1-23)

Unit-II: Chapter 2 (Fully) (Pages 24-45)

Unit- III: Chapter 3 (Fully) (Pages 46-92)

Unit- IV: Chapter 4 (Fully) (Pages 93-114)

Unit- V:Chapter 5 (Fully) (Pages 115-190)

Supplementary Readings

1) P.Duraipandian and Laxmi Duraipandian, Analytical Geometry-3D, Emerald Publishers, Chennai, 1975.
2) G.B.Thomas and R.L.Finney, Calculus and Analytic Geometry, Addison Wesley (9th Edn.), Mass. (Indian Print), 1998.
3) P.R.Vittal, Coordinate Geometry, Margham Publishers, Chennai, 2003.

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	3	3	3	2	2
CO3	3	3	3	3	2
CO4	2	3	3	3	2
CO5	3	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - I SEMESTER -II ALLIED- II	22UNUMA02 NUMERICAL METHODS USING PYTHON - II	HRS/WK – 3 CREDIT – 3

Course Objectives:

This course covers the techniques of Numerical Integration. It also deals with solution of Algebraic and Transcendental equations and Numerical solution of Ordinary differential equations of first order. Students can be given the Python programming practical exercise to solve Numerical method problems. .

UNIT - I

Bisection method-Iteration method-Regula-falsi method (False Position Method)-Newton-Rapson Method. (Book-1 *Chapter. III– Sec. 1–5*)

UNIT - II

Gauss elimination method-matrix inversion method-Gauss-Jordan Method, Gauss-Seidal method (Three unknowns only).(Book 1-*Chapter. IV – Sec. 2,3–6*)

UNIT - III

General Quadrature formula-Trapezoidal rule-Simpson's one third rule- Simpson's three-eight rule, Euler-Maclaurin Summation Formula (Book 2-*Chapter. VI – Sec. 6.2, A, B, C,D, I*)

Unit-IV

Euler's method- Euler's modified method-Picard's method - Taylor's methods-Runge-Kutta method (Second and Fourth order only) (Book – 1, *Chapter XI – Sec. 8 – 12, 14, 15*)

Unit-V

Introduction - Built-in Functions - Composition of Functions - Parameters and Arguments - Function Calls - The return Statement - Python Recursive Function - The Anonymous Functions - Writing Python Scripts (Book – 3, Sec. 4.1 – 4.10)

Recommended Text

1. M.K. Venkataraman. (1992) *Numerical methods in Science and Engineering* (3rd Edition) National Publishing Company, Chennai.
2. B.D. Gupta. (2001) Numerical Analysis. Konark Pub. Ltd., Delhi
3. E Balagurusamy(2017), *Problem Solving and Python Programming*, Mc Graw Hill India; 1st edition, Chennai.

Reference Books

1. S. Arumugham. (2003) *Numerical Methods*, New Gamma Publishing, Palamkottai.
2. H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand & Co., Delhi
3. A.Singaravelu (2004). *Numerical Methods*Meenakshi Agency, Chennai
4. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite difference & Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.

5. K.V. Namboothiri, Python for Mathematics Students, Version 2.1, March 2013.
6. R. Thareja,(2017) Python Programming: Using Problem Solving Approach, Oxford HED.

Course Outcome:

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

CO1: Understand the basic concept of Numerical Integration.
CO2: Find the Numerical Solution of Ordinary Differential Equations
CO3:. Inculcate the basics of Python.
CO4: Write general programs in Python.
CO5: Write the Python programs for Newton-Raphson method, Gauss Elimination method, Trapezoidal rule, Simpsons's rule, and Runge-Kutta method

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	3	3	3	2	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	2	3	3	2

1-Low 2-Moderate 3- High

SEMESTER: II / IV PART : III	22UPHYA02: PHYSICS II	CREDIT: 3 HOURS: 3

COURSE OBJECTIVES

1. To understand the concept and laws of electrostatics, working of capacitors.
2. To acquire knowledge on current electricity, electromagnetic induction and resonance circuits.
3. To understand the atom models, X-rays and nuclear properties and reactions.
4. To study fundamentals of solid-state electronics diodes and transistors.
5. To know the number system, logic gates and basic digital circuits.

UNIT I: Electrostatics **12 Hours**

Coulomb's inverse square law – Gauss law and its applications (Intensity at a point due to a charged sphere & cylinder) – Electric potential – Electric potential due to a point charge – Principle of a capacitor – Capacity of a spherical and cylindrical capacitors – Energy stored in a capacitor – Loss of energy due to sharing of charges - Capacitors in series and parallel – Types of capacitors.

UNIT II: Current Electricity and Electromagnetism **12 Hours**

Resistance in series and parallel connections – Kirchoff's laws – Wheatstone's network – condition for balance – Carey-Foster's bridge – measurement of specific resistance – determination of temperature coefficient of resistance

Electromagnetic Induction – Faraday's law – Lenz law – Self Inductance – Mutual Inductance – Coefficient of Coupling.

A.C. Circuits – Mean value – RMS value – Peak value – LCR in series circuit – impedance – resonant frequency – sharpness of resonance.

UNIT III : Atomic and Nuclear Physics **12 Hours**

Bohr's atom model – radius and energy – Atomic excitation – Ionization potential – Frank and Hertz Method - Vector atom Models – Pauli's exclusion Principle –Various quantum numbers and quantization of orbits –X-rays – Production – properties – Derivation of Bragg's law – uses in industrial and medical fields – Nucleus – Nuclear properties – Mass defect –Binding energy - Radioisotopes – Uses of radioisotopes – Nuclear fission and Nuclear fusion.

UNIT IV : Analog Electronics **12 Hours**

Semiconductor – PN junction diode – Bridge rectifier – Zener diode – Regulated power supply.

Transistor – Working of a transistor – CE Configuration – Transistor Characteristics(CE mode) – CE amplifier – feedback – Hartley oscillator – Colpitts oscillator.

UNIT V : Digital Electronics **12 Hours**

Number system – Decimal – Binary – Octal and Hexadecimal system – Number Conversion(decimal to binary, decimal to hexadecimal and vice versa) - Binary addition, subtraction.

Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables – Half adder and Full adder – Laws and theorems of Boolean's algebra – De Morgan's theorems.

COURSE OUTCOMES

Students studying Allied Physics-II would have learnt the following:

1. Electric intensity, potential and capacitor principle and its types.
2. laws used in electrical circuits, specific resistance measurement and laws of electro magnetic induction.
3. various atom models, nuclear models, fission and fusion reactions.
4. solid state electronic devices diode and transistor, their characteristics and applications.
5. the number systems, conversion between them and logic gates and digital circuits.

Text Books

1. BrijLal & Subramanyam, (2005), *Electricity and Magnetism*, Ratan Prakashan Mandir Publishers.
2. Murugesan R, (2001),*Electricity and Magnetism*, S. Chand&co.
3. Murugesan R, (1998),*Modern Physics*, S. Chand& co.
4. Theraja B L, (2003),*Basic Electronics*, S.Chand&co.
5. Sedha R S, (2004) *A Textbook of Digital Electronics*, S.Chand & co, First edition,

Supplementary Readings

1. Narayanamurthi, (1988) *Electricity and Magnetism*, The National Publishing Co, First edition,.
2. Vasudeva,D.N. *Electricity and Magnetism*, (Twelfth revised edition)
3. Rajam J B, (1990),*Atomic Physics*, S. Chand & Company Limited, New Delhi, First edition,.
4. Srivastava B N, (2005) *Basic Nuclear Physics*, Pragati Prakashan, Meerut.
5. Albert Paul Malvino, (2002),*Digital principles and Applications*, McGraw-Hill International Editions, New York.

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	3	2	2	2
CO4	2	2	3	3	2
CO5	2	3	2	3	3

CORRELATION LEVELS: 1- LOW, 2- MODERATE, 3- HIGH

YEAR - I SEMESTER -II ALLIED PRACTICAL- I	22UNUMP02 ALLIED PRACTICAL – NUMERICAL METHODS WITH PYTHON	HRS/WK – 2 CREDIT – 3

Course Objectives:

To introduce the techniques of Python programming. To solve numerical problems using Python programming.

Using Python Programming develop the programmes in the following topics:

1. Lagrange's method of interpolation
2. Bisection method
3. Newton – Raphson method of solving equations
4. Regula-falsi method
5. Trapezoidal rule of integration
6. Simpson's 1/3 rule of integration
7. Simpson's 3/8 rule of integration
8. Gauss – elimination method of solving simultaneous equations
9. Gauss – Seidal method of solving simultaneous equations
10. Runge-Kutta fourth order method of solving differential equations

- Mathematics faculty alone should be appointed as examiners

SEMESTER: II / IV PART : III PRACTICAL – I	22UPHYP02: PHYSICS PRACTICAL	CREDIT: 3 HOURS: 3

COURSE OBJECTIVES

1. To know the method of determining elastic properties of solids
2. To learn the experimental method to determine surface tension and viscous properties of liquids
3. To acquire knowledge of measurement of optical properties of solid
4. To acquire knowledge to measure the size of very small objects.
5. To gain knowledge of finding thermal properties of liquids
6. To obtain the electrical properties of a conductor and to perform experiments to study the semiconductor devices and digital circuits.

LIST OF EXPERIMENTS
(Any 12 Experiments to be done)

1. Non-Uniform bending – Pin and Microscope.
2. Uniform bending-scale and Telescope.
3. Rigidity modulus – Torsional oscillation method.
4. Coefficient of viscosity of liquid – Variable Pressure head (burette) Method
5. Surface tension and Interfacial Surface tension by Drop weight Method.
6. Specific heat capacity of liquid – Newton's law of cooling Method.
7. Thermal conductivity of a bad conductor – Lee's disc Method.
8. Spectrometer – Refractive index of a solid prism.
9. Spectrometer – Grating – minimum deviation method.
10. Air wedge – Thickness of the given thin wire.
11. Newton's Rings – 'R' determination.
12. Meter bridge – Specific resistance.
13. Carey Foster's Bridge – Resistance Determination.
14. Potentiometer – low range voltmeter.
15. Characteristics of a PN junction diode – Forward resistance and knee voltage.
16. Characteristics of a Zener diode - Breakdown voltage.
17. Basic logic gates – AND, OR and NOT gates using discrete components.
18. Study of basic logic AND, OR and NOT gates – Integrated circuits (IC)
19. Verification of NAND and NOR as Universal gates.
20. Verification of De Morgan's theorem.

COURSE OUTCOMES

After Completion of the Allied Physics Practical course the student would be conversant in measuring the 1)elastic properties 2) surface tension 3)viscous 4) thermal 5) electrical 6)optical properties and 7)acquired knowledge of semiconductor diodes and digital gates.

Text Books

1. Somasundaram S (2012), *Practical Physics,* Apsara Publications, Tiruchirapalli.
2. Sasikumar R (2011) *Practical Physics*, PHI Learning Pvt. Ltd, New Delhi.
3. Arora CL, *B.Sc. Practical Physics*, S.Chand & Co. limited.

Supplementary Readings

1. Srinivasan S, *A TextBook of Practical Physics*, S.Sultan Chand Publications.
2. Ouseph C.C, U.J. Rao (30 May 2009) *Practical Physics and Electronics* Viswanathan, Printers& Publishers Pvt Ltd..Chand and co., New Delhi, 6th Edition.
3. Murugesan R, (2005) *Allied Physics I & II*, S. Chand & Co. First Edition.
4. Thangaraj K, Jayaraman D *Allied Physics*, Popular Book Department, Chennai.
5. Mathur D S, (1999) *Elements of Properties of Matter*, S. Chand & Co.

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	3	2	2	2
CO4	2	2	3	3	2
CO5	3	2	2	2	3

CORRELATION LEVELS: 1- LOW, 2- MODERATE, 3- HIGH

YEAR - I SEMESTER -II ELECTIVE-I	22UMATE26-1: FOURIER SERIES AND FOURIER TRANSFORM	HRS/WK – 2 CREDIT – 3

COURSE OBJECTIVES

Introduce the Fourier series and its application and the concepts of Half range Sine and Cosine series Dirichlet's conditions,Fourier Integrals, Fourier Sine and Cosine Integral, and different type Fourier transforms.

Fourier Series:

Unit-1:

Introduction, Dirichlet conditions, Euler's Formulae for Fourier Series, Theorem for the convergence of Fourier series, Fourier Series for functions of period 2π .Examples.

Unit-2:

Change of Interval -Fourier Series for functions of period 2ʌ, Dirichlet's conditions, Examples. Fourier Series of a function with its periodic extension.

Unit-3:

Half Range Fourier Series: Construction of Half range Sine Series, Construction of Half range Cosine Series. Examples.

Unit-4:

Definition - Fourier Integrals - Fourier Since and Cosine Integral - Complex Form of Fourier Integral - Fourier Transform: Fourier Since and Cosine Transforms - Finite Fourier Sine and Cosine Transforms (without proof)

Unit-5:

Properties of Fourier Transforms - Convolution Theorem for Fourier Transforms - Parseval's Identity for Fourier Transforms - (without derivation), Inverse of Fourier Transform, Examples.

COURSE OUTCOMES

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

1) Find the Fourier series representation of a function of one variable.
2) Find the solution of the wave, diffusion and Laplace equations using the Fourier series.
3) Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4) Understand different types of Fourier Transform and its properties.
5) Solve problems on Fourier Transform and inverse Fourier Transform.

Text Books

1) Unit- I, II, III: Dr. M. K. Venkataraman and Mrs. Manorama Sridhar, Content and treatment of Chapter 1 Fourier series as in the book Calculus and Fourier Series, The National Publishing company, Chennai 2001.

2) B.S.Grewal. Higher Engineering Mathematics (2002), Khanna Publishers, New Delhi.

Supplementary Readings

1) S. Narayanan and T.K. Manicavachagom Pillay, Calculus Volume-III, S. Viswanathan (Printers & Publisher) Pvt. Ltd. Chennai, 2008.
2) M.K.Venkataraman, Engineering Mathematics-Part B. National Publishing Company, Chennai, 1992.
3) Dr. B. S. Grewal, Higher Engineering Mathematics Edition 43rd, Khanna Publishers, New Delhi, 2014.
4) K. Vairamanickam, Nirmala P. Ratchagar and S. Tamilselvan, Engineering Mathematics – II, Scitech Publications (India) Pvt. Ltd., Chennai, 2011.
5) K. Vairamanickam, Nirmala P. Ratchagar and S. Tamilselvan. Transforms and Partial Differential Equations, Scitech Publications (India) Pvt. Ltd., Chennai, 2012.

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	3	3	3	2
CO3	3	3	3	3	2
CO4	2	3	3	3	2
CO5	3	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - I SEMESTER -II ELECTIVE-II	22UMATE26-2: MATRIX THEORY	HRS/WK – 2 CREDIT – 3

COURSE OBJECTIVES

In this course students are trained to develop skills in finding rank, inverse, Eigen values, Eigen vectors and quadratic forms.

Unit-1:

Rank of the Matrix – Inverse of the Matrix.

Unit-2:

Symmetric – Skew Symmetric – Hermitian – Skew Hermitian – Orthogonal and Unitary matrices.

Unit-3:

Eigen values – Eigen vectors – Cayley Hamilton theorem.

Unit-4:

Diagonalisation by similarity transformation.

Unit-5:

Quadratic Forms – Nature of Quadratic Forms.

COURSE OUTCOMES

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

1) Find the rank and inverse of a matrix.
2) To understand the symmetric,skew symmetric,Hermitian ,orthogonal and Unitary matrices
3) Find Eigen Values and Eigen Vectors.
4) Diagonalize the matrix using similarity transformation.
5) Find the nature of Quadratic forms.

Text Books

1) S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay and Dr. P. Kandaswamy, Ancillary Mathematics, Volume-I, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2009.

Supplementary Readings

1) K. Vairamanickam, Nirmala P. Ratchagar and S. Tamilselvan, Engineering Mathematics,Scitech Publications (India) Pvt. Ltd., Chennai, 2009.
2) Richard Bellman, Introduction to Matrix Analysis, Second Edition, T.M.G. Publishing Company Ltd., New Delhi, 1974.

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - I SEMESTER - II ELECTIVE – III	22UMATE26-3: NUMBER THEORY	HRS/WK – 2 CREDIT – 3

COURSE OBJECTIVES

To highlight the niceties and nuances in the world of numbers, the students will be given training on divisibility of numbers and the fundamental theorem of arithmetic, prepare them for coding through congruences and make them understand the Applications of Fermat's theorem , Wilson's theorem and famous Chinese remainder theorem.

Unit I

Euclid's Division Lemma – Divisibility – The Linear Diophantine Equation – The Fundamental Theorem of Arithematic.

Unit II

Permutations and Combinations – Fermat's Little Theorem – Wilson's Theorem – Generating Functions

Unit III

Basic Properties of Congruences Residue Systems. Linear Congruences – The Theorems of Fermat and Wilson Revisited.

Unit IV

The Chinese Remainder Theorem – Polynomial Congruences – Combinational Study of F(n).

Unit V

Formulae for d(n) and s(n) – Multiplicative Arithmetic Function – The Mobius Inversion Formula.

COURSE OUTCOMES

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

1) Know the divisibility of Numbers using Euclid's division Lemma.
2) Solve problems on Permutations and Combinations.
3) Understand the concepts of Chinese theorem and Multiplicative arithmetic functions.
4) Apply the Fermat's and Wilson's theorems for solving problems in Numbers.
5) Solve problems on Liner Congruence and Polynomial congruence.

Books for Study

1. Number Theory by George E.Andrews, Hindustan Publishing Corporation – 1984, Edition.

Unit I : Chapter - 2 Sec. 2.1 – 2.4 pages 12-29

Unit II : Chapter – 3 Sec. 3.1, 3.4 pages 30-44

Unit III : Chapter – 4Sec. 4.1 – 4.2 Pages 49 – 55, Sec. 5.1- 5.2 Pages 58-65

Unit IV : Chapter – 4 Sec. 5.3 – 5.4 pages 66-74, Sec. 6.1 Pages 75-81

Unit V : Chapter – 5 Sec. 6.2 – 6.3 Pages 82-92

Text Books

1) Basic Number Theory by S.B.Malik, Vikas Publishing House Pvt. Ltd.,
2) A First Course Theory of Numbers by K.C.Chowdhury. Asian Books Pvt. Ltd., I Edition (2004)

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	3	3	3	3	2
CO3	2	3	3	3	2
CO4	3	3	3	3	2
CO5	3	3	3	2	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -III CORE- V	22UMATC33: ABSTRACT ALGEBRA	HRS/WK – 5 CREDIT – 4

Course Objectives : Modern algebra plays a major role in other branches of Mathematics. Properties of groups, Various subgroups such as normal subgroups such as normal subgroups, quotient groups are studied. Homomorphism of groups and rings ,automorphisms of groups are discussed. The properties of rings, ideals, quotient rings and Euclidean rings are discussed.

Unit-1: Group Theory

Definition and examples of groups, Some preliminaries Lemmas, Subgroups.

Unit-2: Group Theory (Continued)

A continued principle, Normal subgroups and Quotient groups, Homomorphisms.

Unit-3: Group Theory (Continued)

Automorphisms, Cayley's theorem, Permutation groups.

Unit-4: Ring Theory

Defintion and examples of rings, Some special classes of rings, Homomorphisms, Ideals and Quotient rings.

Unit-5: Ring Theory (Continued)

More on ideals and quotient rings, The field of quotients of an integral domain.

Course Outcomes:

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

CO1: Explain the fundamental concepts of algebra such as groups, subgroups, quotient groups.

CO2: Understand the concept of Homomorphism, Aautomorphisms.

CO3: Solve problems on ideals, Cayley's theorem and permutation groups.

CO4: Demonstrate accurate and efficient use of a ring with examples, some classes of a ring, homomorphism of a ring, ideals, quotient rings and integral domain.

CO5: Solve problems in the above related topics, Normal subgroups,Quotient groups,Homomorphisms, Ideals and Integral domain.

Text Books

I.N.Herstein , Content and treatment as in the book Topics in Algebra , John Wiley and Sons, New York,1999.

Unit I - Chapter 2: Section 1 to 4.
Unit II - Chapter 2: Sections 5 to 7.
Unit III - Chapter 2: Sections 8 to 10.
Unit IV - Chapter 3:Sections 1 to 4.
Unit V - Chapter 3: Sections 5 and 6.

Supplementary Readings

1.R.Balakrishnan and N.Ramabhadharan, A.Textbook of Modern Algerba , Vikas Publishing House, Second Revised Ed., 1994.
2.J.B. Fraleigh, A first course in Abstract Algebra , Addison- Wesley, Fifth Edition, 1999.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	2
CO2	2	3	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	2	2
CO5	3	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -III ALLIED-III	22UMATA03: MATHEMATICAL STATISTICS-I	HRS/WK – 7 CREDIT – 3

Course Objectives:

To Learn Statistical Methods Probability theory, Random variables, Distribution functions, Mathematical expectations, Generating functions,Correlation , Regression, and some standard Distributions. Students should be given practice on Statistical methods so that he could apply the techniques to solve real world problems in the field of Science, Technology and Business Management.

UNIT-I: PROBABILITY THEORY

Axiomatic approach to probability - Some theorems on Probability - Conditional Probability - Multiplication theorem of probability - Independent events - Baye's Theorem - Simple Problems.

[Chapter 3, sec 3.8 (3.8.1;3.8.2;3.8.5;3.8.6), sec 3.9 (3.9.1,3.9.2), sec 3.10 - 3.13;
Chapter 4, sec 4.2]

UNIT –II: RANDOM VARIABLES, DISTRIBUTION FUNCTIONS AND MATHEMATICAL EXPECTATION.

Random Variables (Discrete and Continuous) - Distribution Function – Mathematical Expectation – Expected value of function of a random variable – properties of expectation – properties of variance – covariance.

[Chapter 5, sec 5.2-5.4; Chapter 6, sec 6.2-6.6]

UNIT-III: GENERATING FUNCTIONS.

Moment generating function - Characteristic Function - Uniqueness and Inversion Theorem (Statement only) - Chebychev's Inequality - Simple Problems.

[Chapter 7, sec 7.1,7.3 - 7.5]

UNIT-IV CORRELATION AND REGRESSION.

Concept of Bivariate Distribution - Correlation - Karl Pearson's Coefficient of Correlation - Rank Correlation - Linear Regression.

[Chapter 10, sec 10.4-10.7, Chapter 11, sec 11.2]

UNIT-V STANDARD DISTRIBUTIONS

Discrete distributions - Binomial, Poisson, Hyper Geometric and Negative Binomial Distributions - Continuous Distributions Normal, Uniform, Exponential.

[Chapter 8, sec 8.4(8.4.1-8.4.8), sec 8.5(8.5.1-8.5.6), sec (8.6.1; 8.6.3-8.6.5), sec 8.8; Chapter 9, sec 9.2 (9.2.1-9.2.5), sec 9.3, sec 9.8]

Recommended text book:

S.C. Gupta & V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan & sons , (11^{th} edition, June 2002).

Books for Reference

1. Hogg, R.V. & Craig.A.T.(1998) : Introduction to Mathematical Statistics, Macmillan
2. Mood. A.M. Graybill. F.A.&Boes.D.G.(1974) : Introduction to theory of Statistics, McGraw Hill.
3. Snedecor.G.W. &Cochran.W.G.(1967) : Statistical Methods, Oxford and IBH
4. Hoel, P.G (1971): Introduction to Mathematical Statistics, Wiley.
5. Wilks S.S. Elementary Statistical Analysis, Oxford and IBH

Course Outcomes:

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

CO1: Understand the concepts of Probability theory and their usage in real world Situations .
CO2: Solve problems on Random variables, Distribution functions and Mathematical expectations.
CO3: Understand the Generating functions and its applications.
CO4: Apply the standard distributions in many field of Science , Engineering ,Medicine ,Nano technology and Business.
CO5: Solve problems in Correlation and Regression Analysis.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	3	2
CO2	3	3	3	3	2
CO3	3	3	2	2	2
CO4	3	3	3	3	2
CO5	3	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -III ALLIED-III	22UCOMA25: PRINCIPLES OF ACCOUNTANCY - I	HRS/WK – 7 CREDIT – 3

Course Objectives:

To provide an understanding of the principles of accounts and practice in recording transactions and interpreting individual as well as company accounts, and develop an understanding of the form and classification of financial statements as a means of communicating financial information.

UNIT I: INTRODUCTION

Meaning and Scope of Accounting; Need for Accounting; Definition of accounting; step in accounting- Booking-keeping Vs. Accounting- Objective of accounting; advantage of accounting; Limitation of accounting; Groups interested in accounting information.

UNIT II: BRANCHES OF ACCOUNTING

Branches of Accounting- Methods of Accounting-Double entry system- Types of Accounts- Accounting rules- Bases of Accounting- Accounting terminology; Need for Accounting concepts and conventions- meaning & classification of accounting concepts and conventions.

UNIT III: ACCOUNTING CYCLE

Journal- Transaction analysis for journal entries- Ledger- Posting of Journal to ledger.; Distinction between Journal and Ledger;

UNIT IV: TRAIL BALANCE

Meaning- Definition; Objective; Methods of preparation, Trail balance and accuracy books of accounts; Errors in Trail balance; Subsidiary Books- Benefits of Subsidiary book.

UNIT V: FINAL ACCOUNTS

Introduction- Trading account; Preparation of Profit & loss account and Balance sheet – (Without Adjustments).

TEXT BOOKS:

1. Financial Accounting- R.L.Gupta and V.K Gupta- Sultan chand & Sons.
2. Financial Accounting- T.S.Reddy and A.Murthy- Margham Publishers Chennai.
3. Financial Accounting- Dr.N.Premavathy-Sri Vishnu Publications, Chennai.
4. Advanced Accounts-M.C.Shukla and T.S.Grewal
5. Financial Accounting- S.Thothadri & S.Nafeesa-McGraw Hill Education, New Delhi.

Course Outcomes:

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

CO1: Get knowledge about the concepts of accounting.

CO2: Understand the Basic Principles and rules of accounting.

CO3: Solve Problems on Trial Balance and Final Accounts.

CO4:.Understand the preparation of accounting books.

CO5: Apply the Accounting principles to Bank , Business and Industry with the help of software Tally.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -III ELECTIVE-I	22UMATE36-1: FUZZY SETS AND FUZZY LOGIC	HRS/WK –3 CREDIT – 3

Course Objectives : This course aims to offer fuzzy sets,Crisp sets,properties of α-Cuts, fuzzy operations and fuzzy logic. The students will be given practice on solving problems of real world using Fuzzy sets and Fuzzy logic.

Unit-1

Fuzzy sets: Basic types-Basic Concepts-Characteristic and significant of the paradigm shift.

Unit-2

Fuzzy sets versus Crisp sets: Additional properties of α-Cuts - Representation of fuzzy sets-Extensiton principle of fuzzy sets.

Unit-3

Operations on fuzzy sets: Types of operations-Fuzzy complements-Fuzzy intersections :t-Norms-Fuzzy union: t-CoNorms.

Unit-4

Fuzzy logic: Classical logic-Multivalued logics-Fuzzy Propositions-Fuzzy Quantifiers.

Unit-5

Fuzzy logic contd., :Inference from conditional fuzzy propositions-Inference from conditional and qualified propositions- Inference from quantified propositions.

Course Outcomes:

On successful completion of the course, students will be able to identify the basic concepts on.

CO1: Fuzzy sets.
CO2: Representation of fuzzy sets.
CO3: Operations on fuzzy sets.
CO4: Characteristics of fuzzy logic.
CO5: Fuzzy propositions.

Text Books

Geroge J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications.
Unit-1:Chapter-I:Sections 1.3 to 1.5
Unit-2:Chapter-II:Sections 2.1 to 2.3
Unit-3:Chapter-III:Sections 3.1 to 3.4
Unit-4:Chapter-VIII:Sections 8.1 to 8.4
Unit-5:Chapter-VIII:Sections 8.6 to 8.8

Supplementary Readings

1. H.J. Zimmermamn, Fuzzy sets Theory and its applications, Ailled Publishers 1996.
2. A. Kaufman, Introduction to the theory of Fuzzy subsets Academic press,1975.
3. V.Novak, Fuzzy Sets and Their Applications, Adam Hilger, Bristol, 1969.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -III ELECTIVE-II	22UMATE36-2: PROGRAMMING IN C LANGUAGE	HRS/WK –3 CREDIT – 3

Course Objectives:

To make the students abreast with the programming concepts Constants, variables ,data types,operators, expressions ,formatted input-output statements, Control statements and to master them in C Language. Students can be given practice to write a complete C programs to solve all kinds of problems arise day today life in Science, technology and Business

UNIT –I: OVERVIEW OF C

Basic Structure of C Programs- Programming style- Executing a 'C' Programs –'c' Tokens-Keywords and Identifiers.

UNIT – II: CONSTANTS , VARIABLES & DATA TYPE

Constants-Variables-Data Types- Declaration of Variables- Declaration of Storage Class-Assigning values to variables.

UNIT – III: OPERATORS AND EXPRESSION

Arithmetic Operators-Relational operators- Logical operators-Assignment operators-Increment and decrement operators-Conditional operators-Evaluation of Expressions-Precedence of Arithmetic operators.

UNIT –IV:FORMATTED INPUT,OUTPUT & DECISION MAKING AND BRANCHING

Formatted input- Formatted output- Decision making with 'IF' statement- Simple IF statement- The IF….ELSE statement-Nesting of IF…ELSE statement-The ELSE IF ladder-The switch statement – The ?: Operators- The GOTO statement.

UNIT – V: DECISION MAKING AND LOOPING & ARRAYS

The WHILE statement-The DO statement-The FOR statement- Jumps in LOOPS-One dimensional array-Declaration of one dimensional arrays-Initialization of one dimensional arrays-Two dimensional arrays-Multi dimensional arrays.

Course Outcomes:

At the end of the Course the students should be able to exhibit

CO1: Knowledge pertaining to C-Language Fundamentals
CO2: Logic using Control Statements
CO3: Modular Programming using Functions
CO4: Knowledge pertaining to arrays and structures.
CO5: Advanced Programming techniques to solve a very complex problems.

Text Books

1. E. Balagurusamy [1996], "Programming in ANSI C" .Tata McGraw Hill.
   Unit:I Chap:1(1.8-1.10),Chap:2 (2.3,2.4)
   Unit:II Chap:2 (2.5-2.10),
   Unit:III Chap: 3 (3.2-3.12),
   Unit-IV Chap:4 (4.4,4.5),Chap:5 (5.2-5.9),
   Unit:V Chap:6 (6.2-6.5),Chap:7(7.2-7.7)

Supplementary Readings

1. V.Rajaraman [1995], "Computer Programming In C", Prentice Hall. New Delhi.
2. H.Schildt, Obsborne (1994), "Teach Yourself C", McGraw Hill, New York ,Mullish Cooper.
3. "The Spirit of C – An Introduction to Modern Programming",Jaico Publishing House. Delhi. 1998.
4. Yashavant Kanetkar, "Let Us C", 6th edition BPB publication.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II	22UMATE36-3: R PROGRAMMING	HRS/WK –3
SEMESTER -III		CREDIT – 3
ELECTIVE-II		

Course Objectives:

 Learn Fundamentals of R. Covers how to use different functions in R, how to read data into R, accessing R packages,writing R functions, debugging, and organizing data using R functions.Cover the Basics of statistical data analysis with examples. The whole syllabus will give an idea to collect, compile and visualize data using statistical functions.

UNIT I (08 HRS)

Introduction to R:What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get Started:Installed.packages(),packageDescription(), help(), find.package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.

UNIT II (08 HRS)

R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables - R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators - R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop – Loop control statement: break statement, next statement.

UNIT III (10 HRS)

R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower() - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting - R List - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector - R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division- R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements - R Factors –creating factors, generating factor levels gl().

UNIT IV (10 HRS)
Data Frames –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, Expand Data Frame: Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast().
Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.

UNIT V (09HRS)
Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median - Mode - Standard Deviation – Correlation - Spotting Problems in Data with Visualization: visually Checking Distributions for a single Variable - R –Pie Charts: Pie Chart title and Colors – Slice Percentages and Chart Legend, 3D Pie Chart – R Histograms – Density Plot - R – Bar Charts: Bar Chart Labels, Title and Colors.

Course Outcomes:

On successful completion of the course, the students will be able to
CO1: Understand the Fundamentals Data types, variables, Control statements of R.
CO2: Know the loading, retrieval techniques of data.
CO3: Understand how data is analyzed and visualized using statistics functions.
CO4: Write R programs to solve All statistical problems.
CO5:Present Diagrammatic representations of Science, Technology and Business information Such as Pie chart, Bar chart, 3D charts and Histograms using R Programs.

Text Books

1. Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5.
2. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.
3. Tutorials Point (I) simply easy learning, Online Tutorial Library (2018), R Programming, Retrieved from https://www.tutorialspoint.com/r/r_tutorial.pdf.
4. Andrie de Vries, Joris Meys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -III NON-MAJOR ELECTIVE – I	22UMATN37: BASIC MATHEMATICS - I	HRS/WK – 2 CREDIT – 2

Course Objectives:
Students can be given practice to solve all kinds of problems arise day today life in Science, technology and Business Using the concepts of number system, HCF and LCM, average, ratio, proportion, and partnership.

UNIT 1:
Number System
UNIT 2:
H.C.F and L.C.M of Numbers
UNIT 3:
Average
UNIT 4:
Ratio and Proportion
UNIT 5:
Partnership

Course Outcomes:
On successful completion of the course, the students will be able to:

CO1: Understand the nature of number system
CO2: Compute the HCF an LCM of given numbers
CO3: Calculate the average of given values.
CO4 : Calculate Ratio and Proportion.
CO5: Understand the concepts of Partnership

Text Books
Quantitative Aptitude – Dr.R.S.Aggarwal, S. Chand Publications, Revised and Enlarged Edition 2017
Unit-1 Pages from 3 to 50
Unit-2 Pages from 51 to 68
Unit-3 Pages from 206-239
Unit-4 Pages from 426 to 475
Unit-5 Pages from 476 to 492

Supplementary Readings
1. Quantitative Aptitude for Competitive Examinations- Abhijit Guha,Third Edition (2006),Tata McGraw Hill publishing Company Ltd., New Delhi.
2. Course in Quantitative Aptitude for Competitive Examinations- Agarwal P. K, First Edition (2002), Cyber-tech Publications, New Delhi.
3. Fast Track Objective Arithmetic, Rajesh Verma, Arihant Publications,2004

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -III SKILL BASED SUBJECT – I	22UMATS38: QUANTITATIVE APTITUDE- I	HRS/WK –3 CREDIT – 2

Course Objectives:
To enrich the problem solving skills, teach mathematical ideas for real world problems. Inculcate the habit of self learning. To make the students understand basic Mathematics and guide them to solve problems on Numbers, Average, percentage and Mixture.

UNIT I: AVERAGE
UNIT II : PROBLEMS ON NUMBERS
UNIT III: PROBLEMS ON AGES
UNIT IV: PERCENTAGE
UNIT V: MIXTURE

Course Outcomes:
On successful completion of the course, the students will be able to:

CO1: Recognize, describe and represent numbers and their relationships.
CO2:Estimate, calculate with competence and confidence in solving problems.
CO3 : Understand the problem solving techniques on Average,Percentage and Mixture.
CO4: Solve problems arise on real world situations.
CO5: Acquire the knowledge to write competitive exams.

Text Books

Treatment as in ‘‘Quantitative Aptitude(fully solved)” by R.S.Aggarwal, 7th fully revised edition 2008, S.Chand&Company Ltd,Ramnagar, New Delhi-110 055.

UNIT I: Chapter 6, Page No. 139 to 144
UNIT II: Chapter 7, Page No. 161 to 166
UNIT III: Chapter 8 , Page No. 182 to 186
UNIT IV: Chapter 10,Page No. 208 to 216
UNIT V: Chapter 20, Page No. 435 to 439

Supplementary Readings

1. Quantitative Aptitude for Competitive Examinations- Abhijit Guha, Third Edition (2006),Tata McGraw Hill publishing Company Ltd., New Delhi.
2. Course in Quantitative Aptitude for Competitive Examinations- Agarwal P. K, First Edition (2002), Cyber-tech Publications, New Delhi.
3. Fast Track Objective Arithmetic, Rajesh Verma, Arihant Publications,2004

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -IV CORE- VI	22UMATC43: REAL ANALYSIS – I	HRS/WK – 4 CREDIT – 4

Course Objectives: To lay a good foundation of Analysis and to acquire knowledge about Real number system, metric spaces, various limiting behavior of sequences and series, open sets, closed sets and to enhance the mathematical maturity and to work comfortably with these concepts.

Unit – I: Functions & Sequences

Functions – real valued functions – equivalence – countability and real numbers – least upper bound – definition of sequence and subsequence – limit of a sequence – convergent sequences.

Unit – II: Sequences [Contd…]

Divergent sequences – Bounded sequences – Monotone sequence – Operations on convergent sequences – Operations on divergent sequences – Limit superior and Limit inferior – Cauchy sequences.

Unit – III: Series of Real Numbers

Convergence and Divergence – Series with non negative terms – Alternating series – conditional convergence and Absolute convergence – Tests for Absolute convergence.

Unit – IV: Series of Real Numbers [Contd…], Limits and Metric Spaces

Series whose terms form a non increasing sequence – The class $\ell 2$ – Limit of a function on the real line – Metric spaces – Limits in Metric spaces.

Unit – V: Continuous Functions on Metric Spaces

Functions Continuous at a point on the real line – Reformulation – Functions Continuous on a Metric Spaces – Open Sets – Closed Sets.

Course Outcomes:

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

CO1: Understand examples and counter examples in Functions and Sequences
CO2: Know Proof techniques.
CO3: Improve Problem solving skills in Analysis.
CO4: Understand the concepts of Convergence sequence.
CO5 : Solve problems on Metric spaces and Continuous functions.

Text Books

R. Goldberg, Content and treatment as in the book Methods of Real Analysis, Oxford & IBH Publishing Co., New Delhi 2000.

Unit – I	Chapter 1 Sections 1.3 to 1.7, Chapter 2 Sections 2.1 to 2.3
Unit – II	Chapter 2 Sections 2.4 to 2.10
Unit – III	Chapter 3 Sections 3.1 to 3.4 and 3.6
Unit – IV	Chapter 3 Sections 3.7, 3.10, 4.1 to 4.3
Unit – V	Chapter 5 Sections 5.1 to 5.5

Supplementary Readings

1. Tom M. Apostol, Mathematical Analysis, 2nd Edition, Addison – Wesley New York, 1974.
2. Barite, R.G. and Shebert, Real Analysis, John Wiley and Sons Inc., New York, 1976.
3. Malik, S.C. and Savita Arora, Mathematical Analysis, Wiley Eastern limited, New Delhi, 1991.
4. Sanjay Arora and BansiLal, Introduction to Real Analysis, SatyaPrakashan, New Delhi, 1991.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -IV CORE- VII	22UMATC44: STATICS	HRS/WK – 4 CREDIT – 3

Course Objectives: This Course aims to provide basic skills and problem solving techniques in forces acting at a point, Coplanar system of forces, friction and equilibrium of strings and chains.

Unit-1: Forces acting at a point , Resultant and components, Parallelogram of forces , Analytical expressin for the resultant of two forces acting at a point, Triangle of forces, The polygon of forces, Lami's theorem, An extended form of the parallelogram law of forces, Resolution of a force, Components of a force , Resultant of any number of forces acting at a point, Conditions of equilibrium of any number of force acting upon a particle.

Unit-2: Parallel forces and Moments,The resultant of two like and unlike parallel forces acting on arigid body, Resultant of a number of parallel forces acting on a rigid body, Conditions of equilibrium of three coplanar parallel forces , Centre of two parallel forces, Moment of a force, Varignon's theorem of moments, Generalized theorem of moments.
Couples, Definition, Equilibrium of two couples , Equivalence of two couples, Couples in parallel planes, Representation of couple bya vector, Resultant of a coplanar couples, Resultant of a couples and a force.

Unit-3: Equilibrium of three forces acting on a rigid body, Rigid body subjected to any three forces, Three coplanar forces, Conditions of equilibrium, Procedure to be followed in solving any statical problem, Two trigonometrical theorems, Some artifices, Problems on parallel forces.

Unit-4: Coplanar forces, Reduction of coplanar forces in general, Reduction of any number of coplanar forces, Conditions and alternative conditions for a system of forces to reduce to a single force or to a couple, Change of the base-point, Equation to the line of action of the resu;tant, Equation to the line of action of the resultant , General conditions of equilibrium.

Unit-5: Friction, Statical , Dynamical and Limiting frictions , Laws of friction, Coefficient of friction, Angle of friction, Cone of friction, Numerical values, Equilibrium of a particle on a rough inclined plane, Equilibrium of a body on a rough inclined plane.

Course Outcomes:

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

CO1: Apply the fundamental concept of statics to
a. Demonstrate the application of vectors for the analysis of static equilibrium ;
b.Analyze static equilibrium to particles and rigid bodies and apply the principles of equilibrium for analyzing beams.

CO2: Understand problem solving techniques on Parallel forces and Moments.

CO3: Solve problems on Equilibrium of three forces acting on a rigid body.

CO4: Solve equations involving frictional, statistical, dynamical and limiting frictions.

CO5: Illustrate the mathematical aspects that provide the skills and problem solving in forcesacting at a point, coplanar forces and equilibrium of strings and chains.

Text Books

M.K. Venkataraman , Content and treatment as in the book A Text Book of STATICS, Agasthiar Book Depot, Trichy (1986).

Unit I - Chapter 2 all sections.
Unit II - Chapter 3 Sections 1 to 13 and Chapter 4 all sections.
Unit III - Chapter 5 Sections 1 to 7.
Unit IV - Chapter 6 Sections 1 to 13.
Unit V - Chapter 7 Sections 1 to 13.

Supplementary Readings

R.S.Varma , Text book on STATICS, Pothishala Pvt. Ltd., Allahabad.
A.V.Dharmapadam , STATICS, S.Viswanathan (Printers and Publishers) Private Ltd., 1973.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -IV ALLIED-IV	22UMATA04: MATHEMATICAL STATISTICS-II	HRS/WK – 3 CREDIT – 3

Course Objectives:

The objective is to train students in some concepts in mathematical statistics. The theory of sample moments, significant test, sampling theory and analysis of variance are introduced. Practical problems are solved.

UNIT-I

Sampling and large sample test,

Chapter: 12 Page 307- 333

UNIT-II

Exact sampling distribution (chi-square distribution)

Chapter:13 Page 334 - 351

UNIT-III

Exact sampling distribution t,F and Z distribution

Chapter:14 Page 352-370

UNIT-IV

Theory of estimation, testing of hypothesis

Ch:15 and 16 Pages: S.1-S.15 and S.18-S.30

UNIT-V

Analysis of variance, Design of experiments

Chapter: 17 and 18 Page: S.31-S.46 and S.47-S.75

Recommended Text:

S.C. Gupta & V.K. Kapoor: Elements of Mathematical Statistics, Third extensively revised and greatly improved edition, Sultan Chand & sons.

Books for Reference

1. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & sons.
2. Hogg, R.V. & Craig. A. T. (1998): Introduction to Mathematical Statistics, Macmillan
3. Mood.A.M.,Graybill. F.A.&Boes. D.G.(1974): Introduction to theory of Statistics, McGraw Hill.
4. Snedecor.G.W. &Cochran.W.G.(1967): Statistical Methods, Oxford and IBH
4. Hoel.P.G (1971): Introduction to Mathematical Statistics, Wiley.
5. Wilks . S. S.Elementary Statistical Analysis, Oxford and IBH
6. O. Kempthone - Design of Experiments
7. Das and Giri : Design of Experiments Wiley Eastern

Course Outcomes:

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

CO1: Gain working knowledge related to the problems of theoretical statistics.

CO2: Apply the fundamental concept of statistical methods to solve some real life problems.

CO3: Gain a basic knowledge for study of advanced courses in this area.

CO4: Solve problems on Testing of Hypothesis.

CO5: Apply the Analysis of Variance and Design of Experiments over the collection of data for Research problems.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -IV ALLIED - IV	22UCOMA26: PRINCIPLES OF ACCOUNTANCY - II	HRS/WK – 3 CREDIT – 3

Course Objectives:

To enable the students to learn the concept of system of preparing financial statements for various types of organizations,and make them understand with knowledge about financial reporting standards. To enable the students to acquire the ability in preparing and maintaining Cash book, Single entry system, Depreciation accounting, financial statements and Final Accounts.

UNIT I: CASH BOOK

Preparation simple cash book – Two column cash book- Imprest system

UNIT II: SINGLE ENTRY SYSTEM

Meaning-Definition- Salient features- limitation- Difference between Single entry and double entry system

UNIT III: DEPRECIATION ACCOUNTING

Concept of Depreciation- Meaning – characteristics- causes- objectives- Methods of Depreciation- Difference between Straightline method and Diminishing method

UNIT IV: RECTIFICATION OF ERRORS

Classification of errors- Rectification of errors (excluding Suspense account); Bank Reconciliation statement-need and preparation.

UNIT V: FINAL ACCOUNTS

Preparation Final accounts – (With simple Adjustments).

TEXT BOOKS:

1. Advanced Accounts-M.C.Shukla and T.S.Grewal
2. Financial Accounting- R.L.Gupta and V.K Gupta- Sultan chand & Sons.
3. Financial Accounting- T.S.Reddy and A.Murthy- Margham Publishers Chennai.
4. Financial Accounting- Jain & Narang – Kalyani Publishers, New Delhi

Financial Accounting- Dr.N.Premavathy-Sri Vishnu Publications, Chennai

Course Outcomes:

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

CO1: Get knowledge about the concepts of accounting.

CO2: Understand the Basic Principles and rules of accounting.

CO3: Get Knowledge about the cash book system and Keeping Financial Accounting Records.

CO4: Understand the maintenance of accounting in enterprises.

CO5: Apply the Accounting principles to Bank , Business and Industry with the help of Software Tally.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - II SEMESTER -IV ALLIED PRACTICAL-II	22UMATA46 MATHEMATICAL STATISTICS PRACTICAL USING R - PROGRAMMING	HRS/WK – 3 CREDIT – 3

Course Objectives:

After taking the course, students will be able to use R for statistical programming, computation, graphics, and modeling in Computer practicals, further they will be given training on built in functions in R and use that in an efficient way to solve all critical problems. It helps them to fit some basic types of statistical models, and use R in their own research and expand their knowledge of R on their own.

List of exercise:

Using R Programming develop the programmes in the following topics:

1. Plotting Bar chart and scatter plot
2. Plotting histogram and pie chart
3. Graphics for grouped data
4. Graphical display of distributions
5. Measures of central tendency -Mean, median, mode
6. Measures of Dispersion- std. deviation, mean deviation
7. Regression and correlation. Linear models.
8. Large sample tests
9. Small sample test t- tests
10. Small sample test F-tests
11. Small sample test Chi-square tests
12. ANOVA(one way)
13. ANOVA (Two way)

Textbooks and References:

1. Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters Beginner's Guide to R - Springer, 2009.
2. Allerhand M. Tiny Handbook of R - SpringerBriefs in Statistics, 2011
3. Baayen R. Analyzing Linguistic Data - A Practical Introduction to Statistics using R , 2008.
4. Gardener M. Beginning R - The Statistical Programming Language , 2012.
5. Jim Albert, Maria Rizzo R by Example, 2012.
6. Matloff N. Art of R Programming - A Tour of Statistical Software Design , 2011.

Mathematics faculty alone should be appointed as examiners.

YEAR - II SEMESTER –IV NON-MAJOR ELECTIVE – II	22UMATN47: BASIC MATHEMATICS - II	HRS/WK – 2 CREDIT – 2

Course Objectives:

To enhance the problem solving techniques in real life applications of mathematical concepts Time, work,distance ,Boats and Stream, Alligation or Mixture , Volume and Surface area.

UNIT 1:

Time and Work

UNIT 2:

Time and Distance

UNIT 3:

Boats and Streams

UNIT 4:

Alligation or Mixture

UNIT 5:

Volume and Surface Area

Course Outcomes:

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

CO1: Solve problems on time and work.
CO2: Calculate time and distance for real word problems.
CO2: Compute the speed of boats and streams.
CO3: Calculate the mixing of water in milk
CO5: Solve problems on Volume and Surface area.

Text Books

Quantitative Aptitude – Dr.R.S.Aggarwal, S. Chand Publications, Revised and Enlarged Edition 2017

Unit-1 Pages from 526 to 561
Unit-2 Pages from 562 to 599
Unit-3 Pages from 600 to 611
Unit-4 Pages from 633 to 640
Unit-5 Pages from 766 to 813

Supplementary Readings

1. Quantitative Aptitude for Competitive Examinations- Abhijit Guha,Third Edition (2006),Tata McGraw Hill publishing Company Ltd., New Delhi.
2. Course in Quantitative Aptitude for Competitive Examinations- Agarwal P. K, First Edition (2002), Cyber-tech Publications, New Delhi
3. Fast Track Objective Arithmetic, Rajesh Verma, Arihant Publications,2004

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – II SEMESTER –IV SKILL BASED SUBJECT – II	22UMATS48: QUANTITATIVE APTITUDE II	HRS/WK –2 CREDIT – 2

Course Objectives:

To enhance the problem solving skills and to prepare for any type of competitive examination and identify the teaching techniques and help the students to acquire the competencies and improve the basic mathematical skill.

UNIT I: RATIO AND PROPORTION
UNIT II : TIME AND WORK
UNIT III: TIME AND DISTANCE
UNIT IV: PROBLEMS ON TRAINS
UNIT V: BOAT AND STREAMS

COURSE OUTCOMES:

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

CO1: Understand the concept of ratio and proportion.
CO2: Know the shortcuts and tricks involved in solving time and distance problems.
CO3: Learn how to solve the tricky questions based on time and work.
CO4: Gain knowledge in order to answer problems based on trains.
CO5: Apply the concept of relative speed related to boats and streams.

Text Books

Treatment as in ‘‘Quantitative Aptitude(fully solved)” by R.S.Aggarwal,7th fully revised edition 2008, S.Chand & Company Ltd, Ramnagar, New Delhi-110 055.

UNIT I: Chapter 12, Page No. 294 to 298
UNIT II: Chapter 15, Page No. 341 to 348
UNIT III: Chapter 17, Page No. 384 to 390
UNIT IV: Chapter 18,Page No. 405 to 410
UNIT V: Chapter 19, Page No. 425 to 429

Supplementary Readings

1. Quantitative Aptitude for Competitive Examinations- Abhijit Guha,Third Edition (2006),Tata McGraw Hill publishing Company Ltd., New Delhi.
2. Course in Quantitative Aptitude for Competitive Examinations- Agarwal P. K, First Edition (2002), Cyber-tech Publications, New Delhi.
3.Fast Track Objective Arithmetic, Rajesh Verma, Arihant Publications,2004

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – III	22UMATC51 LINEAR ALGEBRA	HRS/WK – 5
SEMESTER -V		CREDIT – 4
CORE- VIII		

Course Objectives:
To study the Algebraic structures of Vector Spaces and Linear Transformation such as Linear dependence and independence, Dual space, Inner product paces, Algebra of Linear transformations, Characteristic roots, Matrices, Canonical forms, Triangular forms, Trace and Transpose, Determinants.

Unit-I: Vector Spaces
Definition and Examples- Linear dependence and independence.
Unit- II: Vector Spaces (Continued)
Dual Space- Inner Product Spaces.
Unit- III: Linear Transformation
Algebra of Linear Transformations – Characteristics roots.
Unit – IV: Linear Transformations (Continued)
Matrices, Canonical forms, Triangular forms.
Unit – V: Linear Transformation (Continued)
Trace and Transpose, Determinants.
Recommended Text
I.N.Herstein .(1989) Topics in Algebra .Wiley Eastern Ltd. New Delhi.
Chapter- 4 : Sections 4.1,4.2,4.3,4.4
Chapter -6 Sections 6.1,6.2,6.3,6.4,6.8,6.9
Reference Books
1. S.Arumugam (2004)Modern Algebra. Scitech Publications, Chennai.
2. J.B. Fraleigh (1986) A First Course in Algebra (3rd Edition) Addison Wesley , Mass.(Indian Print)
3. S. Lipschutz(2005) Beginning Linear Algebra , Tata McGraw Hill Edition, New Delhi.
4. M.L. Santiago (2002) Modern Algebra , Tata McGraw Hill, New Delhi.
5. Surjeet Singh and Qazi Zameeruddin.(1982) Modern Algebra . Vikas Publishing House Pvt.Ltd., New Delhi, 1982.

Course Outcomes:
On successful completion of the course, the students will be able to:

CO1: Explain the fundamental concepts of Algebraic structures of Vector Spaces and Linear Transformation.

CO2: Understand the concepts of Dual Space- Inner Product Spaces.

CO3: Solve problems on Linear dependence and independence.

CO4: Understand the concepts of Linear transformation on Matrices, Canonical forms, Triangular forms.

CO5: Solve problems on trace of Matrix**,** Transpose,and Determinants

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – III	22UMATC52 REAL ANALYSIS – II	HRS/WK – 5
SEMESTER -V		CREDIT – 4
CORE- IX		

Course Objectives: To study the analytic concepts of connectedness, compactness, derivatives, Riemann integration. To enhance the mathematical maturity and to work comfortably with concepts, Rolles's theorem,Taylor's theorem and sequences and series of functions.

Unit – I: Connectedness, Completeness

More about open Sets – Connected Sets – Bounded Sets and Totally Bounded Sets – Complete Metric Spaces.

Unit – II: Compactness

Compact Metric Space – Continuous Functions on Compact Metric Spaces – Continuity of Inverse Functions – Uniform Continuity.

Unit – III: Riemann Integration

Sets of measure zero – Definition of the Riemann Integral – Properties of the Riemann Integral – Derivatives.

Unit – IV: Derivatives

Rolle's Theorem – The law of the mean – Fundamental theorems of calculus – Taylor's theorem.

Unit – V: Sequences and Series of Functions

Pointwise convergence of sequences of functions – Uniform convergence of sequences of functions – Consequences of uniform convergence – Convergence and uniform convergence of series of functions.

Text Book:

R. Goldberg, Content and treatment as in the book Methods of Real Analysis, Oxford & IBH Publishing Co., New Delhi 2000.

Unit – I Chapter 6 sections 6.1 to 6.4
Unit – II Chapter 6 sections 6.5 to 6.8
Unit – III Chapter 7 sections 7.1, 7.2, 7.4, 7.5
Unit – IV Chapter 7 sections 7.6 to 7.8 and 8.5
Unit – V Chapter 9 sections 9.1 to 9.4

Supplementary Reading:

1. Tom M. Apostol, Mathematical Analysis, 2nd Edition, Addison – Wesley New York, 1974.
2. Barite, R.G. and Shebert, Real Analysis, John Wiley and Sons Inc., New York, 1976.
3. Malik, S.C. and Savita Arora, Mathematical Analysis, Wiley Eastern limited, New Delhi, 1991.

Course Outcomes:

On successful completion of the course, the students will able to:

CO1: Describe fundamental properties of matric spaces that lead to the development of Compact metric spaces.

CO2: Demonstrate an understanding of a set of measure zero and how that are used in Riemann integral.

CO3: Understand the Rolle's theorem,Fundamental theorem of calculus and Taylor's theorem

‘ **CO4**:Understand the point-wise convergence and uniform convergence of a sequence of functions and series of functions.

CO5: Solve problems on complete and compact Metric spaces, Riemann Integration, sequences and series of functions.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – III	22UMATC53 DYNAMICS	HRS/WK – 4
SEMESTER -V		CREDIT – 4
CORE- X		

Course Objectives:

This course aims to provide basic skills and problem solving techniques in kinematics of point and Newton's Laws of motion. Projectiles and simple harmonic motions are studied in detail. Problems in moment of inertia are also considered. The course enhances the problem solving skill of the student.

Unit-1: Kinematics, Speed, Displacement , Velocity, Composition of velocities; Parallelogram law, Resolution of Velocities , Components of a velocity along two given directions , Triangle of velocities , Theorem, Polygon of velocities, Theorem , Resultant of several simultaneous coplanar velocities of a particle, Relative velocities, Acceleration , Variable acceleration, Parallelogram law of accelerations, Relative acceleration, Motion in a straight line under uniform acceleration, Motion in a straight line with variable acceleration, Space-times graph, Velocity -time curve, Velocity- Space graph, To derive graphically the equations of motion of a particle under constant acceleration, Acceleration of falling bodies , Vertical motion under gravity , Bodies freely falling downward , Motion of a particle down a smooth inclined plane, Theorem, Lines of quickestdescent, Theorem.

Unit – 2: The laws of motion: Momentum, Newton's Laws of Motion , Composition of forces: Conversation of linear momentum , Force of friction, Pressure of a body resting on a moving horizontal plane, Motion pf connected particles , Tension in the inextensible string , Atwood's machine, Work, Tension in an elastic string, Work done in stretching an elastic string, Power , Energy , Kinetic Energy, The Principle of work-Energy, Potential Energy, The Principle of conversation of energy, Verification of the principle of energy in the case of a freely falling body , Velocity and acceleration of the centre of inertia of a system of particles.

Unit-3: Projectile: Two Fundamental principles, Path of a projectile, Characteristics of the motion of a projectile, The horizontal range, The velocity at time t, Range on an inclined plane.

Unit 4: Simple harmonic motion: Simple harmonic motion in a straight line, General solution of the S.H.M. equation, Geometrical representation of a simple harmonic motion, Change of origin, Composition of two simple harmonic motions of the same period and in the same straight line, composition of two simple harmonic motions of the same period in two perpendicular directions, Force necessary to produce simple harmonic motion , Motion of a particle suspended by a spiral spring, Horizontal oscillations of particle tied to an elastic spring.

Unit-5: Moment of Inertia: The definition of parallel axes, The theorem of perpendicular axes, Moments of inertia in some particular cases, Dr.Routh's rule , Equimomential systems.

Text Book:M.K.Venkataraman , Content and treatment as in the book Dynamics, Agasthiar Book Depot , Trichy, 1985.

Unit I - Chapter 3 all sections
Unit II - Chapter 4 all sections
Unit III - Chapter 6 sections 1 to 15
Unit IV - Chapter 10 sections 1 to 10
Unit V - Chapter 12 all sections

Reference Books:1.P.Duraipandian and LaxmiDuraipandian , Mechanics , S.Chand and Co., New Delhi, 1979.

1. A.V.Dharmapadam , Dynamics, S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1996.

Course Outcomes:

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

CO1: Apply the fundamental concept of dynamics to

(a) Demonstrate their understanding of the principles of kinematics and kinetics of particles and planar rigid bodies.
(b) Analyze planar rigid body kinematics and kinetics.

CO2: Solve equations of projectiles, moment of inertia and simple harmonic motions.

CO3: Illustrate the mathematical aspects that provide the skills and problem techniques in kinematics of point and Newton's laws of motion.

CO4: Solve problems on work done power energy**,**Work done in stretching an elastic string, Power , Energy , Kinetic Energy.

CO5: Understand **t**he Principle of work-Energy, Potential Energy, The Principle of conversation of energy.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – III	22UMATC54 DIFFERENTIAL EQUATIONS	HRS/WK – 4
SEMESTER -V		CREDIT – 4
CORE- XI		

Course Objectives:

The course aims to introduce the concepts of Equations of the First Order and Higher Degree, Euler's homogeneous linear equations, Legendre's Linear Equations, Simultaneous Equations, Laplace Transform and Formation of PDF.

UNIT-I:

Equations of the First Order and Higher Degree- Equations Solvable for p- Equations Solvable for x - Equations Solvable for y – Clairaut's Equation- Linear equations of Second and Higher Order with constant coefficients.

Chapters: ODE 1,2 (Pages: 1 – 40)

UNIT – II:

Simultaneous Equations, Euler's Homogeneous Linear Differential Equations– Legendre's Linear Equations

Chapters: ODE 3, 4 (Pages: 41 -56)

UNIT – III:

Method of Variation of Parameters- Method of undetermined Coefficients. Total differential Equation

Chapters: ODE 5,6 Pages 57 -105

UNIT -IV:

Formation of PDE – Complete Integral – Particular Integral – Singular Integral – Equation's Solvable by direct Integration – Solving equations of the types: $f(p, q) = 0$, $f(x, p, q) = 0$, $f(y, p, q) = 0$, $f(z, p, q) = 0$, $f(x, p) = f(y, p)$, $Z = p x + q y + f(p, q)$, Equations Reducible to standard form

Chapters: PDE 1 (Pages: 117 – 150)

UNIT – V:

Lagranges Linear Equation, Charpits Method

Chapter: PDE 1, 2 (Pages: 150 – 178)

-+

TEXT BOOK:

1. P.Kandasamy, K.Thilagavathy [2004], "Mathematics for B.Sc" Vol-,III, S.Chand & Company Ltd., New Delhi-55.

REFERENCE BOOKS:

1.M.D.Raisighanian, [2001], "Ordinary and Partial Differential Equations", S.Chand and Co., New Delhi
2. S.Sudha [1998], "Differential Equations and Integral Transforms", Emerald publishers, Chennai.
3. P.R.Vittal [2004], "Differential Equations and Laplace Transform", Margham Publication, Chennai.
4. M.K.Venkataraman(1992)," Higher Engineering Mathematics: III-B", National Publishing

Company, Chennai.

Course Outcomes:

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

CO1: Explain the fundamental concepts of ordinary differential equations and their role in modern mathematics.

CO2: Use ordinary differential equations to model simple electric circuits, population growth and mass-spring systems, as well as other applications.

CO3: Demonstrate accurate and efficient use of the Laplace transforms and their applications in the solution of ordinary differential equations.

CO4: Apply problem-solving using concepts and techniques from ordinary differential equations and Laplace transforms relevant to diverse situations in physics, engineering, financial mathematics and in other mathematical Contexts

CO5: Apply the differential equations in geometrical and physical problems arise in real life situations

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – III SEMESTER -V CORE PRACTICAL - I	22UMATC55 SCIENTIFIC COMPUTING LAB	HRS/WK – 4 CREDIT – 4

The exercises in the following topics shall be performed as minimum mandatory requirements [for eligibility to take the practical examination] and a RECORD of the code-listing and outputs shall be maintained by each student. Select minimum 15 exercise from the following list of programs with at least 4 from each section.

Section-A
Exercises using MATLAB or SCILAB

1. Matrix Manipulation.
2. To Solve the System of Linear Equations
3. To Solve the Quadratic Equations
4. Simplification of Mathematical expression
5. To Generate Fibonacci Number
6. To Find the Binomial Coefficient
7. 2D and 3D Graphs
8. Sub Plots
9. Differentiation
10. Integration

Section B
Exercises using Python or C programming

11. Python program to solve quadratic equation
12. Python Program to Check Leap Year
13. (a)Python Program to Check Prime Number
    (b)Python Program to Print all Prime Numbers in an Interval
14. Python Program to Print the Fibonacci sequence
15. Python Program to Find LCM/HCF
16. (a) Python Program to Display Fibonacci Sequence Using Recursion
    (b) Python Program to Find Factorial of Number Using Recursion
17. (a) Python program to check if the given number is a Disarium Number
    (b) Python program to print all disarium numbers between 1 to 100
18. (a)Python program to check if the given number is Happy Number
    (b)Python program to print all happy numbers between 1 and 100
19. Python program to print the largest/smallest element in an array
20. Python program to sort the elements of an array in ascending order/descending order

Section C
Exercises using R-Programming or SPSS or Excel

21. Plotting Bar chart and scatter plot
22. Plotting histogram and pie chart
23. Measures of central tendency -Mean, median, mode
24. Measures of Dispersion- std. deviation, mean deviation

25. Regression and correlation. Linear models.
26. Large sample tests
27. Small sample test t- tests
28. Small sample test F-tests
29. Small sample test Chi-square tests
30. ANOVA(one way)

References

1. Brain R. Hunt, Ronald R. Lipsman and Jonathan M. Rosenberg, A Guide to MATLAB for Beginners and experienced users, Cambridge University Press, 2003.
2. Getting Started with MATLAB 7, Rudra Pratap, Oxford University Press, India, 2006.
3. Rose L. Spencer, Introduction to MATLAB.
4. K.V. Namboothiri, Python for Mathematics Students, Version 2.1, March 2013.
5. R. Thareja,(2017) Python Programming: Using Problem Solving Approach, Oxford
6. V.Rajaraman [1995], "Computer Programming In C", Prentice Hall. New Delhi.
7. H.Schildt, Obsborne (1994), "Teach Yourself C", McGraw Hill, New York ,
8. Mullish Cooper. "The Spirit of C – An Introduction to Modern Programming",Jaico Publishing House. Delhi. 1998.
9. Yashavant Kanetkar, "Let Us C", 6th edition BPB publication.
10. Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5.
11. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN:978-93-5260-524-8.
12. Tutorials Point (I) simply easy learning, Online Tutorial Library (2018), R Programming, Retrieved from https://www.tutorialspoint.com/r/r_tutorial.pdf.
13. Andrie de Vries, Joris Meys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8
14. Andy Field, Discovering Statistics Using IBM SPSS Statistics, ISBN: 9781526436566
15. Alan C. Elliott; Wayne A. Woodward, IBM SPSS by Example, ISBN: 9781483319032
16. Ronald H. Heck; Scott L. Thomas; Lynn N. Tabata, Multilevel and Longitudinal Modeling with IBM SPSS, ISBN: 9781848728622

Internal Elective – III

(Choose any 1 out of 3)

YEAR - III	22UMATE58-1 DISCRETE MATHEMATICS	HRS/WK –4
SEMESTER -V		CREDIT – 3
ELECTIVE-III		

Course Objectives:

Students must understand Mathematical reasoning in order to read, comprehend and construct Mathematical arguments. Mathematical logic, which serves as foundation for subsequent discussions is discussed. Discrete Structures such as Sets and Permutations, Recurrence Relation and Mathematical Induction are studied.

Unit I : Mathematical Logic I

Statements and Notation-Connectives-Negation-Conjunction-Disjunction-Statement Formulas and Truth tables-Conditional and Biconditional-well-formed formulas-Tautologies-Equivalence of Formulas-Duality law-Tautological Implications-Functionally Complete Sets of Connectives-Normal forms-DNF-CNF-PDNF-PCNF.

Unit II : Mathematical Logic(Continued)

The theory of Inference for the Statement Calculus-Validity using truth tables-rules of inference-Consistency of Premises and Indirect Method of Proof-The Predicate Calculus-Predicates-The Statement Function Variables and Quantifiers-Predicate Formulas-Free and Bound Variables-The Universe of Discourse-Inference Theory of the Predicate Calculus.

Unit III : Combinatorics

Mathematical Induction-Permutations-Combinations-Pigeonhole Principle, Elements of Probability- Recurrence Relations.

Unit IV: Relations and Functions

Relations-Properties of Binary Relations in a Set-Relation Matrix and the Graph of a Relation-Equivalence relations-Partial Ordering-Functions- Composition of Functions-Inverse Functions-Characteristic Function of a Set.

Unit V: Lattice Theory

Lattices as Partially Ordered Sets-Properties of Lattices-Lattices as Algebraic System-Sublattices-Direct Product and Homomorphism-Some Special Lattices-Boolean Algebra.

Text Books (In API Style)

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications toComputer Science, Tata McGraw Hill Publication Company, 1997.
2. Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, Discrete Mathematical Structures by Prentice - Hall of India, Private Limited, New Delhi, 2002.

   Unit I Book 1 Chapter 1 Section 1 to 3

   Unit II Book 1 Chapter 2 Section 4 to 6

   Unit III Book 2 Chapter 2 Sections 1 to 4, Chapter 3 Sections 1 to 5.

   Unit IV Book 1 Chapter 2 Section 3 to 4

Unit V Book 1 Chapter 4 Section 1 to 2

Supplementary Readings

1. K. H. Rosen, Discrete Mathematics and Its Applications with Combinatorics and Graph Theory, 7th Edition, Mc Graw Hill Education
2. E.G. Goodaire and M.M. Paramenter, Discrete Mathematics with Graph Theory, Prentice HallInternational Editions, New Jersey, 1998.
3. J. Matonsek and J. Nesetril, Invitation to Discrete Mathematics by Clarendon Press, Oxford,1998.

Course Outcomes:

Students will be introduced to have knowledge of many mathematical concepts in

CO1: Examples and counter examples for different types Logical Statements.
CO2: Proof techniques.
CO3: Problem solving techniques studied in Discrete Mathematics such as Logic, Relations, Functions, Some Algebraic Structure.
CO4: Equivalence relations ,Composition of functions and inverse functions.
CO5: Lattices as Partially Ordered Sets,Properties of Lattices,Lattices as Algebraic, Special Lattices and Boolean Algebra.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - III	22UMATE58-2 STOCHASTIC PROCESS	HRS/WK –4
SEMESTER -V		CREDIT – 3
ELECTIVE-III		

Course Objectives:
The objectives are to (i) acquire the skills of advanced level of mathematical sophistication and enhancing the horizons of knowledge. (ii) understand the applicability of different concepts of Stochastic Processes on some physical situation. (iii) familiarize the students with the use of Stochastic models in different areas.

Unit I : Stochastic Processes:
Definition and Examples-Higher Transition Probabilities-Generalization of independent Bernoulli Trials-Sequence of Chain Dependent Trials-Classification of States and Chains.

Unit II : More on Markov Chains:
Determination of Higher Transition Probabilities-Stability of a Markov System-Markov Chain with Denumerable Number of States-Reducible Chains.

Unit III : Markov Processes with Discrete State Space:
Poisson Process and its Extensions-Poisson Process-Poisson Process and Related Distributions-Generalization of Poisson Process-Birth and Death Process-Markov Process with Discrete State Space (Continuous Time Markov Chains).

Unit IV: Markov Chains and Markov Processes with Continuous State Space:
Markov Chains with Continuous State Space-Introduction-Brownian Motion-Wiener Process,-Differential Equations for a Wiener Process- Kolmogorov Equations- First Passage Time Distribution for Wiener Process.

Unit V: Renewal Processes and Theory:
Renewal Process-Renewal Processes in Continuous Time-Renewal Equation-Stopping time-Wald's Equation, Renewal Theorems-Delayed and Equilibrium Renewal Processes.

Text Books (In API Style)

1. J. Medhi, Stochastic Processes, New Age International (P) Limited, Publishers, New Delhi, (Third Edition), 2011.

Unit-I Chapter 2: Sections 1 to 4
Unit-II Chapter 2: Sections 5,6,8 and 9.
Unit-III Chapter 3: Sections 1 to 5.
Unit-IV Chapter 2: Section 11
Chapter 4: Sections 1 to 5.
Unit-V Chapter 6: Sections 1 to 6.

Supplementary Reading:

1. S. Karlin and H.M. Taylor, A First Course in Stochastic Processes, Academic Press (second edition), New York, 2011.
2. S.M. Ross, Stochastic Processes, Wiley India Pvt., Ltd., 2nd Edition, 2008.
3. G.F. Lawler, Introduction to Stochastic Processes, 2nd Edition, 2006.

Course Outcomes:

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

CO1: Have working knowledge related to the Problems of Uncertainty.

CO2: Get a basic knowledge for doing research in this area.

CO3: Understand the concepts, Determination of Higher Transition Probabilities,Stability of a Markov System-Markov Chain with Denumerable Number of States.

CO4 : Solve problems on Differential Equations for a Wiener Process and Kolmogorov Equations.

CO5: Solve problems on the following concepts, Renewal Process, Wald's Equation, Renewal Theorems-Delayed and Equilibrium Renewal Processes.

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Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - III	22UMATE58 MATHEMATICAL MODELING	HRS/WK –4
SEMESTER -V		CREDIT – 3
ELECTIVE-III		

Course Objectives:

To introduce the basic concepts of Mathematical Modelling, to make the students familiarize the mathematical d in the context of real-world applications, and to teach suitable methods to adopt the problem using several mathematical concepts.

Unit I

Simple situation requiring Mathematical modeling and technique-Classification of mathematical models-some characteristics of mathematical models-Modelling through Geometry-Modelling through Algebra-Modelling through Trigonometry-Modelling through Calculus-Limitations of Mathematical modeling.

Unit II

Mathematical Modelling through differential Equations-Linear Growth and Decay Models-Non-Linear Growth and Decay models-Compartment models-Modelling in Dynamics through Ordinary differential equations of first order- Mathematical modeling of Geometrical problems through ordinary differential equations of first order.

Unit III

Mathematical Modelling in Population Dynamics-Modelling of Epidemics through systems of Ordinary differential equations of first order-Compartment models through systems of ordinary differential equations-Modelling in Economics through systems of ordinary differential equations of first order**.**

Unit IV

Mathematical models in Medicine, Arms Race, Battles and International Trade in terms of systems of ordinary differential equations-Modelling in Dynamics through systems of Ordinary Differential equations of first order.

Unit V

Mathematical modeling of Planetary motions – Modelling of Circular motion and motion of Satellites.

TEXT BOOK:

1.Mathematical Models in Biology and Medicine' by J.N.Kapur, Wiley Eastern limited , revised edition, New Delhi.1988

Unit I	:	Chapter 1.1-1.9
Unit II	:	Chapter 2.1-2.6
Unit III	:	Chapter 3.1-3.4
Unit IV	:	Chapter 3.5-3.6
Unit V	:	Chapter 4.1-4.2

Supplementary Readings

1. "Mathematical Modelling' by J.N.Kapur, Affiliated East- west press Pvt. limited, New Delhi.1988.
2.Mathematical modeling Models, Analysis and Applications by Sandip Banerjee, CRC Press, Taylor and Francis group

Course Outcomes:

After completion of the course, students will be able to

CO1:Learn the applications of mathematics in real life problems.
CO2:Create mathematical models of empirical or theoretical phenomena in domains such as the physical, natural, or social science;
CO3:Create variables and other abstractions to solve the mathematical problems in conjunction with previously-learned fundamental mathematical skills
CO4:Draw inferences from models using mathematical techniques including problem solving, quantitative reasoning, and exploration.
CO5:Take an analytical approach to problems in their future endeavors.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – III SEMESTER –V SKILL BASED SUBJECT – I11	22UMATS59 QUANTITATIVE APTITUDE- III	HRS/WK –2 CREDIT – 2

Course Objectives:
To enhance the problem solving skills and to prepare for any type of competitive examination in the topics simple interest, compound interest, logarithms, area, surface area and volume.

UNIT - I
Simple Interest.
UNIT - II
Compound Interest
UNIT - III
Logarithms
UNIT - IV
Area
UNIT - V
Volume and surface areas.

Text Book:

1. Quantitative Aptitude – Dr.R.S.Aggarwal, S. Chand Publications, Revised and Enlarged Edition 2017

Unit-1 Pages from 445 to 465
Unit-2 Pages from 466 to 486
Unit-3 Pages from 487-498
Unit-4 Pages from 499 to 548
Unit-5 Pages from 549 to 587

Reference Books:

4. Quantitative Aptitude for Competitive Examinations- Abhijit Guha,Third Edition (2006),Tata McGraw Hill publishing Company Ltd., New Delhi.
5. Course in Quantitative Aptitude for Competitive Examinations- Agarwal P. K, First Edition (2002), Cyber-tech Publications, New Delhi.
6. Fast Track Objective Arithmetic, Rajesh Verma, Arihant Publications,2004

Course Outcomes:

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

CO1: Compute simple interest.
CO2: Solve Problems on compound interest.
CO3: Understand logarithms.
CO3: Calculate area of certain space.
CO5: Find surface area and volume for the real world problems.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2

CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – III	22UMATC61 VECTOR ANALYSIS	HRS/WK –6
SEMESTER –VI		CREDIT – 4
CORE – X11		

Course Objectives:

The objective of the module is to introduce and develop the methods of vector analysis. These methods provide a natural aid to the understanding of geometry and some physical concepts. They are also a fundamental tool in many theories of Applied Mathematics.

Unit -1: Vector Algebra

Scalars or dot product, Vector cross product, physical application, product of three or more vectors, scalar product of three vectors, Vector product of three vectors.

Unit -2: Vector differentiation

Differentiation of a vector – Geometrical interpretation of the derivative – Differentiation Formulae – Differentiation of dot and cross products – Partial Derivatives of Vectors – Differentials of vectors.

Unit- 3: Gradient, Divergence and curl

Vector Differential Operator Del – Gradient of a scalar Function – Directional Derivatives - Geometric Interpretation – Gradient of the sum of functions of the product of functions and of a function of function – operations involving Del – Divergence of a vector and its physical Interpretation – Curl of a vector and its Physical Interpretation – Expansion formulae for Operators involving Del – Solenoidal and Irrotational.

Unit – 4: Vector Integration

The Line integral – Surface Integral and its Physical Meaning – Surface Integral and Volume integral.

Unit-5: Vector Integration (continued)

The Concept of Divergence of a Vector- Equivalence of two Definitions of Divergence – Statement of Gauss Divergence Theorem and Green's Theorem (only) and problems – Line integral – The concept of the curl of a vector – Statement of Stoke's Theorem (only) and Problems.

Text Book:

B.S.Grewal, Content and treatment of Chapter 3 and 8 as in the book Higher Engineering Mathematics (Edition 43rd), Khanna Publishers, New Delhi , 2014.

Reference Books:

1.G.B.Thomas and R.L.Finney, Calculus and Analytic Geometry, Addison Wesley (9thEdn), Mass.(Indian Print), 1998.

2. M.K.Venkataraman, Engineering Mathematics- part B. National Publishing Company, Chennai, 1992.

3.P.R.Vittal, Vector Calculus , Fourier series and Fourier Transform, Margham Publications, Chennai, 2004.

4.K. Vairamanickam, Nirmala P. Ratchagar and S. Tamilselvan, Engineering Mathematics – II, Scitech Publications (India) Pvt.Ltd., Chennai, 2011.

5. K. Vairamanickam, Nirmala P. Ratchagar and S. Tamilselvan, Transforms and partial Differential Equations, Scitech Publications (India) Pvt.Ltd., Chennai,2012.

Course Outcomes:

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

CO1: Explain the fundamental concepts of vectors, direction cosines, direction ratios and workoutscalar and vector products of two and three vector.

CO2: Understand the concepts of Solenoidal and Irrotational vectors.

CO3: Differentiate vector functions of a single variable, find the gradient, divergence and curl and prove identities involving them.

CO4: Integrate vectors, compute line, surface and volume integrals in a vector field.

CO5: Do the verification of Gauss divergence theorem, Stoke's and Green's theorem.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – III	22UMATC62 COMPLEX ANALYSIS	HRS/WK –6
SEMESTER –VI		CREDIT – 4
CORE – X11I		

Course Objectives:

To understand the functions of complex variables, continuity and differentiation of complex variable functions, analytic functions and C – R equations. To learn about elementary transformation concepts and to know about power series expansions of Taylor's and Laurant's series, the singularity concepts and residues, solving definite integrals using the residues.

UNIT I: Mappings and Limits, Analytic Functions

Functions of a Complex variable – Limits – Theorems on Limits – Continuous functions – Differentiability – Cauchy – Riemann equations – Analytic functions – Harmonic functions.

UNIT II : Elementary transformations

Elementary transformations – Bilinear transformations – Cross ratio – Fixed points of Bilinear Transformation – Some special bilinear transformations.

UNIT III : Integrals

Complex integration – definite integral – Cauchy's Theorem – Cauchy's integral formula – Higher derivatives.

UNIT IV : Power Series and Singularities

Series expansions – Taylor's series – Laurant's Series – Zeroes of analytic functions – Singularities.

UNIT V : Residues and Contour Integration

Residues – Cauchy's Residue Theorem – Evaluation of definite integrals.

Text Book:

1. S. Arumugam, A. Thangapandi Isaac, & A. Somasundaram, Complex Analysis, New Scitech Publications (India) Pvt. Ltd, 2002.

Unit – I	Chapter 2 section 2.1 to 2.8
Unit – II	Chapter 3 section 3.1 to 3.5
Unit – III	Chapter 6 section 6.1 to 6.4
Unit – IV	Chapter 7 section 7.1 to 7.4
Unit – V	Chapter 8 section 8.1 to 8.3

References:

1. J.N. Sharma, Functions of a Complex variable, Krishna Prakasan Media (P) Ltd, 13th Edition, 1996-97.
2. T.K. Manickavachaagam Pillai, Complex Analysis, S. Viswanathan Publishers Pvt Ltc, 1994.
3. R.V.Churchill and J.W Brown, (1984) Complex Variables and Applications. McGraw Hill International Book Co., Singapore (Fourth Edition)

Course Outcomes:

Students will be introduced to have knowledge of many mathematical concepts in

CO1: Examples and counter examples in Limits, Functions of Complex variables and

Continuous functions

CO2: Proof techniques in Complex Analysis.

CO3: Problem solving skills in Analytic functions and Elementary Transformation..

CO4: Problem solving skills in Harmonic functions,Complex integration, definite Integral, Cauchy's Theorem, Cauchy's integral formula.

CO5: Computations of Singularities, Residues and zeros of Analytic functions.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – III	22UMATC63 OPERATIONS RESEARCH	HRS/WK –5
SEMESTER –VI		CREDIT – 3
CORE – X1V		

Course Objectives:

To introduce the various techniques of Operations Research, to teach the various methods of solving Linear Programming Problems, Transportation Problems, Assignment Problems and their applications, and to make the students solve real life problems in Business and Management.

Unit I

Operations Research- An overview: Nature and characteristic Features of OR- Models in OR- OR and Decision Making- Applications and Limitations of OR- Linear Programming Problem: Formulation and Graphical methods.

Unit II

Simplex Method – Big M method - Two phase- Simplex Method-Duality in Linear Programming: Formulation of Primal Dual Pairs – Mathematical formulation of duality - problems.

Unit III

Dual Simplex Method - Network Scheduling by PERT/ CPM: Critical path Method and PERT calculations.

Unit IV

Transportation Problem and Assignment Problem.

Unit V

Game Theory: Optimal solution of two person zero- sum games- games with mixed strategies - The graphical method- Dominance property- general solution of (mxn) rectangular games (LPP only)

Text Book:

Problems in operations Research, *PK Gupta & Man Mohan*

(Relevant portions only)

Unit I	:	Chapters 0 to 3
Unit II	:	Chapters 4, 5,6,8,9
Unit III	:	Chapters 9 and 27
Unit IV	:	Chapters 15 and 16
Unit V	:	Chapters 20

Supplementary Readings

1. Prem Kumar Guptha and D.S Hira , Operations Research: An introduction , S.Chand and Co. Ltd.New Delhi.
2. Hamdy A.Taha, Opeations Research(7^{th} Edition) McMillan Publishing Company, New Delhi, 1982.

3. V.Sundaresan, K.S. Ganapathy Subramanian and K.Ganesan , Resource Management Techniques , AR Publications, Chennai.

Course Outcomes:

After completion of the course, students will be able to

CO1 : Understand the various techniques to solve Linear Programming Problems.
CO2 : Apply the Transportation and Assignment problem concepts in real life problems.
CO3: Solve the Network problems by using PERT & CPM Methods.
CO4 : Deal industrial models and also prerequisite for studying advanced courses in Nonlinear Programming Problems, Inventory Control Problem and Queuing Theory.
CO5: Acquire the knowledge to write TNPSC Statistical, UG TRB, Polytechnic TRB exams.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – III	22UMATC64 GRAPH THEORY	HRS/WK – 5
SEMESTER –VI		CREDIT – 3
CORE – XV		

Course Objectives:

To study and develop the concepts of graphs, subgraphs, connectivity, Eulerian and Hamiltonian graphs, Trees, Colourings and Planarity. To acquire knowledge to model real world problems using graph theory.

UNIT – I : Graphs and Sub graphs

Definition and Examples – Degrees – Subgraphs – Isomorphism – Ramsey Numbers – Independent Sets and Coverings –Intersection Graphs and Line Graphs – Matrices – Operations on Graphs.

UNIT – II : Connectivity and Blocks

Walks, Trails and Paths – Connectedness and Components – Blocks – Connectivity – Simple Problems.

UNIT – III : Euler Tours and Hamilton cycles

Eulerian Graphs – Fleury's algorithm - Hamiltonian Graphs - Simple Problems.

UNIT – IV: Trees and Planarity

Characterisation of Tress – Centre of a Tree – Definition of Planarity and Properties – Characterization of Planar Graphs – Thickness, Crossing and Outer Planarity.

UNIT – V : Colourings

Chromatic Number and Chromatic Index – The Five Colour Theorem – Four Colour Problem - Simple Problems.

Text Book

S. Arumugam and S. Ramachandran, "Invitation to Graph Theory", SCITECH Publications India Pvt. Ltd., Chennai – 600 056.

Unit – I Chapter 2 Sections 2.1 to 2.9
Unit – II Chapter 4 Sections 4.1 to 4.4
Unit – III Chapter 5 Sections 5.1 to 5.2
Unit – IV Chapter 6 Sections 6.1 to 6.2
Chapter 8 Sections 8.1 to 8.3
Unit – V Chapter 9 Sections 9.1 to 9.3

Reference Book

1. S. Kumaravelu, Susheela Kumaravelu, Graph Theory, Publishers, 182, Chidambara Nagar, Nagarcoil – 629 002.
2. S.A.Choudham, A First Course in Graph Theory, Macmillan India Ltd.
3. J.A. Bondy and U.S.R. Murthy, Graph Theory with Applications, Macmillon, London.

Course Outcomes:

After completion of the course, students will be able to

CO1: Give Examples and counter examples of Graphs and Subgraphs

CO2: Understand Proof techniques in Graph theory.

CO3: Know the Intersection Graphs and Line Graphs, Incident Matrices, Intersection Graphs and Line Graphs,Operations on Graphs.

CO4: Get Problem solving skills in Chromatic Number and Chromatic Index.

CO5: Understand the concepts of Hamiltonian Graphs, Trees, Planarity and Colouring

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

Internal Elective – IV

(Choose any 1 out of 3)

YEAR - III SEMESTER -VI ELECTIVE-IV	22UMATE65-1 LAPLACE AND Z TRANSFORM	HRS/WK –5 CREDIT – 3

Course Objectives:

To introduce Laplace transform which is a useful technique in solving many application problems and to solve differential and integral equations. To introduce Z-transforms which is a useful technique in solving difference equations and signal processing, the Z-transform converts a discrete domain signal, which is a sequence of real numbers, into a complex frequency domain representation.

Unit I : Laplace Transforms

Definition-Transforms of elementary functions-properties-Transform of derivatives and integrals- Multiplication by t-Division by t.

Unit II : Laplace Transform(Continued)

Transform of unit step function-transform of periodic functions-Initial and Final value theorem-Methods of determining inverse Laplace Transforms.

Unit III : Laplace Transforms(Continued)

Convolution theorem-Application to differential equations-Integral Equations-Evaluation of integrals by Laplace transforms.

Unit IV: Z-transforms

Introduction-Definition-Elementary Properties of Z-transforms-Inverse Z-transforms.

Unit V: Z-transforms (Continued)

Convolution theorem-Formation of difference equations-Solution of difference equations using Z-transforms.

Text Books (In API Style)

1. S. Narayanan and T.K. Manicavachagom Pillay, Calculus, Volume III, Ananda Book Depot (Chapter 5).
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers (Chapter 23).

Unit I Book 1 Chapter 5
Unit II Book 1 Chapter 5
Unit III Book 1 Chapter 5
Unit IV Book 3 Chapter IX
Unit V Book 3 Chapter IX

Supplementary Reading:

1. M.K. Venkataraman. (2009) Engineering Mathematics volume Two. National Publishing Company,Chennai.

2. Erwin Kreyszig, Advanced Engineering Mathematics, Willey India Pvt. Ltd.,
3. T, Veerarajan, Engineering Mathematics [For Semester I and II], 3rd Edition, Tata McGraw Hill Education Private Limited, New Delhi

Course Outcomes:

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

CO1: Explain the fundamental concepts and properties of Laplace transforms, transform of derivatives.
CO2: Demonstrate accurate and efficient use of the Laplace transforms and their applications in the solution of ordinary differential equations
CO3: Explain the fundamental concepts and properties of Z-transforms
CO4: Apply problem-solving skills, concepts and techniques from ordinary differential equations and Laplace transforms relevant to diversified situation in Physics, Engineering, Signals and System and in other Mathematical contexts.
CO5: Solve problems on Convolution theorem,Formation of difference equations and Solution of difference equations using Z-transforms.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - III	22UMATE65-2 ASTRONOMY	HRS/WK – 5
SEMESTER -VI		CREDIT – 3
ELECTIVE-IV		

Course Objective

The prime aim of this paper is to enrich the knowledge of movements of celestial objects using mathematical concepts.

Unit-1:

The Celestial Sphere and Diurnal motion - Sidereal time - Circumpolar star - Twilight - Earth - Length of the day.

Unit-2:

Morning and Evening stars - Circumpolar stars-zones of earth perpetual day-twilight.

Unit-3: Refraction-laws of refraction-tangent formula-horizontal refraction-geocentric parallax-orizontal parallax.

Unit-4:

Kepler's Laws – Anomalies-Kepler's equation-Calendar

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Unit-5: Moon - Sidereal and synodic months-elongation- Phases of the Moon – eclipses-umbra and penumbra-lunar and solar eclipses-maximum and minimum number of eclipses in a year.

Text Book:

Kumaravelu. S and Susheela Kumaravelu, Astronomy for degree classes, SKV Publications, 1999.

Unit I: Articles 39 to 76 (Pages from 38 to 60)
Unit II: Articles 80 to 83, 87 to 89, 111 to 116 (Pages from 71 to 74, 90 to 99, 131 to 138)
Unit III: Articles 117 to 128, 135 to 144 (Pages from 140 to 147, 158 to 164)
Unit IV: Articles 146 to 149, 156 to 159, 175 to 179 (Pages from 172 to 174, 183 to 187, 219 to 222)
Unit V: Articles 229 to 241, 256 to 263, 267, 268, 271 to 275
(Pages from 330 to 341, 358 to 365, 368,369, 372 to377)

Supplementary Reading:

1.Ramachandran. G.V., Astronomy, Text book of Astronomy, Mission Press 1965
2.George.O.Abell, Exploration of the Universe, Second Edition,1975
3.Michael Seeds, Foundations of Astronomy, Wasworth Publishing Company, Third Edition, 1992

Course Outcomes:

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

CO1: Understand the concepts of Celestial movements,
CO2: Inculcate application of Spherical Trigonometry,
CO3: Apply three dimensional geometry.
CO4: Understand the concepts of Morning and Evening stars, Circumpolar stars**.**
CO5: Know the Refraction laws, Kepler's law, Anomalies Kepler's equations and Phases of moon.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR - III	22UMATE65-3 SPECIAL FUNCTIONS	HRS/WK – 5
SEMESTER -VI		CREDIT – 3
ELECTIVE-IV		

Course Objectives:

To make the students understand Linear operators, Simultaneous Linear differential equations, Numerical solutions of differential equations, power series solutions, and to develop computational skill in certain special functions,Legendre functions which are frequently occurring in higher mathematics and mathematical physics.

UNIT-I:

Properties of Linear Operators - Simultaneous Linear Differential Equations - Special Solvable Types of Nonlinear Equations.

UNIT-II:

Numerical Solutions Using Taylor Series - Adams and Modified Adams Method - Extrapolation with Differences

UNIT-III:

Properties of Power Series - Examples - Singular Points of Linear Second Order Differential Equations - Method of Frobenius.

UNIT-IV:

Bessel Functions - Properties - Legendre Functions.

UNIT-V:

Term by Term Differentiation of Fourier Series, Legendre Series - Fourier Integral.

Recommended Text

1. F.B.Hildebrand. (1977) Advanced Calculus for Applications. Prentice Hall. New Jersey.

Reference Books

1. J.N.Sharma and R.K.Gupta (1998) Special Functions, Krishna Prakashan Mandir, Meerut.
2. Satya Prakash. (2004)Mathematical Physics. Sultan & Sons. New Delhi.
3. B.D.Gupta (1978) Mathematical Physics, Vikas Publishing House.

S

Course Outcomes:

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

CO1: Know the concepts of Linear operators. .
CO2: Solve Simultaneous Linear differential equations.
CO3 :Find the Numerical solution of Differential equations.
CO4: Find the power series solution of differential equations.
CO5: Get a basic knowledge about Legendre's polynomials and other functions

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

YEAR – III	22UMATS66 QUANTITATIVE TECHNIQUES	HRS/WK –3
SEMESTER –VI		CREDIT – 2
SKILL BASED SUBJECT – IV		

Course Objectives:

To formulate/ design and solve the practical problems in various fields using the quantitative techniques. Understanding the Diagrammatic representation of information, index numbers for business problems,Analysis of Time series for solving real world problems.

UNIT–I

Diagrammatic Representation

Bar Diagram - Component Bar Diagram - Percentage Bar Diagram - Pie Diagram - Pictogram - Graphical Representation - Frequency Polygon - Frequency Curve - Cumulative Frequency Curve (Ogive) - Ogive - Lorenz Curve

UNIT–II

Index Numbers

Introduction - Meaning - Definition - Characteristics - Uses - Types of Index Number - Interpretation of Index Numbers - Problems of Construction - Choice of Formula - Method of construction - Laspeyre's Method - Paasche's Method - Dorbish and Bowley's Method - Fisher's Ideal method - Marshall-Edgeworth method - Kelly's Method, Walsch's Method

UNIT–III

Index Numbers (cont.)

Quantity Index Numbers - Value Index Numbers - Time Reversal Test - Factor Reversal Test - circular Test - Chain base - Fixed Base - Base Shifting - Deflating of Index Numbers - Consumer Price Index - Family Budget - Limitation of Index Numbers

UNIT–IV

Analysis of Time Series

Meaning - Definition - Uses - Time Series - Models - Secular Trend - Seasonal Variation - cyclical Variation - Irregular Variation - Preparation of Data for analysis - Measurement of Secular Trend - Graphic Method - Semi-average Method - Moving Average Method - Method of least Squares - Parabola Curve - Selecting the Type of Trend - Choice Conversion - Shifting of Origin

UNIT–V

Analysis of Time Series (cont.)

Measurement of Seasonal Variation - Method of Simple Average - Ratio to Trend Method - Ratio to Moving Average Method - Link Relative Method.

Recommended Text

1. P.R.Vittal & V.Malini, *Statistical and Numerical Methods,* (1st Edition, Reprint 2011) Margham Publications.
2. R. S. N. Pillai, Bagavathi, *Statistics Theory and Practice*, (1st Edition, Reprint 2015) S Chand & Co Ltd

Reference Books

1. P.Kandasamy and others, Probability statistics and queuing theory, Sultan Chand & Sons
2. V.Sundaresan, K.S. Ganapathy Subramanian and K.Ganesan, Resource management Techniques, Meenakshi Pub., Arapakkam-609111 [Ph.04364–7141720081]
3. Arumugam & Issac, Linear programming, New Gamma Pub., House Palayamkottai

Course Outcomes:

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

CO1: Represent the scientific and Business information in Diagrams
CO2: Know the different methods of index numbers.
CO3: Use index numbers in Business and Budget making.
CO4: Analyze Time series.
CO5: Know the different methods of Time series.

Outcome Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

Allied Courses offered by the Department of Mathematics

22UNUMA01	Theory	Numerical Methods using Python - I
22UNUMA02	Theory	Numerical Methods using Python - II
22UNUMP02	Practical	Numerical Methods using Python
22UMATA01	Theory	Mathematics – I (For B.Sc. Physics, Chemistry, Statistics and Computer Science)
22UMATA02	Theory	Mathematics – II (For B.Sc. Physics, Chemistry, Statistics and Computer Science)
22UMAFA01	Theory	Mathematical Foundations – I (For B.Sc Computer Science & BCA)
22UMAFA02	Theory	Mathematical Foundations – II (For B.Sc Computer Science)
22UBUMA01	Theory	Business Mathematics (For All B.Com. Programmes Except B.Com. (Cooperation)

SEMESTER -I ALLIED- I	22UNUMA01: NUMERICAL METHODS USING PYTHON - I	HOURS – 4 CREDITS – 4

COURSE OBJECTIVES

In this course students are exposed to topics interpolation for equal & unequal intervals. It also makes the students abreast with the programming concepts and to master them in python.

UNIT - I

Interpolation – Gregory Newton forward & backward formulae for interpolation (no derivations of formula, simple problems only) (Book –1*, Chapter. VI – Sec. 1–5*)

UNIT - II

Central differences formulae: Gauss Forward and Backward formulae - Sterling's formula - Bessel's formula (no derivations of formula, simple problems only) (Book –1*, Chapter. VII – Sec. 3–6*)

UNIT - III

Divided differences - Newton's divided differences formula and Lagrange's (no derivations of formula, simple problems only) (Book –1*, Chapter. VIII – Sec. 1, 3, 4*)

Unit-IV

Introduction -Python Overview - Getting Started with Python - Comments - Python Identifiers - Reserved Keywords - Variables - Standard Data Types - Operators - Statement and Expression - String Operations - Boolean Expressions (Book –2, Sec. 3.1 – 3.12)

Unit-V

Control Statements -Iteration – while Statement - Input from Keyboard (Book –2, Sec. 3.13 – 3.15)

COURSE OUTCOMES

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

1) Understand the basic concepts of interpolation for equal and unequal intervals.
2) Find the Finite differences and Central differences
3) Inculcate the basics of python.
4) Know the variables, Standard data types, Operators
5) Understand the control statements, iteration and input and output statements.

Text Books

1) M.K. Venkataraman. (1992) *Numerical methods for Science and Engineering* National Publishing Company, Chennai.
2) E Balagurusamy(2017), *Problem Solving and Python Programming,* McGraw Hill India; 1st edition, Chennai.

Supplementary Readings

1) S. Arumugham. (2003) *Numerical Methods*, New Gamma Publishing, Palamkottai.
2) H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand& Co., Delhi.
3) A.Singaravelu (2004). *Numerical Methods* Meenakshi Agency, Chennai.
4) P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite difference & Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.
5) K.V. Namboothiri, Python for Mathematics Students, Version 2.1, March 2013.
6) R. Thareja,(2017) Python Programming: Using Problem Solving Approach, Oxford.

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	2	3	3	3	2
CO3	3	3	2	3	2
CO4	3	3	3	3	2
CO5	3	2	3	3	2

1-Low 2-Moderate 3- High

SEMESTER -II ALLIED- II	22UNUMA02: NUMERICAL METHODS USING PYTHON - II	HRS/WK – 3 CREDIT – 3

COURSE OBJECTIVES

This course covers the techniques of Numerical Integration. It also deals with solution of Algebraic and Transcendental equations and Numerical solution of Ordinary differential equations of first order. Students can be given the Python programming practical exercise to solve Numerical method problems.

UNIT - I

Bisection method-Iteration method-Regula-falsi method (False Position Method)-Newton-Rapson Method. (Book-1 *Chapter. III– Sec. 1–5*)

UNIT - II

Gauss elimination method-matrix inversion method-Gauss-Jordan Method, Gauss-Seidal method (Three unknowns only).(Book 1-*Chapter. IV – Sec. 2,3–6*)

UNIT - III

General Quadrature formula-Trapezoidal rule-Simpson's one third rule- Simpson's three-eight rule, Euler-Maclaurin Summation Formula (Book 2-*Chapter. VI – Sec. 6.2, A, B, C,D, 1*)

Unit-IV

Euler's method- Euler's modified method-Picard's method - Taylor's methods-Runge-Kutta method (Second and Fourth order only) (Book – 1, *Chapter XI – Sec. 8 – 12, 14, 15*)

Unit-V

Introduction - Built-in Functions - Composition of Functions - Parameters and Arguments - Function Calls - The return Statement - Python Recursive Function - The Anonymous Functions - Writing Python Scripts (Book – 3, Sec. 4.1 – 4.10)

COURSE OUTCOME

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

1) Understand the basic concept of Numerical Integration.
2) Find the Numerical Solution of Ordinary Differential Equations
3) Inculcate the basics of Python.
4) Write general programs in Python.
5) Write the Python programs for Newton-Raphson method, Gauss Elimination method, Trapezoidal rule, Simpsons's rule, and Runge-Kutta method

Text Boks

1) M.K. Venkataraman. (1992) *Numerical methods in Science and Engineering* (3rd Edition) National Publishing Company, Chennai.
2) B.D. Gupta. (2001) Numerical Analysis. Konark Pub. Ltd., Delhi
3) E Balagurusamy(2017), *Problem Solving and Python Programming,* McGraw Hill India; 1st edition, Chennai.

Supplementary Readings

1) S. Arumugham. (2003) *Numerical Methods*, New Gamma Publishing, Palamkottai.
2) H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand& Co., Delhi
3) A.Singaravelu (2004). *Numerical Methods*Meenakshi Agency, Chennai
4) P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite difference & Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.
5) K.V. Namboothiri, Python for Mathematics Students, Version 2.1, March 2013.
6) R. Thareja,(2017) Python Programming: Using Problem Solving Approach, Oxford HED.

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	3	3	3	2	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	2	3	3	2

1-Low 2-Moderate 3- High

SEMESTER -II ALLIED PRACTICAL- I	22UNUMP02: NUMERICAL METHODS USING PYTHON	HRS/WK – 2 CREDIT – 3

COURSE OBJECTIVES

To introduce the techniques of Python programming. To solve numerical problems using Python programming.

Using Python Programming develop the programmes in the following topics:

1) Lagrange's method of interpolation
2) Bisection method
3) Newton – Raphson method of solving equations
4) Regula-falsi method
5) Trapezoidal rule of integration
6) Simpson's 1/3 rule of integration
7) Simpson's 3/8 rule of integration
8) Gauss – elimination method of solving simultaneous equations
9) Gauss – Seidal method of solving simultaneous equations
10) Runge-Kutta fourth order method of solving differential equations

- Mathematics faculty alone should be appointed as examiners

SEMESTER -I ALLIED- I	22UMATA01: MATHEMATICS – I	HRS/WK – 4 CREDIT – 4

(For B.Sc Physics, Chemistry, Statistics and Computer Science)

COURSE OBJECTIVES

To acquire knowledge on finding roots of the Transcendental and Algebraic equations by Numerical methods, applications of matrices and Numerical methods for solving Simultaneous Linear equations. To understand the Computations of Eigen values ,Eigen vectors, differential calculus ,the evaluation of double and Triple integrals for finding Area and Volume.

UNIT-I: SOLUTIONS OF TRANSCENDENTAL AND ALGEBRAIC EQUATIONS

Iteration method**,** Bisection method, Newton's method - Regula Falsi method, Horner's method (without proof) (Simple problems only)

Unit-II: SOLUTIONS OF SIMULTANEOUS EQUATIONS

Gauss Elimination method- Gauss Jordan method-Gauss Seidel Iterative method-Gauss Jacobi method (Restricted to three variables only) (Simple problems only)

UNIT-III: MATRICES

Characteristic equation of a square matrix– Eigen values and eigen vectors – Cayley – Hamilton theorem [without proof] – Verification and computation of inverse matrix-

UNIT-IV: DIFFERENTIAL CALCULUS

n-th derivatives – Leibnitz theorem [without proof] and applications – Jacobians– Curvature and radius of curvature in Cartesian co-ordinates and polar co-ordinates.

UNIT-V: APPLICATION OF INTEGRATION

Evaluation of double, triple integrals – Simple applications to area, volume and centroid.

COURSE OUTCOMES

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

1) Attain knowledge on finding Approximate root for polynomial equations using Numerical methods.
2) Develop the skills of finding solutions of Simultaneous Linear equations.
3) Adopt techniques in solving problems involving Matrices
4) Provide skills on finding curvature and radius of curvature in Cartesian and polar co-ordinates.
5) Understand the applications of double and Triple integration in real life situation.

Text Books

1) A.Singaravelu "Numerical Methods"Meenakshi Publications
   Unit-I: Chapter 2
   Unit-II: Chapter 2
2) P. Duraipandian and Dr. S. Udayabaskaran. 1997, "Allied Mathematics" , Vol I & II. Chennai: Muhil Publishers.
   Unit-III: Sec(1.1.1,1.1.2,1.2,1.4.3),
   Unit-IV: Sec(2.7,4.1,4.1.1,4.2),
   Unit-V: Chap:3(3.4,3.4.1,3.5,3.5.1,3.5.2,3.6)

Supplementary Readings

1) P. Balasubramanian and K. G. Subramanian. 1997, "Ancillary Mathematics", Vol I & II. New Delhi: Tata McGraw Hill.
2) S.P.Rajagopalan and R.Sattanathan(2005), "Allied Mathematics", Vol I & II. New Delhi: Vikas Publications.
3) P. R. Vittal (2003), "Allied Mathematics",Chennai: Marghan Publications.

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

SEMESTER -II ALLIED- II	22UMATA02: MATHEMATICS – II	HRS/WK – 4 CREDIT – 4

(For B.Sc Physics, Chemistry, Statistics and Computer Science)

COURSE OBJECTIVES

To expand trigonometric functions, solving partial differential equations and learn about vector differentiation and integration, also too familiar with physical interpretation of divergence and curl of a vector. Learning Finite differences and applications of Interpolations in real life situations.

UNIT-I:TRIGONOMETRY

Expansions of $\sin^n\theta$, $\cos^n\theta$, $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ – Expansions of $\sin\theta$, $\cos\theta$, $\tan\theta$ in terms of θ – Hyperbolic and inverse hyperbolic functions – Logarithms of complex numbers.

Unit-I: Chap: 6 (6.1,6.1.1-6.1.3,6.2,6.2.1-6.2.3,6.3,6.4)

UNIT-II: PARTIAL DIFFERENTIAL EQUATIONS

Formation-complete integrals and general integrals-Four standard types-Lagranges equations.

Unit-II: Chap:6 (6.1,6.1.1,6.2,6.3,6.4).

UNIT-III: VECTOR DIFFRENTIATION

Vector functions- Derivative of a vector function- Scalar and vector point functions-Gradient of a scalar point function- Gradient- Directional derivatives –Unit vector normal to a surface – angle between the surfaces-divergence, curl.

Unit-IIISec(8.1,8.1.1,8.2,8.3,8.3.1,8.3.2,8.4,8.4.1,8.4.2,8.4.3,8.4.4).

UNIT-IV: VECTOR INTEGRATION

Green's theorem in the plane- Gauss divergence theorem- Stoke's theorem [without proofs].

Unit-IV:Sec(8.6.1, - 8.6.3).

UNIT-V: FINITE DIFFERENCES

Operator E, Relation between Δ, ∇ and E – Interpolation – Newton – Gregory forward & backward formulae for interpolation-Lagrange's interpolation formula for unequal intervals(without proof) .

Unit-V:Sec(5.1,5.2).

COURSE OUTCOMES

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

1) Attain knowledge on finding the expansions of trigonometric functions and concept of hyperbolic and inverse hyperbolic functions.
2) Provide a basic knowledge of Partial Differential equations and develops knowledge on handle practical problems.
3) Adopt techniques in solving problems involving vector and scalar functions

4) Provide skills on finding derivatives and gradients on vector differentiation and Integration.
5) Understand the applications of differentiation and integration in real life situation.

Text Books

1) P. Duraipandian and S. Udayabaskaran(1997), "Allied Mathematics", Vol I & II. Chennai: Muhil Publishers.

   Unit-I: Chap: 6 (6.1,6.1.1-6.1.3,6.2,6.2.1-6.2.3,6.3,6.4), Vol I,

   Unit-II: Chap:6 (6.1,6.1.1,6.2,6.3,6.4), Vol II,

   Unit-IIISec(8.1,8.1.1,8.2,8.3,8.3.1,8.3.2,8.4,8.4.1,8.4.2,8.4.3,8.4.4),Vol I,

   Unit-IV:Sec(8.6.1, - 8.6.3), Vol I,

   Unit-V:Sec(5.1,5.2), Vol II.

Supplementary Readings

1) P. Balasubramanian and K. G. Subramanian. 1997, "Ancillary Mathematics", Vol I & II. New Delhi: Tata McGraw Hill.
2) S.P.Rajagopalan and R.Sattanathan(2005), "Allied Mathematics", Vol I & II. New Delhi: Vikas Publications.
3) P. R. Vittal (2003), "Allied Mathematics", Chennai: Marghan Publications.
4) P.Kandhasamy, K. Thilagavathy (2003), "Allied Mathematics" Vol I & II, New Delhi: Tata McGraw Hill.

OUTCOME MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	2	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	2	3	3	3	2

1-Low 2-Moderate 3- High

SEMESTER -I ALLIED- I	22UMAFA01: MATHEMATICAL FOUNDATIONS – I	HRS/WK – 4 CREDIT – 4

(For B.Sc Computer Science & BCA)

COURSE OBJECTIVES

To know about Logical operators, validity of arguments, set theory and set operations, relations and functions, Binary operations, Binary algebra, Permutations & Combinations, Differentiation, Straight lines, pair of straight lines, Circles, Parabola, Ellipse, Hyperbola.

To learn how to apply fundamental mathematical tools and techniques used in most fields of science and mathematics.

UNIT-I: SYMBOLIC LOGIC

Proposition, Logical operators, conjunction, disjunction, negation, conditional and bi-conditional operators, converse, Inverse, Contra Positive, logically equivalent, tautology and contradiction. Arguments and validity of arguments.

UNIT-II: SET THEORY

Sets, set operations, venn diagram, Properties of sets, number of elements in a set, Cartesian product, relations & functions, Relations : Equivalence relation. Equivalence class, Partially and Totally Ordered sets, Functions: Types of Functions, Composition of Functions.

UNIT-III: BINARY OPERATIONS

Types of Binary Operations: Commutative, Associative, Distributive and identity, Boolean algebra: simple properties. Permutations and Combinations.

UNIT-IV: DIFFERENTIATION Simple problems using standard limits,

$$\lim_{x\to a}\frac{x^n-a^n}{x-a}\,,\lim_{x\to 0}\frac{\sin x}{x}\,,\lim_{x\to 0}\frac{\tan x}{x}\,,\lim_{x\to 0}\frac{e^x-1}{x}\,,\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n\,,\lim_{n\to 0}(1+n)^{\frac{1}{n}}$$

Differentiation, successive differentiation, Leibnitz theorem, partial differentiation, Applications of differentiation, Tangent and normal, angle between two curves.

UNIT-V: TWO DIMENSIONAL ANALYTICAL GEOMETRY

Straight Lines - Pair Straight Lines

COURSE OUTCOMES

The students after undergoing this course will be able to

1) Understand operators and solve problems using operators
2) Know the concept of set theory, relations and functions
3) Solve problems using permutation and combination
4) Know the concept of limits, differentiation
5) Solve Problems on straight lines and pair straight lines

Text Books

1) P.R. Vittal, Mathematical Foundations – Maragham Publication, Chennai. 8

Supplementary Readings

1) U. Rizwan, Mathematical Foundation - SciTech, Chennai
2) V.Sundaram & Others, Discrete Mathematical Foundation - A.P.Publication, sirkali.
3) P.Duraipandian& Others, Analytical Geometry 2 Dimension - Emerald publication 1992 Reprint.
4) Manicavachagom Pillay & Natarajan. Analytical Geometry part I - Two Dimension - S.Viswanathan (printers & publication) Put Ltd., 1991.

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1-Low 2-Moderate 3- High

SEMESTER -II ALLIED- I	22UMAFA02: MATHEMATICAL FOUNDATIONS – II	HRS/WK – 4 CREDIT – 4

(For B.Sc Computer Science)

COURSE OBJECTIVES

To know about Operations on Matrices, types of Matrices, Rank of matrix, Inverse of Matrix,Methods to solve Simultaneous Linear equations,Test for consistency,Matrix of linear transformations, Characteristic roots and vectors, Types of Integration with applications to Area and Volume, Analytical Geometry 3D Planes and Straight Lines.

UNIT-I: MATRICES

Multiplication of matrices, Singular and Non-Singular matrices, Adjoint of a Matrix, Inverse of a matrix Symmetric and Skew-Symmetric, Hermitian and Skew-Hermition, Orthogonal and unitary matrices, Rank of a matrix, Solution of Simultaneous Linear equations by (i) Cramer's rule. (ii) Matrix Inversion Method.

UNIT-II: MATRICES

Test for Consistency and Inconsistency of linear equations, (Rank Method), characteristic roots and characteristic vectors, Cayley - Hamilton theorem, Matrix of linear transformations: reflection about the x, y axes and the line y=x, rotation about the origin through an angle, expansion or compression, shears, translation.

UNIT-III : INTEGRATION

Simple problems, Integration of rational functions involving algebraic expressions of the form

$$\frac{1}{ax^2+bx+c}, \frac{1}{\sqrt{ax^2+bx+c}}, \frac{px+q}{ax^2+bx+c}, \frac{px+q}{\sqrt{ax^2+bx+c}}, \frac{\sqrt{px+q}}{\sqrt{ax^2+bx+c}}$$

Integration using simple substitutions, Integration involving trigonometric functions of the form

$$\frac{1}{a+b\cos x}, \frac{1}{a^2\sin^2 x+b^2\cos^2 x}$$

Integration by parts.

UNIT-IV : INTEGRATION

Properties of definite integrals, Reduction formulae for

$$\int x^n e^{ax}dx, \quad \int \sin^n x\,dx, \int \cos^n x\,dx, \int x^m(1-x)^n dx$$

applications of Integration for (i) Area under plane curves, (ii) Volume of solid of revolution.

UNIT-V: ANALYTICAL GEOMETRY OF THREE DIMENSION

Planes, straight lines.

COURSE OUTCOMES

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

1) Understand different types of matrix operators
2) Know the concept of Consistency and Inconsistency of linear equations
3) Solve different forms of Integration
4) Find the Area and volume using integration for real world problems.
5) Know the concept of Planes, straight lines

Text Books

1) P.R.Vittal, Mathematical Foundations - Margham Publication, Chennai.

Supplementary Readings

1) U. Rizwan, Mathematical Foundations - SciTech, Chennai
2) V.Sundaram& Others, Mathematical Foundations - A.P.Publication, sirkali.
3) P.Duraipandian& Others, Analytical Geometry 3 Dimension – Emerald publication 1992 Reprint.
4) Manicavachagom Pillay & Natarajan. Analytical Geometry part II - Three Dimension - S.Viswanathan (printers & publication) Pvt Ltd., 1991.

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1-Low 2-Moderate 3- High

SEMESTER – I ALLIED-I	22UBUMA01: BUSINESS MATHEMATICS	HRS/WK – 4 CREDIT – 4

(For All B.COM. Except B.COM (Cooperation) - I Year)

COURSE OBJECTIVES

The course aim is to introduce the concepts of operations on set and applications, to study the characteristic of analytical geometry, differential calculus, matrices and commercial arithmetic.

UNIT - I: SET THEORY

Basic concepts – Subsets – Operations on sets Applications – Cartesian Product – Relation – Properties of relation - Functions.

UNIT – II: ANALYTICAL GEOMETRY

Distance – Slope of a straight line – Equation of Straight line-Point of Intersection of two lines – Interpretation – Break even analysis – Parabolas.

UNIT – III: DIFFERENTIAL CALCULUS

Limits – Continuity –Changes in related variables-Average & Marginal concepts – Differential coefficient-Standard Forms – Simple applications to Economics.

UNIT – IV: MATRICES

Addition of matrices –Scalar multiplication-Multiplication of a matrix by a matrix-Inverse of a matrix – Solution of a system of linear equation –Input output Analysis.

UNIT – V: COMMERCIAL ARITHMETIC

Percentages – Simple and Compound interests – Arithmetic and Geometric Series – Simultaneous Linear equations.

COURSE OUTCOMES

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

1) Know the basic concepts of operations on sets, relations and functions.
2) Learn to find an equations of straight line, distance, slope and interpretations.
3) Abel to find Limit, Continuity, Average and Marginal cost using differential calculus.
4) Know the operations on Matrices, inverse of Matrix, Solution of system of linear equations and Input and Output Analysis using matrices.
5) Compute percentage, simple and compound interest, Arithmetic and Geometric series and solve Simultaneous Linear equations.

Text Books

1) Contents and Treatement as in "An Introduction to Business Mathematics", V. Sundaresan, S. D. Jaya Seelan, S. Chand & Company Ltd, New Delhi(2003).
   Unit-I: Chap:2 (Sec: 2.1 – 2.7), Pages(34-62)
   Unit-II: Chap:1 (Sec: 1.1 –1.8), Pages(1-33)
   Unit-III: Chap:3 (Sec: 3.1–3.6,3.11),Pages(75-91),Pages(116-123)
   Unit-IV: Chap:8 (Sec: 8.2-8.7),Pages(285-328)
   Unit-V: Chap:7 (Sec: 7.1,7.2,7.3,7.5),Pages(229-258),Pages(269-272).

Supplementary Readings

1) "Business Mathematics", Qazi Zameeruddin, V. K. Kahanna, S. K. Bhambri, Vikas Publishing Pvt Ltd, New Delhi (1995).
2) "Business Mathematics", V. K. Kapoor, S. Chand & Company Ltd, New Delhi (1994).
3) "Business Mathematics" P.R.Vittal , Margham Publications.

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