ALLIED COURSES

MATHEMATICS

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 B.Com I Year)

YEAR - I 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)

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

Course Outcomes

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

CO1: Understand the basic concepts of interpolation for equal and unequal intervals.
CO2: Find the Finite differences and Central differences
CO3: Inculcate the basics of python.
CO4:. Know the variables, Standard data types, Operators
CO5: Understand the control statements, iteration and input and output statements.

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

YEAR - I SEMESTER -II ALLIED- II	22UNUMA02: NUMERICAL METHODS USING PYTHON - II	HRS/WK – 4 CREDIT – 4

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)

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.

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

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

YEAR-I 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.

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),

REFERENCE BOOKS:

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.

Course Outcomes:

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

CO1: Attain knowledge on finding Approximate root for polynomial equations using Numerical methods.
CO2: Develop the skills of finding solutions of Simultaneous Linear equations.
CO3: Adopt techniques in solving problems involving Matrices
CO4: Provide skills on finding curvature and radius of curvature in Cartesian and polar co-ordinates.
CO5:Understand the applications of double and Triple integration in real life situation.

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 -I 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).

TEXT BOOK:

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.

REFERENCE BOOKS:

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.

Course Outcomes:

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

CO1: Attain knowledge on finding the expansions of trigonometric functions and concept of hyperbolic and inverse hyperbolic functions.
CO2: Provide a basic knowledge of Partial Differential equations and develops knowledge on handle practical problems.
CO3: Adopt techniques in solving problems involving vector and scalar functions
CO4: Provide skills on finding derivatives and gradients on vector differentiation and Integration.
CO5: Understand the applications of differentiation and integration in real life situation.

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-I 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

Text Book. P.R. Vittal, Mathematical Foundations – Maragham Publication, Chennai. 8

Reference Books 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.

Course Outcomes:

The students after undergoing this course will be able to

CO1: Understand operators and solve problems using operators
CO2: Know the concept of set theory, relations and functions
CO3: Solve problems using permutation and combination
CO4: Know the concept of limits, differentiation
CO5: Solve Problems on straight lines and pair straight lines

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-I 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

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

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.

Text Book: P.R.Vittal, Mathematical Foundations - Margham Publication, Chennai.

Reference Books

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.

Course Outcomes:

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

CO1: Understand different types of matrix operators
CO2: Know the concept of Consistency and Inconsistency of linear equations
CO3: Solve different forms of Integration
CO4: Find the Area and volume using integration for real world problems.
CO5: Know the concept of Planes, straight lines

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

I B.Com SEMESTER – I ALLIED-I	22UBUMA01: BUSINESS MATHEMATICS	HRS/WK – 4 CREDIT – 3

(For B.COM 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.

TEXT BOOK :

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).

REFERENCE BOOKS:

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.

Course Outcomes:

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

CO1: Know the basic concepts of operations on sets, relations and functions.
CO2: Learn to find an equations of straight line, distance, slope and interpretations.
CO3: Abel to find Limit, Continuity, Average and Marginal cost using differential calculus,
CO4: Know the operations on Matrices, inverse of Matrix, Solution of system of linear equations and Input and Output Analysis using matrices.
CO5:.Compute percentage, simple and compound interest, Arithmetic and Geometric series and solve Simultaneous Linear equations.

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