

B.Sc. Mathematics
Under Choice Based Credit System (CBCS)
SCHEME OF EXAMINATIONS
Program code: updated April- 2020(June onwards)

Semester – I									
S. No.	Course Code	Part	Title of the Paper	Hrs.	Credits	Exam Hrs.	Max. Marks		
							Int.	Ext.	Total
1	20UGC1TA1/1HI1	I	Tamil – I Amutha Tamil / Hindi – I	6	3	3	50	50	100
2	20UGC1EN1	II	English – I	6	3	3	50	50	100
3	20UMA1C01	III	Core 1 – Classical Algebra	6	5	3	50	50	100
4	20UMA1C02	III	Core 2 - Calculus	6	5	3	50	50	100
5	20UMA1AL1	III	Allied – 1: Physics -I	4	4	3	35	35	70
6	20UMA2AP1	III	Allied - Physics Practical	2	-	-	-	-	-
Semester I Total				30	20		235	235	470

Semester – II									
S. No.	Course Code	Part	Title of the Paper	Hrs.	Credits	Exam Hrs.	Max. Marks		
							Int.	Ext.	Total
1	20UGC2TA2/2HI2	I	Tamil – II Kappiya Tamil / Hindi - II	6	3	3	50	50	100
2	20UGC2EN2	II	English – II	6	3	3	50	50	100
3	20UMA2C03	III	Core 3 - Differential Equations and Laplace Transforms	6	5	3	50	50	100
4	20UMA2C04	III	Core 4 - Trigonometry, Vector Calculus and Fourier Series	6	5	3	50	50	100
5	20UMA2AL2	III	Allied 2 - Physics II	4	4	3	35	35	70
6	20UMA2AP1	III	Allied - Physics Practical	2	2	3	30	30	60
7	20UGC2ENS	IV	Environmental Studies		2	2	-	50	50
Semester II Total				30	24		265	315	580

Semester – III									
S. No.	Course Code	Part	Title of the Paper	Hrs.	Credits	Exam Hrs.	Max. Marks		
							Int.	Ext.	Total
1	20UGC3TA3/ 3HI3	I	Tamil – III Deiva Tamil / Hindi - III	6	3	3	50	50	100
2	20UGC3EN3	II	English – III	6	3	3	50	50	100
3	20UMA3C05	III	Core 5 - Analytical Geometry of 2D & 3D	5	4	3	50	50	100
4	20UMA3C06	III	Core 6 - Statics	5	4	3	50	50	100
5	20UMA3AL3	III	Allied 3 - Mathematical Statistics I	6	5	3	50	50	100
6	20UMA3NM1 / 20UGC3TB1	IV	NME: I Principles of Accountancy // Basic Tamil - I	2	2	2	-	50	50
Semester III Total				30	21		250	300	550

Semester – IV									
S. No.	Course Code	Part	Title of the Paper	Hrs.	Credits	Exam Hrs.	Max. Marks		
							Int.	Ext.	Total
1	20UGC4TA4 / 4HI4	I	Tamil – IV Sanga Tamil / Hindi - IV	6	3	3	50	50	100
2	20UGC4EN4	II	English – IV Immortal Speeches from Shakespeare and Public Speaking	6	3	3	50	50	100
3	20UMA4C07	III	Core 7 - Dynamics	5	4	3	50	50	100
4	20UMA4C08	III	Core 8 - Numerical Methods	5	4	3	50	50	100
5	20UMA4AL4	III	Allied 4 - Mathematical Statistics II	6	5	3	50	50	100
6	* / 20UGC4TB2	IV	NME: II* / Basic Tamil - II	2	2	2	-	50	50
7	20UGC4VAE	IV	Value Education	-	2	2	-	50	50
8	20UGC4 NCC/NSS/SPO/Y RC	V	Extension Activities (NSS / NCC / Sports/YRC)	-	1	-	25	25	50
Semester IV Total				30	24		275	375	650

Semester – V									
S. No.	Course Code	Part	Title of the Paper	Hrs.	Credits	Exam Hrs.	Max. Marks		
							Int.	Ext.	Total
1	20UMA5C09	III	Core 9 - Modern Algebra	5	5	3	50	50	100
2	20UMA5C10	III	Core 10 - Real Analysis I	5	5	3	50	50	100
3	20UMA5C11	III	Core 11 - Complex Analysis	5	4	3	50	50	100
4	20UMA5C12	III	Core 12 - Discrete Mathematics	4	4	3	50	50	100
5	20UMA5C13	III	Core 13 - Operations Research I	5	4	3	50	50	100
6	20UMA5EL1	III	Elective 1 : Web Programming	4	4	3	50	50	100
7	20UMA6EP1	III	Elective Practical: Web Programming and 'C	2	-	-	-	-	-
Semester V Total				30	26		300	300	600

Semester – VI									
S. No.	Course Code	Part	Title of the Paper	Hrs.	Credits	Exam Hrs.	Max. Marks		
							Int.	Ext.	Total
1	20UMA6C14	III	Core 14 - Linear Algebra	5	5	3	50	50	100
2	20UMA6C15	III	Core 15 - Real Analysis II	5	5	3	50	50	100
3	20UMA6C16	III	Core 16 - Special Functions	4	4	3	50	50	100
4	20UMA6C17	III	Core 17 - Operations Research II	5	4	3	50	50	100
5	20UMA6C18	III	Core 18 – Number Theory	5	4	3	50	50	100
6	20UMA6EA2 / 6EB2	III	Elective 2 : Introduction to "C" / Data Science using R	4	4	3	50	50	100
7	20UMA6EP1	III	Elective Practical: Web Programming and 'C	2	2	3	50	50	100
Semester VI Total				30	28	3	350	350	700

Programme : B.Sc. Mathematics
Course Title : Core 1: Classical Algebra **Course Code** : 20UMA1C01
Year : First Year **Semester** : I
Hours/Week : 6 **Credits** : 5

Course Objectives

1. To get the knowledge of convergence and divergence of a series.
2. To know how to find the summation of series.
3. To understand the nature of the roots of the algebraic equations.

Course Outcomes (CO)

CO1	Finding the roots of polynomial functions.	K1
CO2	Classifying convergence and divergence of series.	K2
CO3	Applying the Binomial theorem, Exponential theorem, logarithmic theorem to find the summation of series.	K3
CO4	Analyzing the nature of the roots of the equations.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S		S	S	S	S	S
CO2	S	S	S	S	S		S	S	S	S	S
CO3	S	S	S	M	M		S	M	S	M	M
CO4	S	S	S	M	L		M	S	M	S	L

S – Strong; M – Medium; L - Low

Unit -I

CONVERGENCY AND DIVERGENCY OF SERIES: Infinite series – **Geometric series*** – some general theorems concerning infinite series- The series is convergent when k is greater than unity and divergent when k equal to or less than unity – Cauchy’s condensation test- D’Alembert’s Ratio test – Cauchy’s Root test – Raabe’s test.

Chapter 2: Sections 8 - 19

Unit-II

BINOMIAL THEOREM: Binomial theorem – Positive integral index –**The greatest term in the expansion of $(1 + x)^{n*}$** - Summation of various series involving binomial coefficients - Vandermonde's theorem – Binomial theorem for a rational index – Some important particular cases of Binomial expansion – The method of splitting functions into partial fractions - Application of the binomial theorem to the summation of series.

Chapter 3: Sections 1 – 10

Unit –III

EXPONENTIAL AND LOGARITHMIC SERIES: The Exponential theorem – Summation - The Logarithmic series – Euler’s constant – **summation*** – The application of the exponential and logarithmic series to limits and approximations.

Chapter 4 Sections:1 - 11

Unit –IV

THEORY OF EQUATIONS: Roots of an equation* – Relations between the roots and co-efficient of equations – Symmetric functions of the roots – Transformation of equations – Reciprocal equations

Chapter 6. Sections:1 to 12, 15 & 16

Unit -V

THEORY OF EQUATIONS: To increase or decrease the roots of a given equation by a given quantity – Removal of terms – Descartes’ Rule of signs - **Roll’s theorem*** – Multiple roots – Strum’s theorem - Horner’s method of approximation.

Chapter 6 Sections: 17, 19, 24 –27 and 30. (Omit section 30.1)

* denotes self-study (Questions may be asked from these portions also)

Book for study:

Manickavachagam Pillay, T. Natarajan, K. S. Ganapathy, *Algebra, Vol. I*, S. Viswanathan Pvt. LTD, 2007.

Books for reference:

1. P. N. Chatterji, *Algebra*, Rajhans Prakasham Mandir, Meerut (U.P), 1994.
2. M. L. Khanna, *Algebra*, Jai Prakash Nath & Co, Meerut (U.P), 1991.
3. A. R. Vasishtha and R. K. Gupta, *Algebra*, Krishna Prakasham Mandir, Meerut (U.P), 1990-91.

Programme : B.Sc. Mathematics

Course Title : Core 2: Calculus

Year : First Year

Hours/Week : 6

Course Code : 20UMA1C02

Semester : I

Credits : 5

Course Objectives

1. To give basic knowledge about Mathematical concepts in calculus.
2. To evaluate double and triple integrals.
3. To learn different methods of integration, Beta and Gamma functions which forms the basis for higher studies.

Course Outcomes (CO)

CO1	Remembering the formulas in differentiation and integration.	K1
CO2	Interpret the definite integral geometrically as the area under a curve.	K2 & K3
CO3	Apply the concept of definite integral to solve various kinds of problems.	K3
CO4	Analyze the values of the derivative at a point algebraically.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	L		M	S	M	S	M
CO2	S	S	S	S	M		S	S	S	S	M
CO3	S	S	S	S	M		S	S	M	S	S
CO4	S	S	S	S	M		S	S	M	S	M

S – Strong; M – Medium; L - Low

Unit-I

CURVATURE OF PLANE CURVES: Curvature – Circle, radius and centre of curvature – Cartesian formula for the radius of curvature – The coordinates of the centre of curvature - Evolute and involute – **Radius of curvature when the curve is given in polar co-ordinates*** - Pedal equation of a curve – finding asymptotes of rational algebraic curves.

Chapter X: Sections 2.1 to 2.7, Chapter XI: Sections 1 to 4

Unit-II

INTEGRATION: Integration of rational algebraic functions - Integration of irrational functions – **Properties of definite integrals***.

Chapter 1: Sections 7 to 11

Unit-III

MULTIPLE INTEGRALS: Evaluation of the double integral – Change of order of integration – Double integral in polar co-ordinates – Triple integrals – Applications of Multiple integrals – Volumes of solids of revolution – Volumes of solids as double integrals– **Volume as a triple integral***.

Chapter 5: Sections 1 to 6.3

UNIT– IV

IMPROPER INTEGRALS: Beta and Gamma functions – Recurrence formula for Gamma functions – **Properties of Beta functions*** - Relation between Beta and Gamma functions – Applications of Gamma functions to multiple integrals.

Chapter 7: Sections 2.1 to 6

Unit - V

CHANGE OF VARIABLES: Jacobian – Two important results regarding Jacobians - Change of variables in the case of two variables – Change of variables in the case of three variables. Transformation from Cartesian to polar co-ordinates – **Transformation from Cartesian to spherical polar co-ordinates***.

Chapter 6: Sections 1.1 to 2.4

*** denotes self-study (Questions may be asked from these portions also)**

Books for study:

1. S. Narayanan and T. K. M. Pillai, *Calculus, Vol-1*, Viswanathan Publishers, 2007.
For Unit I
2. S. Narayanan and T. K. M. Pillai, *Calculus, Vol-2*, Viswanathan Publishers, 2007.
For Units II to V

Books for reference:

1. N. P. Bali, *Integral Calculus*, Laxmi Publications, 4th Edition, 1980.
2. A. R. Vasishtha and S. K. Sharma, *Integral Calculus*, Krishna Prakashan Mandir, Meerut, 1990.
3. Shanthi Narayan, *Differential Calculus*, Shyam Lal Charitable Trust, New Delhi, 1993.

e-resources:

1. <https://www.math24.net/integration-rational-functions>
2. https://www.rtu.ac.in/expert/app/documents/kjangid@rtu.ac.in_21829122020100843am.pdf
3. [https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Calculus_\(OpenStax\)](https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Calculus_(OpenStax))
4. <https://www.youtube.com/watch?v=6ntZ1KQL04A&t=15s>
5. <https://www.youtube.com/watch?v=gAOwckHIDl8>

Programme : B.Sc. Mathematics
Course Title : Core 3: Differential Equations and Laplace Transforms
Year : First Year
Hours/Week : 6
Course Code : 20UMA2C03
Semester : II
Credits : 5

Course Objectives

1. To solve second-order linear differential equations with constant and variable coefficients.
2. To get the ability of solving first and second order ordinary differential equations and first order partial differential equations.
3. To get the knowledge about Laplace and inverse Laplace transforms.

Course Outcomes (CO)

CO1	Recalling the concept of first order linear differential equations.	K1
CO2	Understanding the concept of first order higher degree ordinary differential equations	K2
CO3	Solving Linear partial differential equations by using the Lagrange’s method.	K3 & K4
CO4	Analyzing the concepts of Laplace transforms and inverse Laplace transforms to solve ODE with constant and variable coefficients.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	M	M	L		M	S	M	S	M
CO2	S	M	M	S	S		S	M	S	S	M
CO3	S	S	S	M	M		M	S	M	M	S
CO4	M	M	S	S	S		S	M	S	L	S

S – Strong; M – Medium; L - Low

Unit –I

DIFFERENTIAL EQUATIONS: Equations of the first order and the first degree - Variable separable - Homogeneous equations - Non homogeneous equations of the first degree in x and y- **Linear equation***- Bernoulli’s equation. Differential Equations of the first order, but of the higher degree - Equations solvable for dy/dx – Equations solvable for y- Equations solvable for x- Clairaut’s form.

Vol III: Chapter 1 section 2.1 to 2.5,5.1 to 6.1

Unit –II

DIFFERENTIAL EQUATIONS (cont.): Linear differential equations with constant coefficients – special methods of finding particular integral – Linear equations with variable coefficients – Equations reducible to the linear homogeneous equations – **Variation of parameters***.

Vol III: Chapter 2 sections 2 to 4, 8 to 10

Unit – III

DIFFERENTIAL EQUATIONS (cont.) : Simultaneous equations of the first order and first degree – Methods for solving $dx/P = dy/Q = dz/R$ simultaneous linear differential equations with constant coefficients.

VOL III: Chapter 3 sections 1 to 6

Unit -IV

PARTIAL DIFFERENTIAL EQUATIONS: Derivation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Different integrals of partial differential equations - **standard types of first order equations*** - Lagrange's equations.

Vol III: Chapter 4, Omit section 4, 5.5 and 7.0

Unit –V

LAPLACE TRANSFORMS: Laplace transforms – Definition – Transform of $f(t)$, - **exp at, cos at, sin at *** and t^n when n is an integer – The inverse Laplace transform - Laplace transforms to solve ordinary differential equations with constant and variable co-efficient – to solve system of differential equations.

Vol III Chapter 5

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

T. K. Manicavachagam Pillay and S. Narayanan, *Calculus Vol III*, S. Viswanathan Printers, 2007.

Books for reference:

1. N. P. Bali, *Differential Equations*, Laxmi Publications (P) Ltd., New Delhi, 2004.
2. Dr. J. K. Goyal and K. P. Gupta, *Laplace and Fourier Transforms*, Pragati Prakashan Publishers, Meerut, 2000.

e-resources:

1. <http://www.nptelvideos.in/2012/11/mathematics-iii.html>
2. https://www.whitman.edu/mathematics/calculus_online/chapter17.html
3. <https://www.khanacademy.org/math/differential-equations>

Programme	: B.Sc. Mathematics		
Course Title	: Core 4 : Trigonometry, Vector Calculus and Fourier Series	Course Code	: 20UMA2C04
Year	: First Year	Semester	: II
Hours/Week	: 6	Credits	: 5

Course Objectives

1. To enable the students to provide basic knowledge of trigonometry
2. To inculcate the knowledge of vector calculus and integral theorems
3. To understand the expansions of Fourier series.

Course Outcomes (CO)

CO1	Understanding the hyperbolic and inverse hyperbolic functions.	K1
CO2	Illustrating the Fourier co-efficient for periodic functions.	K2
CO3	Applying the differential operator to find gradient, divergence and curl.	K3
CO4	Examining the multiple integrals by applying Gauss divergence theorem, Stoke's theorem and Green's theorem.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	S		M	S	M	S	S
CO2	S	M	S	S	M		S	M	S	S	M
CO3	S	S	L	S	M		S	S	M	S	S
CO4	M	S	S	S	M		S	S	M	S	M

S – Strong; M – Medium; L - Low

Unit -I

TRIGONOMETRY: Expansions of $\cos n\theta$, $\sin n\theta$, $\tan n\theta$, $\tan (A+B+C+\dots)$, $\cos \theta$, $\sin \theta$, Hyperbolic functions – **Inverse Hyperbolic functions***- Separation of real and imaginary parts of Hyperbolic functions.

Chapter. III: Sec 1, 2, 3, 5, Chapter. IV

Unit -II

TRIGONOMETRY: Logarithms of Complex quantities – Summation of Trigonometric series.

Chapter. V: Sec 5, Chapter. VI

Unit III

VECTOR CALCULUS: Scalar and Vector point function – **Differentiation of vectors*** – Directional derivative – gradient, divergence and curl.

Chapter 1 and Chapter 2

Unit -IV

VECTOR CALCULUS: Integration of vectors – line, surface and **volume integrals*** – Integral theorems and their applications.

Chapter 3 and Chapter 4

Unit -V

FOURIER SERIES: Definition – finding Fourier coefficient for a given periodic function with period 2π – **odd and even functions***, Change of Interval.

Chapter VI: Sec 1, 2, 3 and 6

* denotes self-study (Questions may be asked from these portions also)

Books for study:

1. S. Narayanan and Manickavachagam Pillai, *Trigonometry*, S. Viswanathan (Printers and Publishers) PVT Ltd
For Units I and II.
2. N. Namasivayam, *Vector Calculus*, S. Viswanathan (Printers and Publishers) PVT Ltd.
For Units III and IV.
3. T.K.Manicavachagam Pillay and S.Narayanan, *Calculus - Vol III*, S.Viswanathan Printers, 2007.
For Unit V.

Books for reference:

1. P. Kandasamy and K. Thilagavathi, *Mathematics*, S. Chand's and Company Ltd., New Delhi - 55, 2004.
2. S. Narayanan and T. K. Manicavasagampillay, *Vector Algebra and Analysis*, S. Viswanathan Printers and Publishers Pvt., Ltd, 1995.
3. K. Viswanathan and S. Selvaraj, *Vector Analysis*, Emerald Publishers, Chennai – 2, 1998.

e-resources:

1. https://www.youtube.com/watch?v=uMXcKY_w3w4
2. <https://www.youtube.com/watch?v=TYOYID9gJxM>
3. <https://www.youtube.com/watch?v=NyG0vRn5FfU>

Programme : B.Sc. Mathematics
Course Title : Core 5 : Analytical Geometry of 2D & 3D
Year : Second Year
Hours/Week : 5
Course Code : 20UMA3C05
Semester : III
Credits : 4

Course Objectives

1. To gain knowledge about co-ordinate geometry.
2. To know the basic concepts of cone and cylinder.
3. To determine co-ordinate axes and co-ordinate planes in the dimensional space.

Course Outcomes (CO)

CO1	Remembering the equation of a line that passes through a given point which is parallel or perpendicular to a given line.	K1
CO2	Understanding the results based on the properties of a sphere.	K2
CO3	Identifying conic sections.	K1 & K3
CO4	Analyzing the concepts of geometry.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M		M	S	M	S	M
CO2	S	S	S	S	M		S	S	S	S	M
CO3	S	S	S	S	L		S	S	M	S	S
CO4	S	S	S	S	M		S	S	M	S	M

S – Strong; M – Medium; L – Low

Unit-I:

ANALYTICAL GEOMETRY OF 2D: POLAR equation of a Conic – Directrix – Chord – Tangent – Normal* - simple problems.

Chapter IX: Sections 9 – 13.

Unit-II:

ANALYTICAL GEOMETRY 3D: DIRECTION Cosines – Direction Ratios – Planes – Equation of the plane passing through the points – Angle between the planes* – Equation of the plane through the line of intersection of two given planes.

Chapter I: Sections 7 – 11 and Chapter II

Unit-III:

STRAIGHT LINE: Equation of the straight lines passing through two given points – Coplanarity of straight Line - **Shortest Distance (SD)*** and equation of SD between two lines-simple problems.

Chapter III: Sections 1, 2, 3, 4, 7, 8

Unit-IV:

SPHERE: Standard equation of Sphere* - results based on the properties of a Sphere - Equation of circle on a Sphere - Equation of tangent plane to a Sphere.

Chapter IV

Unit-V:

CONE AND CYLINDER: Cone whose vertex is at the origin - right circular cone - Equation of a cylinder - right circular cylinder – Enveloping cylinder – **Central quadrics***.

Chapter V: Sections 1, 2, 8

*** denotes self-study (Questions may be asked from these portions also)**

Books for study:

1. T. K. Manickavachagam Pillai and T. Natarajan, *Analytical Geometry – 2D*, S. Viswanathan (Printers & Publishers), PVT., LTD, 2007.
For Unit I.
2. T. K. Manickavachagam Pillai and T. Natarajan, *Analytical Geometry – 3D*, S. Viswanathan (Printers & Publishers), PVT., LTD, 2001.
For Units II, III, IV & V.

Books for reference:

1. T. K. Manicavachagom Pillay and T. Natarajan, *Analytical Geometry*, S. Viswanathan Printers and Publishers Pvt., Ltd, 2001.
2. A. R. Vasistha and J. N. Sharma, *Analytical Geometry 3D*, Krishna Prakashan Media (P) Ltd, Meerut, 1997.

e-resource:

http://www.brainkart.com/article/Three-Dimensional-Analytical-Geometry_6453/

Programme : B.Sc. Mathematics
Course Title : Core 6: Statics
Year : Second Year
Hours/Week : 5

Course Code : 20UMA3C06
Semester : III
Credits : 4

Course Objectives

1. To enable the knowledge of forces and moments.
2. To understand the notions of friction.
3. To solve problems under friction and equilibrium of strings.

Course Outcomes (CO)

CO1	Remembering the notions of friction and equilibrium of strings and deploy them in solving the problems.	K1&K3
CO2	Understanding the concepts of forces and moments.	K2
CO3	Applying the concepts of forces in finding the resultant of any number of forces.	K3
CO4	Analyzing the basics of coplanar forces and equilibrium of forces acting on a rigid body and solving the problems.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 – Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M		S	S	S	S	S
CO2	S	S	S	S	M		S	S	S	S	M
CO3	S	S	S	S	M		S	S	M	S	S
CO4	S	S	S	S	M		S	S	M	S	M

S – Strong; M – Medium; L - Low

Unit -I

KINEMATICS: Mechanics, Units, Vector and Scalar quantities, A vector as a sum of three mutually perpendicular vectors, A vector as a sum of two non – perpendicular vectors.

FORCES: Force, types of forces*, magnitude and direction of the resultant of forces acting on a particle (in particular resultant of two forces acting on a particle), equilibrium examples.

EQUILIBRIUM OF A PARTICLE: **Equilibrium** of a particle acted on a rough inclined plane, examples.

Chapter 1, Sec. 1-5, Chapter 2 & 6

Unit –II

FORCES ON A RIGID BODY: Moment of a vector, General motion of rigid body, equivalent or equipotent systems of forces, **resultant of parallel forces***, couple, resultant of several coplanar forces.

Chapter 7, Sec 7.1 – 7.6

Unit –III

Moment of the resultant force, couples in a plane or in parallel planes, resultant of a couple and a force, three coplanar forces on a rigid body, **equation of the line of action of the resultant***, equilibrium of a rigid body under three coplanar forces examples.

Chapter 7, Sec 7.7 – 7.12

Unit –IV

A SPECIFIC REDUCTION OF A SYSTEM OF FORCES: **Reduction** of a system of forces to a force at a chosen point and a couple, **central axis***, problems involving frictional force, problems involving tilting of bodies, examples.

Chapter 8.

Unit -V

STABILITY OF EQUILIBRIUM AND HANGING STRINGS: Equilibrium of a uniform homogeneous string, sag, suspension bridge, examples.

Chapter 10 &11

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

P. Duraipandian and others, *Mechanics*, S. Chand & Co., 1990.

Books for reference:

1. A. V. Dharmapadam, *Statics*, S. Viswanathan Printers and Publishing Pvt., Ltd, 1993.
2. P. Duraipandian and Laxmi Duraipandian, *Mechanics*, S. Chand and Company Ltd, Ram Nagar, New Delhi -55, 1985.
3. Dr. P. P. Gupta, *Statics*, Kedal Nath Ram Nath, Meerut, 1983-84.

Programme : B.Sc. Mathematics
Course Title : Allied 3: Mathematical Statistics I **Course Code** : 20UMA3AL3
Year : Second Year **Semester** : III
Hours/Week : 6 **Credits** : 5

Course Objectives

1. To enable the students to acquire the knowledge of statistics.
2. To remember the properties of various statistical functions.
3. To understand the concepts of some statistical distributions.

Course Outcomes (CO)

CO1	Remembering the concepts of probability and random variables	K1
CO2	Understanding the properties of some distributions.	K2
CO3	Finding mean, median, mode, moments and moment generating functions of Binomial, Poisson and Normal distributions.	K1&K3
CO4	Analyzing how correlation is used to identify the relationships between variables and how regression analysis is used to predict outcomes.	K3 &K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	L		M	M	S	M	L
CO2	S	S	S	M	M		S	M	S	S	S
CO3	S	S	S	S	M		M	S	M	S	M
CO4	S	S	S	M	S		S	S	S	S	M

S – Strong; M – Medium; L - Low

Unit –I

Random Variables - Mathematical Expectations-Properties of Expectation*

Chapter 2: pages 2.1 to 2.32

Chapter 3: pages 3.1 to 3.18

Unit –II

Variance -Moments -Moment Generating Function.

Chapter 4: pages 4.1 to 4.25

Chapter 5: pages 5.1 to 5.17

Unit –III

Correlation (Omit Bivariate sample) - Types of Correlation *– Regression

Chapter 8: pages 8.1 to 8.51

Chapter 9: pages 9.1 to 9.24

Unit –IV

Binomial Distribution – Poisson Distribution - Geometric Distribution*.

Chapter 12: pages 12.1 to 12.25

Chapter 13: pages 13.1 to 13.21

Chapter 15

Unit –V

Normal Distribution - Uniform Distribution* - Exponential Distribution* - Gamma Distribution – Beta distribution.

Chapters 16,17,18,19 and 20.

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

P. R. Vittal, *Mathematical Statistics*, Margham Publications, Chennai, 2004.

(Omit all Exercise Problems)

Books for reference:

1. S. C. Gupta and V. K. Kapoor, *Fundamental of Mathematical Statistics*, Sultan Chand & Sons, 2008.
2. R. S. N. Pillai and V. Bagavathi, *Statistics*, Sultan Chand, New Delhi, 2008.
3. S. P. Gupta, *Statistical Methods*, Sultan Chand, New Delhi, 33rd Edition, 2005.

e - resources:

1. <https://www.tutorialspoint.com/statistics/index.htm>
2. <https://nptel.ac.in/courses/111/105/111105041/>
3. <https://www.youtube.com/watch?v=p1Y4yJ1XnKY&list=PLbMVogVj5nJQWowhOG0-K-yI-bwRRmm3C&index=5>

Programme : B.Sc. Mathematics
Course Title : Core 7: Dynamics
Year : Second Year
Hours/Week : 5

Course Code : 20UMA4C07
Semester : IV
Credits : 4

Course Objectives

1. To enable the students to know the laws, principles and understand the concepts of motion of a particle and projectiles.
2. To provide the knowledge about the field of kinematics and impact between spheres.
3. To gain knowledge about simple harmonic motion and central orbits.

Course Outcomes (CO)

CO1	Remembering the concepts of motion of a particle and projectile in different angles.	K1
CO2	Understanding the notions of impact between two smooth spheres in different ways.	K2
CO3	Applying the concept of simple harmonic motions in composition of two bodies in different directions.	K3
CO4	Distinguishing between the pedal equations of well-known curves and solving two-fold problems in central orbits.	K2 &K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M		S	S	S	S	M
CO2	S	S	S	S	M		S	S	S	S	M
CO3	S	S	M	S	M		S	S	M	M	S
CO4	S	S	S	S	M		S	M	S	S	M

S – Strong; M – Medium; L - Low

Unit –I

KINEMATICS :Velocity*, resultant of \vec{v}_1 and \vec{v}_2 relative velocity acceleration, velocity and acceleration in a rectilinear motion, velocity and acceleration in a co-planar motion, angular velocity, rectilinear motion when the acceleration is constant, examples.

RECTILINEAR MOTION UNDER GRAVITY: Motion along a vertical line under gravity, line of quickest descent, motion along a smooth inclined plane, motion along a rough inclined plane, motion of connected particles, examples.

Chapter 1: Sec 1.6 to 1.15 Chapter 3: Sec 3.1 to 3.6

Unit -II

RECTILINEAR MOTION OF A PARTICLE UNDER VARYING FORCE: Simple harmonic motion, Orthogonal projection of a uniform circular motion, composition of two simple harmonic motions of same period, motion of a heavy particle attached to one end of a horizontal spiral spring, motion of heavy particle attached to one end of a vertical spiral spring, **motion under gravity in a resisting medium***, examples.

Chapter 5: Sec 5.1 to 5.7

Unit -III

IMPACT: Impulsive force, Impulse, conservation of linear momentum, elasticity, Impact of two smooth spheres, direct impact of two smooth spheres, Impact of smooth sphere on a fixed smooth plane, **Oblique impact between two smooth spheres***, examples.

Chapter 12: Sec 12.1 to 12.9

Unit -IV

MOTION OF A PROJECTILE UNDER GRAVITY: Motion of projectile*, Nature of a projectory, Results pertaining to the motion of a projectile, maximum horizontal range and speed of a projectile, examples.

Chapter 13: Sec 13.1 to 13.4, 13.6 to 13.11

Unit -V

CIRCULAR AND CYCLOIDAL MOTIONS: Conical pendulum, circular motion in a vertical plane under gravity, **simple pendulum***, cycloidal motion in a vertical plane, examples.

CENTRAL ORBITS: Central force and central orbit, equation of a central orbit, law of force and speed for given orbit, determination of the orbit when the law of force is given.

Chapter 14: Sec 14.1 to 14.6 and Chapter 15: Sec 15.1 to 15.5

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

P. Duraipandian and others, *Mechanics*, S. Chand & Co., 1990.

Books for reference:

1. A. V. Dharamapadam, *Dynamics*, S. Viswanathan Printers and Publishers Pvt., Ltd, Chennai, 1998.
2. K. Viswanatha Naik and M. S. Kasi, *Dynamics*, Emerald Publishers, 1992.
3. Naryanamurthi, *Dynamics*, National Publishers, New Delhi, 1991.

Programme : B.Sc. Mathematics
Course Title : Core 8: Numerical Methods
Year : Second Year
Hours/Week : 5

Course Code : 20UMA4C08
Semester : IV
Credits : 4

Course Objectives

1. To solve algebraic and transcendental equations using numerical methods.
2. To solve simultaneous algebraic linear equations numerically. To know about finite differences and its uses to interpolate the values for equal and unequal intervals.

Course Outcomes (CO)

CO1	Derive numerical methods for approximating the solution of the problems of algebraic and transcendental equations, ordinary differential equations.	K1
CO2	Implement a variety of numerical algorithms using appropriate technology	K2&K3
CO3	Get practical knowledge of polynomial interpolation, also numerical algorithms are used in C++ for solving scientific problems	K3
CO4	Solve the ordinary differential equations by using the methods like Euler's, Runge Kutta, Modified Euler and Improved Euler	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 – Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	L	M	M		M	S	M	S	M
CO2	S	S	S	S	M		S	S	S	S	M
CO3	S	S	S	M	M		S	S	M	S	S
CO4	S	S	S	S	M		S	S	M	S	M

S – Strong; M – Medium; L - Low

Unit -I

THE SOLUTION OF NUMERICAL, ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

Introduction – The Bisection method – Method of Successive Approximation or the Iteration method – The Method of False Position– Newton's Iteration method.

SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS: Introduction – **Gauss Elimination method*** – Computation of the inverse of a matrix using Gauss's Elimination method – Method of Triangularisation– Crout's method – Iterative methods – Comparison of Gauss Elimination and Gauss-Seidal Iteration methods – Relaxation methods – examples.

Chapter – III & IV

Unit -II

FINITE DIFFERENCES: First Differences – Higher Differences – Backward Differences – Central difference notation – Properties of the operator Δ - Differences of a polynomial – Factorial polynomials – Relation between the operators E and Δ - Relation between the operators (D) and Δ - other difference operators – **Relationship between the operators*** – Examples.

Chapter – V

Unit –III

INTERPOLATION: Introduction – Linear Interpolation – Gregory Newton Forward Interpolation Formula – Gregory Newton Backward Interpolation Formula – Equidistant terms with one or more missing values. Central difference tables – Central Difference Interpolation Formulae – Gauss’s Forward Interpolation Formula - **Gauss’s Backward Interpolation Formula*** – Stirling’s Formula – Bessel’s Formula – Lagrange’s Interpolation Formula – Examples.

Chapter –VI &VII

Unit -IV

NUMERICAL DIFFERENTIATION AND INTEGRATION: Newton’s Forward Difference Formula to compute the Derivatives – Newton’s Backward Difference Formula to compute the derivatives – Derivatives using Stirling’s formula – The Trapezoidal Rule – Truncation error in the Trapezoidal Formula – Romberg’s method – Simpson’s rule – **Practical Applications of the Simpson’s rule*** – Examples.

Chapter –IX

Unit -V

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS. Solutions by Taylor’s series – Euler’s method – Improved Euler’s method – **Modified Euler’s method*** – RungeKutta method – Second order Runge Kutta method – Higher order Runge Kutta method – Examples.

Chapter – X

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

Dr. M. K. Venkataraman, *Numerical Methods in Science and Engineering*, The National Publishing Company, Fifth Edition, 1999.

Books for reference:

1. M. K. Jain, S. R. K. Iyengar and R. K. Jain, *Numerical Methods for Scientific and Engineering Computations*, New Age International publishers, New Delhi, 2004.
2. A. Singaravelu, *Numerical Methods*, Meenakshi Publications, Arpakkam, 2002.

e-resources:

1. <https://nptel.ac.in/courses/122/102/122102009/>
2. <https://nptel.ac.in/courses/111/107/111107105/>
3. <https://www.britannica.com/science/difference-equation>
4. <https://nptel.ac.in/courses/122/102/122102009/>
5. <https://nptel.ac.in/courses/111/107/111107063/>

Programme : B.Sc. Mathematics
Course Title : Allied 4: Mathematical Statistics II **Course Code** : 20UMA4AL4
Year : Second Year **Semester** : IV
Hours/Week : 6 **Credits** : 5

Course Objectives

1. To enable the students to give inference on statistical population based on sample statistics.
2. To understand the concepts of various estimators.
3. To study the concepts of analysis of variance.

Course Outcomes (CO)

CO1	Finding the derivations of t , χ^2 and F distributions.	K1
CO2	Explaining the procedure for testing of hypothesis and sampling of attributes.	K2
CO3	Applying the concepts of various distributions in real time situations.	K2 & K3
CO4	Analyzing one - way and two – way classifications and design of experiments.	K3 & K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	L		S	M	M	L	M
CO2	S	S	S	S	M		S	M	S	S	M
CO3	S	S	S	S	M		S	S	S	M	M
CO4	S	S	S	M	S		S	S	M	S	M

S – Strong; M – Medium; L - Low

Unit –I

Sampling Distribution – Chi Square, t, F - Distributions.

Chapter 22: page 22.1 to 22.40

Unit –II

Estimation - ML estimator*(Omit Cramer – Rao inequality and Rao-Blackwell Theorem).

Chapter 23: page 23.1 to 23.56

Unit –III

Large Samples - Test for specified standard deviation of the population*.

Chapter 24: page 24.1 to 24.44

Unit –IV

Small Samples – t- test Test for a specified mean*(Omit t-test for paired observation) – Small Samples – F test - **One way classification***.

Chapter 25: page 25.1 to 25.39, Chapter 26: page 26.1 to 26.27

Unit-V

Small samples – Chi square Test – Design of experiments (Omit Factorial Experiments) – **Test of Hypothesis***.

Chapter 27: page 27.1 to 27.35, Chapter 28: page 28.1 to 28.17,

Chapter 29: page 29.1 to 29.6

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

Dr. P. R. Vittal, *Mathematical Statistics*, Margham Publications, Chennai, 2004.

(Omit all Exercise Problems)

Books for reference:

1. S. C. Gupta and V. K. Kapoor, *Fundamental of Mathematical Statistics*, Sultan Chand & Sons, 2008.
2. B. L. Agarwal, *Basic Statistics*, New Age International Publishers, Chennai, 2009.
3. S. P. Gupta, *Statistical Methods*, Sultan Chand and Sons, New Delhi, 2011.

e-resources:

1. <https://www.tutorialspoint.com/statistics/index.htm>
2. <https://nptel.ac.in/courses/111/105/111105041/>
3. <http://www.comfsm.fm/~dleeling/statistics/text.html>

Programme : Other than B.Sc Mathematics

Course Title : NME II: Quantitative methods for competitive examinations

Subject Code : 20UMA4NM2

Year : Second Year

Semester : IV

Hours/Week : 2

Credits : 2

Course Objective

1. To understand the number system.
2. To understand the average value and different types of roots of numbers.
3. To learn profit and loss in business.

Course Outcomes (CO)

CO1	By learning HCF, LCM and decimal fractions will help the student to solve problems in competitive examinations
CO2	By learning average of numbers, problems on ages
CO3	By learning profit and loss and ratio and proposition will help the students to solve the practical problems.

Unit – I

Numbers – HCF and LCM of numbers – Decimal fractions – simplifications

Sections: 1- 4

Unit – II

Square roots and cube roots - average - problems on numbers – problems on ages – Surds and Indices

Sections: 5 – 9

Unit – III

Percentage – Profit and loss – ratio and proportion – partnership - chain rule – time and work

Sections: 10 -15

Book for study:

R.S. Agarwal, Quantitative Aptitude (For competitive examinations), 17th revised edition, S Chand and company ltd., Ram Nagar, New Delhi – 110 055.

Programme : B.Sc. Mathematics
Course Title : Core 9 : Modern Algebra
Year : Third Year
Hours/Week : 5

Course Code : 20UMA5C09
Semester : V
Credits : 5

Course Objectives

1. To know the concepts of group theory and ring theory.
2. To understand the concepts of ideals and quotient rings.
3. To enable the concepts of Cauchy's theorem for Abelian groups, automorphisms, inner automorphism and Cayley's theorem.

Course Outcomes (CO)

CO1	Finding whether a given abstract structure is a group or a ring.	K1
CO2	Understanding the elementary concepts of rings and fields.	K2
CO3	Applying the concepts of homomorphism and isomorphism for comparing the algebraic features of mathematical systems in groups, rings and fields	K3
CO4	Examining the results from group theory to study the properties of rings and fields.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S		S	S	S	S	S
CO2	S	S	S	S	S		S	S	S	S	S
CO3	S	S	S	M	M		S	S	M	S	M
CO4	S	S	S	L	M		S	S	L	S	S

S – Strong; M – Medium; L - Low

Unit -I

PRELIMINARY NOTIONS: Set theory-Mappings – The Integers.

GROUP THEORY: Definition of a Group* - Some Examples of Groups-Some Preliminary Lemmas.

Chapter 1: Sections 1.1 to 1.3 and Chapter 2 : Sections 2.1 to 2.3.

Unit –II

GROUP THEORY: Subgroups* – A Counting Principle- Normal Subgroups and Quotient Groups.

Chapter 2: Sections 2.4 to 2.6.

Unit –III

GROUP THEORY: Homomorphisms – Automorphisms – Cayley's Theorem- **Permutation Groups***.

Chapter 2: Sections 2.7 to 2.10.

Unit –IV

RING THEORY: Definition* and examples of rings- Some special classes of rings-Homomorphisms.

Chapter 3: Sections 3.1 to 3.3.

Unit -V

RING THEORY: Ideals and Quotient Rings- **More Ideals and Quotient Rings***- The field of Quotients of an Integral Domain.

Chapter 3: Sections 3.4 to 3.6.

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

I.N. Herstein, *Topics in Algebra*, Vani Educational Books a Division of Vikas Publishing House Pvt Ltd, New Delhi, 1984.

Books for reference:

1. Surjeet Singh and Qazi Zameeruddin, *Modern Algebra*, Vikas Publishing house, 1992.
2. A. R. Vasishtha, *Modern Algebra*, Krishna Prakashan Mandir, Meerut, 1994 – 95

Programme : B.Sc. Mathematics
Course Title : Core 10 : Real Analysis – I
Year : Third Year
Hours/Week : 5

Course Code : 20UMA5C10
Semester : V
Credits : 5

Course Objectives

1. To know about the basic notions of the real number system, set theory, relations and functions.
2. To enable to have knowledge about the basic topological properties and theorems based on point set topology.
3. To Study about the covering theorems, compactness, metric spaces and continuity of a function.

Course Outcomes (CO)

CO1	Remembering the basic properties in the field of real numbers.	K1
CO2	Understanding the concepts of continuity, convergent sequences and metric spaces.	K2 & K3
CO3	Applying the concept of point set topology in related theorems	K3
CO4	Analyzing the compactness and to classify the continuity of a function with its limits.	K4

K1-Remember, K2-Understand, K3-Apply, K4-Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M		S	M	M	M	M
CO2	S	S	S	S	S		S	S	S	M	M
CO3	S	S	M	S	S		S	S	S	S	L
CO4	S	S	S	S	S		S	S	S	S	M

S- Strong, M- Medium, L- Low

Unit-I

THE REAL AND COMPLEX NUMBER SYSTEMS: Introduction – The field and order axioms - the unique factorization theorem for integers – rational and irrational numbers – upper bounds and the completeness axiom – **the Archimedean property of the real number system***- the Cauchy Schwarz inequality.

Chapter 1: Sections 1.1 to 1.19

Unit- II

SOME BASIC NOTATIONS OF SET THEORY: Ordered pairs- relations and functions- sequences- similar sets – finite and infinite sets – countable and uncountable sets - **countable collection of countable sets***.

Chapter 2: Sections 2.1 to 2.15.

Unit-III

ELEMENTS OF POINT SET TOPOLOGY: Introduction – Euclidian space R^n - open balls and open sets in R^n – The Structure of open sets in R^1 – closed sets – Adherent points. Accumulation points – **closed sets and adherent points*** – the Bolzano – Weirstress theorem - the Cantor intersection theorem.

Chapter 3: Section 3.1 to 3.9.

Unit-IV

COVERING: The Lindelofs covering theorem – the Heine – Borelcovering theorem –compactness in R^n - metric spaces- point set topology in **metric spaces** – compact subsets of a metric spaces – **boundary of a set***.

Chapter 3: Section 3.10 to3.16.

Unit-V

LIMITS AND CONTINUITY: Introduction – convergent sequence in metric spaces- Cauchy sequences – complete metric spaces – Limit of a function – continuous functions – continuity of a composite functions– examples of continuous functions – continuity and inverse images of open or closed sets – **functions continuous on compact sets***.

Chapter 4: Sections 4.1 to 4.5,4.8,4.9,4.11,4.12,4.13.

*** denotes self-study (Questions may be asked from these portions also)**

Book for study

Tom M. Apostol, *Mathematical Analysis*, Addison Wesley, 1974.

Books for reference:

1. R. R. Goldberg, *Methods of Real Analysis*, NY, John Wiley, New York 1976.
2. G. F. Simmons, *Introduction to Topology and Modern Analysis*, McGraw – Hill, New York, 1963.
3. G. Birkhoff and MacLane, *A survey of Modern Algebra*, Macmillian, New York, 3rd Edition, 1965.
4. J. N. Sharma and A. R. Vasistha, *Real Analysis*, Krishna Prakashan Media (P) Ltd, 1997.

Programme : B.Sc. Mathematics
Course Title : Core 11: Complex Analysis
Year : Third Year
Hours/Week : 5

Course Code : 20UMA5C11
Semester : V
Credits : 4

Course Objectives

1. To recognize complex analysis as an essential part of mathematical background.
2. To introduce the students about the complex number system.
3. To Justify the need for a complex number system and explain how it is related to other existing number systems.

Course Outcomes (CO)

CO1	Defining continuity, differentiability and analyticity of a complex valued function which helps the students to acquire deeper knowledge.	K1
CO2	Showing the condition(s) for a complex valued function to be analytic and/or harmonic.	K2
CO3	Developing the concept of sequences and series with respect to the complex number system.	K3
CO4	Analyzing complex integration, Cauchy’s integral formulae and Cauchy’s fundamental theorem.	K4

K1- Remember; K2-Understand; K3-Apply; K4-Analyse

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M		M	M	M	M	L
CO2	S	S	S	S	S		S	S	S	S	M
CO3	S	S	S	S	S		S	S	S	S	M
CO4	S	S	S	S	S		S	S	S	S	M

S-Strong; M-Medium; L-Low

Unit- I

ANALYTIC FUNCTIONS: Complex functions - Limit of a function - Continuity of a function - Uniform Continuity - Differentiability and analyticity of a function – Necessary conditions for Differentiability - **Sufficient conditions for Differentiability*** – C-R equations in polar coordinates

Chapter 4: Sections: 4.1-4.8

Unit- II

ELEMENTARY AND CONFORMAL MAPPINGS: Bilinear transformation- **Special bilinear transformation*** – Circles and inverse points – Transformations $w = z^2$, $w = z^{\frac{1}{2}}$, $w = e^z$, Conformal mapping

Chapter 7: Sections: 7.1-7.6 &7.8.

Unit- III

COMPLEX INTEGRATION: Simple rectifiable oriented curves – Integration of complex functions – **Simple integrals using definition*** – Definite integrals – Interior and exterior of a closed curve – Simply-connected region – Cauchy’s fundamental theorem using Goursat’s lemma - Goursat’s lemma (statement only) theorem 8.6 (statement only) – Integral along an arc joining two points, theorem 8.7 (statement only)- Cauchy’s integral formula and formulas for derivatives , theorem 8.9, 8.10 (statements only), Morera’s theorem.

Chapter 8: Sections: 8.1- 8.9.

Unit- IV

COMPLEX INTEGRATION: Zeros of a function – Related integral theorems, theorem 8.13-8.16 only. **Taylor’s and Laurent’s Series: Taylor’s series*** – Zeros of an analytic function – Laurent’s series – Singular point or singularity – Isolated singularities – Removable singularity – Pole – Essential singularity.

Chapter 8: Sections: 8.10, 8.11.

Chapter 9: Sections: 9.1- 9.3, 9.5-9.9.

Unit-V

RESIDUES: RESIDUE* – Calculation of residues – Real definite integrals (types I, II, III only)

Chapter 10: Sections: 10.1-10.3.

* denotes self-study (Questions may be asked from these portions also)

Book for study:

P. Duraipandian, Laxmi Duraipandian and D. Muhilan, *Complex Analysis*, M. D. Gopalakrishnan, Emerald Publishers, 2001.

Books for references:

1. S. Narayanan and T. K. Manicavachagompillay, *Complex Analysis*, S. Viswanathan (Printers and Publishers), PVT. LTD, 1997.
2. J. N. Sharma, *Functions of a Complex Variable*, Krishna Prakasan Mandir PVT, Meerut, Twenty Third Edition, 1992-1993.
3. Churchill and Others, *Complex Variable and Applications*, Tata Mecgrow Hill Publishing Company Ltd, 1974.
4. Santhinarayan, *Theory of functions of Complex Variable*, S. Chand and Company Meerut, 1995.
5. Tyagi B.S, *Functions of Complex Variable*, Pragati Prakasham Publishing Company Ltd, Meerut, 17th Edition, 1992-93.

Programme : B.Sc. Mathematics
Course Title : Core 12 – Discrete Mathematics **Course Code** : 20UMA5C12
Year : Third Year **Semester** : V
Hours/Week : 4 **Credits** : 4

Course Objectives

1. To understand the concepts of discrete structures, formal languages.
2. To use finite state machines to model computer operations.
3. To genuine use in computer science and elsewhere are identified and combined together in a logically coherent fashion

Course Outcomes (CO)

CO1	Acquire knowledge about the basic concepts of Discrete Mathematics and its applications	K1
CO2	Apply logically valid forms of arguments to avoid logical errors by studying mathematical logic	K2
CO3	Understand abstract algebra, posets, lattices, Boolean algebra and their applications in the field of engineering and computer science.	K3
CO4	Define the basic definitions of graph theory and a knowledge about types of graphs including isomorphic graphs, homeomorphic graphs, Eulerian graphs and Hamiltonian graphs	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	L		M	S	M	S	M
CO2	S	S	M	S	M		S	S	S	S	M
CO3	S	S	S	S	M		S	S	M	S	S
CO4	S	S	S	S	M		S	S	M	S	M

S – Strong; M – Medium; L - Low

Unit – I

MATHEMATICAL LOGIC: Statements – Truth tables – Connectives – **Normal forms***.

Chapter 1: Sections 1.2.1 to 1.2.4, 1.2.6 to 1.2.11, 1.3.1 to 1.3.5.

Unit –II

MATHEMATICAL LOGIC: Predicate Calculus – Inference theory of Predicate Calculus.

Chapter 1: Sections 1.4.1 to 1.4.3, 1.5.1 to 1.5.5, 1.6.4, 1.6.5.

Unit –III

GRAMMAR AND AUTOMATA: Grammar and languages – Finite state acceptors and **regular grammar***.

Chapter 3: Sections 3.1, 3.3.2, Chapter 6: Sections 6.1, 6.2.

Unit –IV

LATTICE THEORY: Partial ordering – Posets – Hasse diagram – Lattices – Properties of Lattices – Boolean Algebra – **Boolean Functions*** – Minimization.

Chapter 4: Sections 4.1.1, 4.1.2, 4.2 - 4.4

Unit –V

GRAPH THEORY: Introduction to Graphs – Matrix Representation of Graphs – Paths, Reachability, and Connectivity – **Euler and Hamiltonian paths***, Trees.

Chapter 5: Sections 5.1.1 to 5.1.4.

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

J. P. Tremblay and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw Hill Book Edition, 1997.

Book for reference:

V. Sunderesan, K. S. Ganapathy Subramanian and K. Ganesan, *Discrete Mathematics*, A.R publications.

e-resources:

1. <https://nptel.ac.in/courses/106/106/106106094/>
2. <https://nptel.ac.in/courses/111/107/111107058/>

Programme : B.Sc. Mathematics
Course Title : Core 13: Operations Research – I **Course Code** : 20UMA5C13
Year : Third Year **Semester** : V
Hours/Week : 5 **Credits** : 4

Course Objectives

1. To introduce certain OR techniques such as LPP, transportation and assignment problems.
2. To help the students to develop logical reasoning.
3. To apply mathematical tools to managerial and real life problems.

Course Outcomes (CO)

CO1	Remembering the concept of linear programming problem using Simplex Method.	K1
CO2	Applying the notions of linear programming in solving transportation problems and assignment Problem.	K3
CO3	Understanding the rules for sequencing problems.	K2
CO4	Analyzing the concepts of dynamic programming.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S		M	S	M	S	M
CO2	S	L	S	S	M		S	S	S	M	M
CO3	S	S	S	L	M		S	S	M	S	S
CO4	M	S	S	S	S		S	L	M	S	M

S – Strong; M – Medium; L - Low

Unit -I

THE LINEAR PROGRAMMING PROBLEM: Introduction – Mathematical Formulation of the Problem – Graphical Solution Method – Some Exceptional Cases – General Linear Programming Problem – Standard Form of LPP – Some important definitions.

THE SIMPLEX METHOD: Introduction – The Computational procedure – Use of Artificial variables – Two Phase Method – **Big-M Method***.

Chapter 2 and Chapter 3.

Unit-II

DUALITY IN LINEAR PROGRAMMING: Introduction – General Primal-Dual pair – Formulating a Dual Problem – Duality and Simplex Method – Economic Interpretation of Dual – Dual Simplex Method.

INTEGER PROGRAMMING: Introduction – Gomory’s all LPP Method – Construction of Gomory’s Constraints – Gomory’s Fractional Cut Method – **Geometrical Interpretation of the Cutting Plane***.

Chapter 4 and Chapter 5.

Unit-III

THE TRANSPORTATION PROBLEM: Introduction – General Structure of the Problem – Basic Feasible Solution of a Transportation problem – The Transportation Tables – Loops in Transportation Tables – Solution of a Transportation problem – **Finding Initial Basic Feasible Solution*** - Moving Towards Optimality – The Transportation Algorithm – Some exceptional cases.

Chapter 6.

Unit-IV

THE ASSIGNMENT PROBLEMS: The Assignment Problems – Mathematical Statement of the Problem – Method for Solving an Assignment Problem – Variations of the Assignment Problem – **Travelling Salesman Problem***.

Chapter 7.

Unit-V

SEQUENCING PROBLEMS: Introduction – Problem of Sequencing – Terminology, Notations and Assumptions – Problems with n Jobs and two Machines – Problems with n Jobs and three Machines – Problems with n Jobs and m Machines – **Problems with two Jobs and m Machines***.

DYNAMIC PROGRAMMING: Introduction – Characteristics of Dynamic Programming – The Recursive Equation Approach – The Computational Procedure – An Application in Production – Solution of an L.P.P. by Dynamic Programming.

Chapter 8 and Chapter 9.

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

Kanti Swarup, P.K. Gupta and Man Mohan, *Introduction to Operations Research*, Sultan Chand and Sons, Third Edition, 1997.

Books for reference:

1. Prem Kumar Gupta and D.S.Hira, *Problems in Operations Research*, Chand and Company, New Delhi, 1998.
2. B.S. Goel and S.K. Mittal, *Operations Research*, 16th Edition, Pragathi Prakashan, Publishers, Meerut, 1999.

e-resources:

1. <https://www.youtube.com/watch?v=xrGVe6gMRyk>
2. <https://www.youtube.com/watch?v=ItOuvM2Kmd4>
3. <https://www.youtube.com/watch?v=rrfFTdO2Z7I>

Programme : B.Sc. Mathematics

Course Title : Core 14 - Linear Algebra
Year : Third Year
Hours/Week : 5

Course Code : 20UMA6C14
Semester : VI
Credits : 5

Course Objectives

1. To know the concepts of Hermitian and Skew-Hermitian, orthogonal and unitary matrices, characteristic roots and characteristic vectors of a square matrix.
2. To enable the concepts of linear independence, basis and dimension of a vector spaces.
3. To understand the concept of linear transformation and matrices which will enrich the knowledge of logical thinking.

Course Outcomes (CO)

CO1	Recalling the basic concepts of matrices, rank of a matrix.	K1
CO2	Understanding the basic ideas of vector spaces and the concepts of linear span, linear independence, basis, dimension.	K2
CO3	Applying the principles of matrix algebra to linear transformations.	K3
CO4	Examining whether the given set of vectors is linearly dependent or independent.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S		S	S	S	S	S
CO2	S	S	S	M	L		S	S	S	M	S
CO3	S	S	M	S	S		S	S	S	S	L
CO4	S	S	S	S	S		S	M	S	S	S

S – Strong; M – Medium; L - Low

Unit –I

MATRICES: Algebraic operations – Triangular, Diagonal, Scalar, Unit matrices – **Transpose***, adjoint and inverse of a square matrix – Symmetric and Skew Symmetric matrix.

Chapter 1: Sections 1.1 to 1.7.

Unit-II

Hermitian and Skew Hermitian Matrices-Orthogonal and Unitary Matrices:

Rank of a matrix* - Eigen values and Eigen Vectors of linear operators – Solutions of Homogeneous linear equations, Solutions of non-homogeneous linear equations. Characteristic roots and Characteristic vectors of a square matrix

Chapter 1: Sections 1.8 -1.9, Chapter 2: Section 2.9, Chapter 3: Sections 3.6 to3.9.

Unit -III

VECTOR SPACES: Elementary basic concepts, linear Independence and **bases***.

Chapter 4: Sections 4.1 to 4.2.

Unit –IV

Dual spaces – Inner product spaces

Chapter 4: Sections 4.3 and 4.4.

Unit –V

LINEAR TRANSFORMATIONS: Algebra of linear transformations – **Characteristic roots*** – Matrices.

Chapter 6: Sections 6.1 to 6.3.

*** denotes self-study (Questions may be asked from these portions also)**

Books for study:

1. R. Balakrishnan and N. Ramabhadran, *A Text Book of Modern Algebra* by Vikas Publishing House Pvt Ltd, New Delhi, 1979.
(For Units I and II)
2. I. N. Herstein, *Topics in Algebra*, Vani Educational Books a Division of Vikas Publishing House Pvt Ltd, New Delhi, 1984.
(For Units III, IV and V)

Books for references:

1. Schaum's Outline series, *Linear Algebra*, McGraw Hill Book Company, New Delhi.
2. Dr. S. N. Goel, *Linear Algebra*, Kadar Nath, Ram Nath, Meerut, 4th Edition.

Programme : **B.Sc. Mathematics**
 Course Title : **Core 15 - Real Analysis II**
 Year : **Third Year**
 Hours/Week : **5**

Course Code : **20UMA6C15**
 Semester : **VI**
 Credits : **5**

Course Objectives

1. To understand the concept of functions, Connectedness, uniform continuity, fixed point and related theorems.
2. To find the derivatives and functions of bounded variations.
3. To know about the Reimann- Stieltjes integrals and its properties.

Course Outcomes (CO)

CO1	Remembering the concept of derivatives, bounded variations.	K1
CO2	Understanding the concept of connectedness.	K2
CO3	Applying the differentiability of real functions.	K3
CO4	Analyzing the Riemann integrals to a finite sum.	K4

K1-Remember, K2-understand, K3-Apply, K4-Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M		S	M	M	M	M
CO2	S	S	S	S	M		S	S	M	S	M
CO3	S	S	S	S	S		S	S	S	S	M
CO4	S	S	S	S	S		S	S	S	S	L

S- Strong, M- Medium, L- Low

Unit-I

Topological mappings (homeomorphisms)- Bolzano's theorem- connectedness- components of a metric space – uniform continuity and compact sets – fixed point theorem for contractions – **discontinuities of real valued functions***– monotonic functions.

Chapter 4 : Sections 4.14 to 4.17, 4.19 – 4.23.

Unit- II

DERIVATIVES: Introduction – definition of derivative – derivatives and continuity – algebra of derivatives – algebras of derivatives – the chain rule – Rolle 's theorem – the mean value theorem for derivatives – intermediate- value theorem for derivatives – Taylor's formula with remainder – derivatives of vector – valued functions – **partial derivatives***.

Chapter 5: Section 5.1 to 5.5, 5.9 - 5.14.

Unit-III

FUNCTIONS OF BOUNDED VARIATION: Introduction – **properties of monotonic functions*** –

Function of bounded variation – Total Variation – Additive property of total variation – Total variation on $[a, x]$ as a function of x - Functions of bounded variation expressed as the difference of increasing functions – continuous functions of bounded variation.

Chapter 6: Sections 6.1 to 6.8

Unit-IV

THE RIEMANN-Stieltjes Integral: Introduction –**Notation***– The definition of the Riemann Steiltjes integral- Linear properties – Integration by parts – change of variables in a Riemann Stieltjes integral- Reduction to a Reimann integral – Step function as integrators.

Chapter 7: Section 7.1 to 7.8.

Unit-V

Reduction of a Reimann Steiltjes integral to a finite sum – Eulers summation formula – monotonically increasing integration, Upper and lower integrals- **Additive and linearity properties of upper and lower integrals*** – Reimann condition.

Chapter 7: Section 7.9 to 7.13.

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

Tom M. Apostol, *Mathematical Analysis*, Addison Wesley, 1974.

Books for reference:

1. R.R. Goldberg, *Methods of Real Analysis*, NY, John Wiley, New York 1976.
2. G.F. Simmons, *Introduction to Topology and Modern Analysis*, McGraw – Hill, New York, 1963.
3. G. Birkhoff and MacLane, *A survey of Modern Algebra*, Macmillian, New York, 3rd Edition, 1965.
4. J. N. Sharma and A. R. Vasistha, *Real Analysis*, Krishna Prakashan Media (P) Ltd, 1997.

Programme : B.Sc. Mathematics
Course Title : Core 16– Special Functions
Year : Third Year
Hours/Week : 4

Course Code : 20UMA6C16
Semester : VI
Credits : 4

Course Objectives

1. To introduce certain types of special functions.
2. To help the students to simplify hyper geometric functions.
3. To apply mathematical tools to solve Chebyshev’s polynomials.

Course Outcomes (CO)

CO1	Remembering the concept of special functions.	K1
CO2	Understanding the applications of hyper geometric functions.	K2
CO3	Using the solution of Bessel’s equation in solving science and engineering problems.	K3
CO4	Analyzing the use of Hermite’s polynomial.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M		S	S	S	S	M
CO2	S	S	M	S	M		S	S	S	S	M
CO3	S	S	M	S	S		S	S	M	S	S
CO4	S	S	M	S	S		S	S	M	S	M

S – Strong; M – Medium; L - Low

Unit -I

SPHERICAL HARMONICS: Spherical Harmonics, Kelvin’s theorem, Legendre’s equation from Laplace equations, Bessel’s equation from Laplace equations.

Legendre’s equation: Legendre’s equation, Solution of Legendre’s equation, Definition of $P_n(x)$ and $Q_n(x)$, To show that $P_n(x)$ is the coefficient of h^n in the expansion of $(1 - 2xh + h^2)^{-1/2}$, Laplace Definite integral for $P_n(x)$, **Orthogonal properties of Legendre’s Polynomials***, Recurrence formulae.

Chapter 1: Sec: 1.1 – 1.4 and Chapter 2: Sec: 2.1 – 2.8, Examples: Pg. No:20-26

Unit -II

HYPER GEOMETRIC FUNCTIONS: Hypergeometric functions, Gauss’s hypergeometric equation, The hyper geometric series, Particular cases of hypergeometric series, Different forms of hypergeometric function, Solution of hypergeometric equation, Linear relations between the solution of hypergeometric equation, Symmetric property of hypergeometric function, Integral formula for the hypergeometric function, Kummer’s Theorem, Gauss’s Theorem, Vandermonde’s Theorem, **Differentiation of**

hypergeometric function*.

Chapter 4: Sec: 4.1 – 4.13

Examples: Pg. No:91-95

Unit -III

BESSEL'S EQUATION: Bessel's equation, Solutions of Bessel's general differential equation , General solution of Bessel's equation, Integration of Bessel's equation in series for $n=0$, Definition of Bessel's Equation for series for $n=0$, Definition of $J_n(x)$, **Recurrence formula for $J_n(x)$ ***.

Chapter 5: Sec: 5.1 – 5.6.

Examples: Pg. No:107-113

Unit -IV

HERMITE POLYNOMIALS: Hermite's Differential equation, Solution of Hermite's equation, Hermite polynomials, Generating functions, Other forms for the Hermitepolynomials, To find the first few Hermite polynomials, Orthogonal properties of Hemite polynomials, **Recurrence formulae for Hermite polynomials***.

Chapter 6 : Sec 6.1-6.8

Examples: Pg. No:145-149

Unit -V

CHEBYSHEV Polynomials: Chebyshev's Differential equation, Chebyshev polynomial , To prove that $T_n(x)$ and $U_n(x)$ are independent solutions of Chebyshev's equation, Relations for $T_n(x)$ and $U_n(x)$, To find first few Chebyshev polynomials, Generating Functions , Orthogonal properties of Chebyshev polynomials, **Recurrence for $T_n(x)$ and $U_n(x)$ ***.

Chapter 8: Sec: 8.1 – 8.8.

Examples: Pg. No:180-182

*** denotes self-study (Questions may be asked from these portions also)**

Books for Study:

J. N. Sharma, R. K. Gupta, *Mathematical Methods (Part I)*, Krishna Prakashan Mandir, Edition 1990-91.

Book for reference:

J. N. Sharma and R. K. Gupta, *Special Functions*, Krishna Prakashan Mandir, Fifteenth edition, 1992.

Programme : B.Sc. Mathematics
Course Title : Core 17: Operations Research II **Course Code** : 20UMA6C17
Year : Third Year **Semester** : VI
Hours/Week : 5 **Credits** : 4

Course Objectives

1. To understand the mathematical tools that are needed to solve game and queueing theory problems.
2. Knowing the concept of inventory and replacement problems.
3. Understanding the difference between PERT and CPM.

Course Outcomes (CO)

CO1	Applying the maximin and minimax principles in game theory.	K1
CO2	Analyzing the classifications of queueing models.	K4
CO3	Applying the concept of inventory control and replacement techniques in business.	K2
CO4	Examining the concept of traffic intensity in real life problems.	K3

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	M		M	M	S	S	M
CO2	S	L	S	M	M		S	S	M	S	M
CO3	M	S	S	S	M		S	M	S	M	S
CO4	S	S	S	S	M		S	S	M	S	M

S – Strong; M – Medium; L - Low

Unit –I

GAME THEORY: Introduction – Two-person Zero-Sum Games – The MaxiMin - MiniMax Principle – Games Without Saddle Points– Mixed Strategies - Graphical Solution of $2 \times n$ and $m \times 2$ Games – **Dominance Property*** – Reducing the Game Problem to an LPP – A short-cut method for $n \times n$ Games.

Chapter 10

Unit –II

QUEUEING THEORY: Introduction – Queueing Systems – Characteristics of the Queueing Systems – Operating Characteristics of a Queueing System – Poisson Process and Exponential Distribution – Definition of Transient and Steady States - **Classification of Queues – Poisson Queues***.

Chapter 11 (Omit Sec 11.9)

Unit –III

INVENTORY PROBLEMS: Introduction – Inventory Control – Costs Associated with Inventories – Economic Lot Size Problems – Problems of EOQ with Shortage Allowed – Purchase Inventory Problem with Price Breaks – Multi-item Deterministic Problem – **Buffer Stock or Safety Stock – Re-Order Level***

Chapter 12 (Omit Sec 12.10)

Unit –IV

REPLACEMENT PROBLEM: Introduction - Replacement of items that deteriorate with time - **Replacement of Items that fail completely***

Chapter 13

Unit –V

NETWORK SCHEDULING BY PERT/CPM: Introduction – Basic Concepts – Construction of the Network – **Critical Path Analysis*** – Statistical Considerations in PERT – Cost Considerations in PERT/CPM

Chapter 14

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

Kanti Swarup, P. K. Gupta and Man Mohan, *Introduction to Operations Research*, Sultan Chand and Sons, Third Edition, 1997.

Book for reference:

V. Sundaresan, K. S. Ganapathy Subramanian and K. Ganesan, *Resource Management Techniques*, A.R. Publications, Second Edition, 2004.

e-resources:

1. <https://www.youtube.com/watch?v=xGkpXk-AnWU>
2. <https://www.youtube.com/watch?v=fW5VYQqcSpY>
3. <https://www.youtube.com/watch?v=vUMGvpsb8dc>

Programme : B.Sc. Mathematics
Course Title : Core 18: Number Theory
Year : Third Year
Hours/Week : 5

Course Code : 20UMA6C18
Semester : VI
Credits : 4

Course Objectives

1. To impart knowledge in the basic concepts of number theory, fundamental definitions, theorems.
2. To learn congruence, arithmetic function and its properties.
3. To solve challenging problems in number theory.

Course Outcomes(CO)

CO1	Recall the theory of integers from a list of axioms.	K1
CO2	Classify the problems to solve using the learned principles and theorem.	K2&K3
CO3	Explaining various divisibility tests and apply them in real life problems.	K4
CO4	Apply number theory algorithms and procedures to basic problems in mathematics.	K3

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	L		M	S	M	S	M
CO2	S	S	S	M	M		S	S	S	S	M
CO3	S	S	S	S	M		S	S	M	S	S
CO4	S	S	S	S	M		S	S	M	S	M

S – Strong; M – Medium; L – Low

Unit –I

INTRODUCTION – Divisibility- **Division Algorithm**-Euclidean Algorithm- Primes

Chapter 1: 1.1-1.3

Unit-II

CONGRUENCES: Congruences- Solution of Congruences- The Chinese remainder theorem- Prime Power Moduli- Prime Modulus.

Chapter 2: 2.1 – 2.3 & 2.6-2.7

Unit-III

QUADRATIC RECIPROcity AND QUADRIC FORMS: Quadratic Residue– Quadratic Reciprocity- The Jacobi Symbol – Binary Quadric Forms.

Chapter 3: 3.1 - 3.4

Unit-IV

SOME FUNCTIONS OF NUMBER THEORY: Greatest integer function –Arithmetic function- The Mobius inversion formula- Recurrence functions.

Chapter 4 : 4.1 – 4.4

Unit- V

SOME DIOPHANTINE EQUATIONS: The equation $ax+by = c$ – Simultaneous Equations- Pythagorean Triangles- Assorted Examples

Chapter 5 : 5.1 – 5.4

Book for study:

A. Ivan Niven, S. Herbert, Zuckerman, Hugh and L. Montgomery, *An Introduction to The Theory of Numbers*, Wiley, Fifth Edition, Reprint-2013.

Books for reference:

1. T. M. Apostol, *Introduction to Analytic Number theory*, Springer Verlag, 1976.
2. Kenneth and Rosan, *Elementary Number Theory and its Applications*, Addison Wesley Publishing Company, 1968.

e-resources:

1. <https://freevidelectures.com/course/3027/cryptography-and-network-security>
2. <https://www.youtube.com/watch?v=SCvtxjpVQms&t=3321s>
3. <https://www.youtube.com/watch?v=Oyw5OmOd9B8>

Programme : B.Com. Co-operation

Course Title : NME 1:Business Mathematics

Course Code : 20UCO3NM1

Year : Second Year

Semester : III

Hours/Week : 2

Credits : 2

Course Objectives:

1. To understand the concept of simple and compound interest rate.
2. To use matrices and their properties in business finance
3. To learn quantitative analysis by Linear Programming Problem (LPP)

Course Outcomes (CO):

CO1	Practice on various types of interest rate in business organization.	K1& K3
CO2	Apply and calculate matrix in business.	K2
CO3	Mathematical calculations of maximization and minimization of profit through LPP.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 – Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	M		S	S	S	S	M
CO2	M	M	L	S	M		M	S	M	S	M
CO3	M	S	S	S	S		S	S	M	S	M

Unit-I

MATHEMATICS OF FINANCE: Basic concept - Simple interest - formulae and problem - Compound interest – formulae and problems – Effective rate and Normal rate of Interest - Depreciation.

Page No.: 43-65

Unit-II

MATRIX: Definition of Matrix - Importance – Notation – order of a Matrix – types of matrices – matrix operations – I – Addition - Subtraction – Scalar Multiplication – multiplication – transpose - Properties.

Page No.: 147-162

Unit-III

LINEAR PROGRAMMING: Introduction to OR - Meaning and Scope of operations Research – Limitations of OR – Linear Programme - Formulation of LLP - Graphical Method.

Page No.: 328-343

Book for study: P. Navinatham, *Business Mathematics & Statistics*, Jai Publishers, 2012.

Programme : B.Sc. Physics

Course Title : Allied 1: Mathematics I

Course Code : 20UPH1AL1

Year : First Year

Semester : I

Hours/Week : 6

Credits : 5

Course Objective

1. To provide the basic knowledge of sequences, series and nature of the roots of theory of equations.
2. To provide the basic knowledge of trigonometry and matrices.
3. To give basic knowledge about mathematical concepts in calculus.

Course Outcomes (CO)

CO1	Knowing the relation between the coefficients and the roots of an algebraic equation.	K1 & K2
CO2	Understanding the characteristic equation for finding eigenvalues and eigenvectors.	K2
CO3	Knowing the expansion of trigonometric functions and hyperbolic functions.	K2
CO4	Applying finite difference methods for interpolation.	K3 & K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	M		S	S	L	M	M
CO2	M	S	S	S	M		S	M	M	L	M
CO3	S	S	S	S	M		S	S	M	S	M
CO4	S	M	S	M	M		S	S	M	M	M

S – Strong; M – Medium; L - Low

Unit –I

ALGEBRA: Statement of Binomial, Exponential and Logarithmic series – Approximation and limit expression obtained by Binomial, Exponential and Logarithmic series.

(Chapter 1: Section: 1.2, 1.3, 1.4 Omit summation problems)

THEORY OF EQUATIONS: Nature of Roots* – Relation between the coefficients and the roots of an algebraic equation - Newton's and Horner's method.

Chapter 2: Section: 2.1, 2.2, 2.6, 2.7

Unit –II

MATRICES: Rank of a matrix* – Simultaneous linear equations - Eigen values and Eigen vectors - Cayley-Hamilton Theorem (without proof) and its applications.

Chapter 3: Section: 3.2 – 3.5

Unit –III

FINITE DIFFERENCES: Interpolation - Binomial method – Lagrange’s interpolation.

Chapter 4: Section: 4.1 – 4.3 (Omit excises)

Unit –IV

TRIGNOMETRY: Expansions of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ – Expansion of $\sin \theta$ and $\cos \theta$ in a series of ascending powers of θ - Hyperbolic functions - **Relation between Hyperbolic functions***- Inverse Hyperbolic functions – Real and Imaginary parts - Logarithm of complex numbers.

Chapter 5: Sections 5.1, 5.3 to 5.5

Unit –V

DIFFERENTIAL CALCULUS: Curvature – Circle, radius and center curvature - **Coordinates of center of Curvature***– Evolute and involute – Radius of Curvature when the curve is given in polar coordinates - p-r Equation of the curve

Chapter 6: Section: 6.4

*** denotes self-study (Questions may be asked from these portions also)**

Book for Study:

S. Narayanan, R. Hanumantha Rao, Manickavachagam Pillai and P. Kandaswamy, *Ancillary Mathematics (Volume I)*, S.Viswanathan (Printers & Publishers) Pvt Ltd., 2007.

Books for reference

1. G. C. Sharma and Madhu Jain, *Algebra and Trigonometry*, Galgotia Publications Pvt. Ltd., 1st Edition, 2003.
2. Dr. J. K. Goyal and G. P. Gupta, *Laplace and Fourier Transforms*, Pragati Prakashan, Meerut, 16th Edition, 2003.

Programme : B.Sc. Physics.
Course Title : Allied 1: Mathematics – II **Course Code** : 20UPH2AL2
Year : First Year **Semester** : II
Hours/Week : 6 **Credits** : 5

Course Objective

1. To give basic knowledge for evaluating double and triple integrals.
2. To understand Laplace and inverse Laplace transforms.
3. To get the ability of solving ordinary and partial differential equations.

Course Outcomes (CO)

CO1	Remembering the formulas in differentiation and integration.	K1
CO2	Illustrating the Fourier co-efficient for periodic functions.	K1&K2
CO3	Knowing different integrals of partial differential equations.	K2
CO4	Analyzing the differential operator for finding gradient, divergence and curl	K3&K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	S	S	S		S	S	S	L	M
CO2	S	M	S	S	M		M	S	M	M	M
CO3	S	M	S	S	M		S	S	S	L	M
CO4	S	M	S	S	M		S	S	M	M	M

S – Strong; M – Medium; L - Low

Unit –I

INTEGRATION: Reduction formula

(Chapter 1: Section: 13)

FOURIER SERIES: Fourier series – **Even and Odd functions*** – Half range Fourier series – Development in cosine series – Development in sine series.

Chapter 2: Section: 1 – 5

Unit –II

ORDINARY DIFFERENTIAL EQUATIONS: Variable separable- Homogenous equations - Non-Homogenous equations - **Linear equations*** - Bernoulli's equations - First order higher degree equations.

Chapter 4: Omit Sections 6.1 - 6.4

Unit –III

PARTIAL DIFFERENTIAL EQUATIONS: Derivation of Partial differential equations- Eliminations of arbitrary constants / functions – Different integrals of partial differential equations – **Four standard types of first order equations*** - Lagrange's equations

Chapter 6: Section: 1 – 3, 5, 6

Unit –IV

LAPLACE TRANSFORMS: Definition – Laplace transforms of standard functions – **Inverse Laplace Transforms*** - Applications to solve ordinary differential equations and simultaneous equations

Chapter 7

Unit –V

VECTOR ANALYSIS: Vector differentiation* – Gradient of a scalar point function – Divergence and Curl – Formula connecting Divergence and Curl – Vector integration – Line integral – Volume integral – Surface integral - Statement of Stoke's and Gauss theorem – Simple applications.

Chapter 8: Sections: 1.11, 1.12, 1.17 to 1.20, 2, 4, 5, 6, 9

*** denotes self-study (Questions may be asked from these portions also)**

Book for Study:

S. Narayanan, R. Hanumantha Rao, Manickavachagam Pillai and P. Kandaswamy, *Ancillary Mathematics (Volume II)*, S. Viswanathan (Printers & Publishers) Pvt Ltd., 2007.

Books for reference

1. Shanti Narayan, *Differential Calculus*, Shyamlal Charitable Trust, New Delhi, 2004.
2. B. M. Aggarwal, *Integral Calculus*, Satya Prakashan Publishers, New Delhi, 1st Edition, 1992.
3. P. N. Chatterji, *Vector Calculus*, Rajhans Prakashan Publishers, Chennai, 1st Edition, 1998.

Programme : B.Sc. Chemistry

Course Title : Allied 1: Mathematics I

Year : First Year

Hours/Week : 6

Course Code : 20UCH1AL1

Semester : I

Credits : 5

Course Objective

1. To provide the basic knowledge of sequences, series and nature of the roots of theory of equations.
2. To provide the basic knowledge of trigonometry and matrices.
3. To give basic knowledge about mathematical concepts in calculus.

Course Outcomes (CO)

CO1	Knowing the relation between the coefficients and the roots of an algebraic equation.	K1 & K2
CO2	Understanding the characteristic equation for finding eigenvalues and eigenvectors.	K2
CO3	Knowing the expansion of trigonometric functions and hyperbolic functions.	K2
CO4	Applying finite difference methods for interpolation.	K3 & K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	M		M	S	S	M	S
CO2	M	S	S	S	M		M	S	M	M	S
CO3	S	S	S	S	M		M	S	M	L	M
CO4	S	M	S	M	M		M	M	M	M	S

S – Strong; M – Medium; L - Low

Unit –I

ALGEBRA: Statement of Binomial, Exponential and Logarithmic series – Approximation and limit expression obtained by Binomial, Exponential and Logarithmic series.

(Chapter 1: Section: 1.2, 1.3, 1.4 Omit summation problems)

THEORY OF EQUATIONS: Nature of Roots* – Relation between the coefficients and the roots of an algebraic equation - Newton's and Horner's method.

Chapter 2: Section: 2.1, 2.2, 2.6, 2.7

Unit –II

MATRICES: Rank of a matrix* – Simultaneous linear equations - Eigen values and Eigen vectors - Cayley-Hamilton Theorem (without proof) and its applications.

Chapter 3: Section: 3.2 – 3.5

Unit –III

FINITE DIFFERENCES: Interpolation - Binomial method – Lagrange’s interpolation.

Chapter 4: Section: 4.1 – 4.3 (Omit excises)

Unit –IV

TRIGONOMETRY: Expansions of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ – Expansion of $\sin \theta$ and $\cos \theta$ in a series of ascending powers of θ - Hyperbolic functions - **Relation between Hyperbolic functions***- Inverse Hyperbolic functions – Real and Imaginary parts - Logarithm of complex numbers.

Chapter 5: Sections 5.1, 5.3 to 5.5

Unit –V

DIFFERENTIAL CALCULUS: Curvature – Circle, radius and center curvature - **Coordinates of center of Curvature***– Evolute and involute – Radius of Curvature when the curve is given in polar coordinates - p-r Equation of the curve

Chapter 6: Section: 6.4

*** denotes self-study (Questions may be asked from these portions also)**

Book for Study:

S. Narayanan, R. Hanumantha Rao, Manickavachagam Pillai and P. Kandaswamy, *Ancillary Mathematics (Volume I)*, S. Viswanathan (Printers & Publishers) Pvt Ltd., 2007.

Books for reference

1. G. C. Sharma and Madhu Jain, *Algebra and Trigonometry*, Galgotia Publications Pvt. Ltd., 1st Edition, 2003.
2. Dr. J. K. Goyal and G. P. Gupta, *Laplace and Fourier Transforms*, Pragati Prakashan, Meerut, 16th Edition, 2003.

Programme : B.Sc. Chemistry.
Course Title : Allied 1: Mathematics – II **Course Code** : 20UCH2AL2
Year : First Year **Semester** : II
Hours/Week : 6 **Credits** : 5

Course Objective

1. To give basic knowledge for evaluating double and triple integrals.
2. To understand Laplace and inverse Laplace transforms.
3. To get the ability of solving ordinary and partial differential equations.

Course Outcomes (CO)

CO1	Remembering the formulas in differentiation and integration.	K1
CO2	Illustrating the Fourier co-efficient for periodic functions.	K1&K2
CO3	Knowing different integrals of partial differential equations.	K2
CO4	Analyzing the differential operator for finding gradient, divergence and curl	K3&K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	S	S	S		S	M	M	L	S
CO2	S	M	S	S	M		M	M	M	M	M
CO3	S	M	S	S	M		S	S	S	M	M
CO4	S	M	S	S	M		M	M	L	M	M

S – Strong; M – Medium; L - Low

Unit –I

INTEGRATION: Reduction formula

Chapter 1: Section: 13

FOURIER SERIES: Fourier series – **Even and Odd functions*** – Half range Fourier series – Development in cosine series – Development in sine series.

Chapter 2: Section: 1 – 5

Unit –II

ORDINARY DIFFERENTIAL EQUATIONS: Variable separable- Homogenous equations - Non-Homogenous equations - **Linear equations*** - Bernoulli's equations - First order higher degree equations.

Chapter 4: Omit Sections 6.1 - 6.4

Unit –III

PARTIAL DIFFERENTIAL EQUATIONS: Derivation of Partial differential equations- Eliminations of arbitrary constants / functions – Different integrals of partial differential equations – **Four standard types of first order equations*** - Lagrange's equations

Chapter 6: Section: 1 – 3, 5, 6

Unit –IV

LAPLACE TRANSFORMS: Definition – Laplace transforms of standard functions – **Inverse Laplace Transforms*** - Applications to solve ordinary differential equations and simultaneous equations

Chapter 7

Unit –V

VECTOR ANALYSIS: Vector differentiation* – Gradient of a scalar point function – Divergence and Curl – Formula connecting Divergence and Curl – Vector integration – Line integral – Volume integral – Surface integral - Statement of Stoke's and Gauss theorem – Simple applications.

Chapter 8: Sections: 1.11, 1.12, 1.17 to 1.20, 2, 4, 5, 6, 9

*** denotes self-study (Questions may be asked from these portions also)**

Book for study:

S. Narayanan, R. Hanumantha Rao, Manickavachagam Pillai and P. Kandaswamy, *Ancillary Mathematics (Volume II)*, S. Viswanathan (Printers & Publishers) Pvt Ltd., 2007.

Books for reference

1. Shanti Narayan, *Differential Calculus*, Shyamlal Charitable Trust, New Delhi, 2004.
2. B. M. Aggarwal, *Integral Calculus*, Satya Prakashan Publishers, New Delhi, 1st Edition, 1992.
3. P. N. Chatterji, *Vector Calculus*, Rajhans Prakahana Publishers, Chennai, 1st Edition, 1998.

Programme : B.Sc. Electronics and Communication Systems

Course Title : Allied Mathematics I

Year : First Year

Hours/Week : 6

Course Code : 20UEC1AL1

Semester : I

Credits : 5

Course Objective

1. To provide the basic knowledge of Matrices and Differential Calculus
2. To provide the basic knowledge of Fourier series and Laplace transform.
3. To give basic knowledge about Mathematical concepts in Vector Analysis

Course Outcomes (CO)

CO1	Remembering the basic concepts of Matrices and Differentiation.	K1
CO2	Understanding the concept of Characteristic equations to find Eigen Values and Eigen Vector and Fourier series.	K2 &K3
CO3	Understanding the concepts of Laplace transform and Vector analysis	K3

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	L	S	S	S	M
CO2	S	S	S	S	M	S	S	S	M
CO3	S	S	S	S	M	S	S	S	S

S – Strong; M – Medium; L - Low

Unit –I: MATRICES

Rank of a matrix – Simultaneous linear equations - Eigen values and Eigen vectors - Cayley-Hamilton Theorem (without proof) and its applications.

Unit –II: DIFFERENTIAL CALCULUS

Curvature – Circle, radius and center curvature - Coordinates of center of Curvature – Evolutes and involutes – Radius of Curvature when the curve is given in polar coordinates - p-r Equation of the curve.

Unit - III: FOURIER SERIES

Fourier series – Even and Odd functions – Half range Fourier series – Development in cosine series – Development in sine series – Change of Interval.

Unit - IV: LAPLACE TRANSFORMS:

Definition – Laplace transforms of standard functions – Inverse Laplace Transforms - Applications to solve ordinary differential equations and simultaneous equations.

Unit - V: VECTOR ANALYSIS: Gradient of a scalar point function – Divergence and Curl – Formula connecting Divergence and Curl – Gauss, Green's and Stoke's theorem (Statement and proof only)

Books for study:

1. S. Narayanan, R. Hanumantha Rao, Manickavachagam Pillai and P. Kandaswamy, *Ancillary Mathematics (Volume I)* , S.Viswanathan (Printers & Publishers) Pvt Ltd., 2007.
2. S. Narayanan, R. Hanumantha Rao, Manickavachagam Pillai and P. Kandaswamy, *Ancillary Mathematics (Volume II)* , S.Viswanathan (Printers & Publishers) Pvt Ltd., 2007.

Book for reference:

Dr. J. K.Goyal and G. P.Gupta, *Laplace and Fourier Transforms*, 16th Edition, Pragati Prakashan, Meerut, 2003

e-resources:

1. <https://www.youtube.com/watch?v=TQvxWaQnrqI>
2. <https://www.youtube.com/watch?v=qjhccqxP6ho>
3. <https://www.youtube.com/watch?v=pjA4TAmNIzI>

Programme : **B.Sc. Electronics and Communication Systems**

Course Title : **Allied Mathematics II**

Year : **First Year**

Hours/Week : **6**

Course Code : **20UEC2AL2**

Semester : **II**

Credits : **5**

Course Objectives

1. To understand the concepts solving Numerical Algebraic equations and Differential equations.
2. To use finite differences and Numerical Differentiation.
3. To solve real time problems using various statistical techniques.

Course Outcomes (CO)

CO1	Understanding the concept of Differential equations, measures of central tendency, measures of dispersion.	K2
CO2	Applying problem solving techniques to solve real world problems.	K2 &K1
CO3	Analyzing the experimental and observational data and draw appropriate conclusions.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	S	L		M	S	S	M
CO2	S	S	S	S	M		S	S	S	S
CO3	S	S	S	S	M		S	S	M	M

S – Strong; M – Medium; L - Low

Unit - I:

Differential Equations Second Order Linear Differential Equations with constant Co-efficient – special method of finding particular integral.

Unit - II:

Fourier Transforms Definition of Fourier transforms – Properties of Fourier transforms- Fourier Cosine transform - Fourier sine transform - Parseval's Identity Convolution theorem - examples.

Unit - III:

Numerical Methods Solution of Simultaneous linear Algebraic Equations using Gauss Elimination Method – Gauss Jordan Method- Iterative Methods – Gauss Jacobi Method – Gauss Seidal Method - Numerical Integration - Trapezoidal Rule - Simpson's rule.

Unit - IV:

Finite Differences & Numerical Differentiations Newton's Forward and Backward Interpolations and examples - Newton's Forward and Backward difference – Stirling's formula and examples.

Unit - V:

Measurements of Central Tendency Arithmetic Mean-Direct, Step deviation method – Median, Quartiles (Individual, continuous series) - Mode- Geometric mean - Harmonic mean – Standard deviation coefficient of dispersion, variations – Dispersion, Skewness.

Books for study:

1. S. Narayanan and T. K. M. Pillai, *Calculus, Vol III*, Viswanathan Publishers, 2011.
2. Dr. P. Kandasamy, Dr. K. Thilagavathy and Dr. K. Gunavathi, *Numerical Methods*, S. Chand Publishers, 2012.
3. Examples in Statistics - H.C. Saxena, Atmaram & Sons, Delhi, Seventh Edition, 1989.

Books for reference:

1. M. K. Venkatraman, *Numerical methods for Science and Engineering*.
2. P. Navnitham, *Business Mathematics & Statistics*, Jai Publishers, 2008.

Programme : B.Sc. Computer Science

Course Title : Allied Mathematics I

Year : First Year

Hours/Week : 6

Course Code : 20UCS1AL1

Semester : I

Credits : 5

Course Objectives

1. To understand the concept of matrices and solving simultaneous algebraic equations numerically.
2. To use Newton's and Lagrange's method for computing the derivatives.
3. To solve real time problems using various statistical techniques.

Course Outcomes (CO)

CO1	Applying problem solving techniques to solve algebraic and transcendental equations.	K1&K4
CO2	Understanding the concept of measures of central tendency, measures of dispersion.	K2
CO3	Analyzing the concepts of correlation and regression.	K3
CO4	Knowing to solve simultaneous linear algebraic equations.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	M		S	S	S	M
CO2	S	S	S	S	S		S	S	M	M
CO3	S	S	S	S	S		S	S	M	M
CO4	S	S	S	M	M		S	S	S	M

S – Strong; M – Medium; L - Low

Unit I

THE SOLUTION OF NUMERICAL ALGEBRAIC AND TRANSCENDENTAL EQUATIONS – Bisection method – Method of Successive approximations – Regula -Falsi Method – Newton's method.

Chapter: 3; Section:3.1-3.4

Unit II

SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS: Gauss Elimination – Gauss Jordan Method – Method of Triangularization - Gauss Jacobi Method - Gauss Seidel Method.

Chapter:4; Section: 4.1-4.2, 4.4, 4.7-4.9

Unit III

INTERPOLATION AND NUMERICAL DIFFERENTIATION: Interpolation by Newton's Forward Interpolation, Backward Interpolation-Lagrange's method - Newton's forward difference, backward difference to compute the derivatives.

Chapter:6; Section:6.1-6.3, Chapter:8; Section: 8.7; Chapter: 9; Section:9.1-9.3

Unit IV

MEASURES OF CENTRAL TENDENCY: Arithmetic mean, Geometric Mean and Harmonic Mean, Median, Mode. Standard deviation, Co-efficient of variation

Chapter: 9; Section: Page No: 124-156, 166-180 & Chapter: 10; Section IV: Page No:259-290

Unit V

CORRELATION -Pearson's co-efficient of Correlation – Rank Correlation – Regression – Linear Regression.

Chapter: 12; Page No: 396-420, Chapter: 13; Page No: 465-510

Books for study:

1. P. Kandasamy, K. Thilakavathy, K. Gunavathy, *Numerical methods*, Sultan Chand Publishers 2003 Edition. (Unit I, II and III).
2. Statistics, RSN. Pillai & Bhagavathi, *Numerical methods*, Sultan Chand Publishers, reprint 2002(Unit-IV &V).

Books for reference:

1. M. K. Venkatraman, *Numerical methods for Science and Engineering*, National Publishing Company, Fifth Edition, 2001 (Unit I, II and III).
2. P. Navnitham, *Business Mathematics & Statistics*, Jai Publishers,2008. (Unit IV, V)

Programme : B.Sc. Computer Science

Course Title : Allied Mathematics II
Year : First Year
Hours/Week : 6

Course Code : 20UCS2AL2
Semester : II
Credits : 5

Course Objectives

1. To understand the concepts of discrete structures, formal languages.
2. To use finite state machines to model computer operations.
3. To solve real time problems using various statistical techniques.

Course Outcomes (CO)

CO1	Understanding the basic concepts of probability theory.	K2
CO2	Applying the concepts of formal languages and automata.	K3
CO3	To know the basic ideas of normal forms.	K1
CO4	Analyzing the use of probability distributions.	K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S		S	S	M	M
CO2	S	M	M	S	M		S	S	S	S
CO3	S	M	M	S	M		S	S	S	L
CO4	S	M	S	S	S		S	S	M	M

S – Strong; M – Medium; L - Low

Unit I

MATHEMATICAL LOGIC: Connectives, Negation, conjunction, Disjunction, Truth tables, Conditional and bi-Conditional, well-formed formulas, tautologies, equivalence, duality. Tautological implications.

Chapter: 1; Section: 1-1, 1-2(1-2.1-1-2.4, 1-2.6, 1-2.7, 1-2.8, 1-2.9, 1-2.10, 1-2.11)

Unit II

Normal forms: Disjunctive, Conjunctive, Principal Disjunctive, Principal Conjunctive. Predicates Calculus: Predicates, variables, quantifiers, free and bound variables. Inference theory of Predicate the Calculus.

Chapter:1; Section:1-3, (1-3.1)-(1-3.4), (1-5.1)-(1-5.4) 1-6.1-1-6.4

Unit III

FORMAL LANGUAGES AND AUTOMATA: Regular expressions, types of grammar, regular grammar, context free and context sensitive grammars, finite automata.

Chapter:3; 3-3.2, Chapter:6; 6.1

Unit IV

PROBABILITY: Mathematical Preliminaries-Permutation and Combination- Baye's Theorem (without Proof) – Problems in Probability.

Chapter: 18; Page No: 726-759

Unit V

THEORETICAL DISTRIBUTIONS: Binomial – Poisson – Normal distributions

Chapter: 19; Page No: 769-800

Books for study:

1. J. P. Tremblay and R. P. Manohar, *Discrete Mathematical structures with Applications to Computer science*, TATA McGraw Hill. (Unit I, II and III).
2. RSN. Pillai & Bhagavathi, *Statistics*, Sultan Chand Publishers, reprint 2002. (Unit-IV & V).

Books for reference:

1. V. Sundaresan, K. S. Ganapathy Subramanian, K. Ganesan. *Discrete Mathematics*, AR Publication, 2019.
2. S. P. Gupta, *Statistics for Commerce Students*, Sultan Chand Publishers.
3. P. Navnitham, *Business Mathematics & Statistics*, Jai Publishers, 2008.

Programme : B. Sc (IT)

Course Title : Allied Mathematics -I

Year : First Year

Hours/Week : 6

Course Code : 20UIT1AL1

Semester : I

Credits : 5

COURSE OBJECTIVES

1. To understand the concept of matrices and solving simultaneous algebraic equations numerically.
2. To use Newton's and Lagrange's method for computing the derivatives.
3. To solve real time problems using various statistical techniques.

COURSE OUTCOMES (CO)

CO1	Applying problem solving techniques to solve algebraic and transcendental equations.	K3
CO2	Understanding the concept of measures of central tendency, measures of dispersion.	K2
CO3	Analyzing the concepts of correlation and regression.	K4
CO4	Knowing to solve simultaneous linear algebraic equations.	K2 & K3

K1 – Remember; K2 – Understand; K3 – Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4
CO1	S	M	L	S	M		S	S	S	M
CO2	S	S	L	M	S		S	S	M	M
CO3	M	S	L	M	L		S	M	M	L
CO4	S	S	M	L	M		S	M	S	L

S – Strong; M – Medium; L - Low

Unit I

The solution of Numerical Algebraic and Transcendental equations – Bisection method – Method of Successive approximations – Regula -Falsi Method –**Newton's method***.

Chapter: 3: Section:3.1-3.4

Unit II

Simultaneous Linear Algebraic Equations: Gauss Elimination* – Gauss Jordan Method – Method of Triangularization - Gauss Jacobi Method - Gauss Seidel Method.

Chapter:4: Section: 4.1-4.2, 4.4, 4.7-4.9

Unit III

Interpolation and Numerical Differentiation: Interpolation by Newton's and Lagrange's method - Newton's forward difference, **backward difference*** to compute the derivatives.

Chapter:6: Section:6.1-6.3, Chapter:8: Section: 8.7, Chapter: 9: Section:9.1-9.3

Unit IV

Measures of central tendency: Arithmetic mean*, Geometric Mean and Harmonic Mean, Median, Mode. Standard deviation, Co-efficient of variation

Chapter: 9: Page No: 124-156, 166-173, Chapter: 10: Section IV Only

Unit V

Correlation -Pearson's co-efficient of Correlation – Rank Correlation – Regression – **Linear Regression***

Chapter: 12; Page No: 396-420, Chapter: 13; Page No: 465-510

*** Self-study (Questions may be asked from these portions also)**

Books for study:

1. P. Kandasamy, K. Thilakavathy and K. Gunavathy, *Numerical methods*, S. Chand and Company PVT. LTD, Reprint 2016.
(Unit I, II and III).
2. R.S.N. Pillai and Bhagavathi, *Statistics*, Sultan Chand Publishers, reprint 2016.
(Unit-IV &V).

Books for reference:

1. M. K. Venkatraman, *Numerical methods for Science and Engineering*.
2. P. Navnitham, *Business Mathematics & Statistics*, Jai Publishers, May 2017. (Unit IV, V)

e- resources:

1. <https://nptel.ac.in/courses/122/102/122102009/>
2. <https://freevidelectures.com/course/4307/nptel-business-statistics/6>

Programme : B.Sc (IT).

Course Title : Allied Mathematics II

Year : First Year

Hours/Week : 6

Subject Code : 20UIT2AL2

Semester : II

Credits : 5

COURSE OBJECTIVES

1. To understand the concepts of discrete structures, formal languages.
2. To use finite state machines to model computer operations.
3. To solve real time problems using various statistical techniques.

COURSE OUTCOMES (CO)

CO1	Understanding the basic concepts of probability theory.	K2
CO2	Applying the concepts of formal languages and automata.	K3 & K4
CO3	To know the basic ideas of normal forms.	K1
CO4	Analyzing the use of probability distributions.	K4

K1 – Remember; K2 – Understand; K3 – Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4
CO1	S	M	L	M	M		S	M	L	M
CO2	S	S	M	S	S		S	S	S	M
CO3	S	M	L	M	S		S	S	S	M
CO4	M	S	L	M	S		S	M	L	M

S – Strong; M – Medium; L - Low

Unit I

Mathematical Logic: Connectives, Negation, conjunction, Disjunction, Truth tables, **Conditional and biconditional***, well-formed formulas, tautologies, equivalence, duality. Tautological implications.

Chapter: 1: Section: 1-1, 1-2 (1-2.1-1-2.4, 1-2.6 - 1-2.11)

Unit II

Normal forms: Disjunctive, Conjunctive, Principal Disjunctive, Principal Conjunctive. Predicates
Calculus: Predicates, variables, quantifiers, free and bound variables - Inference theory of the
Predicate Calculus*.

Chapter 1: Section:1-3, (1-3.1-1-3.4), 1-5 1-6

Unit III

Formal Definitions of a languages: Regular expressions, **types of grammar***, regular grammar, context free and context sensitive grammars, finite-state acceptors and regular grammars.

Chapter 3: 3-3.2, Chapter 6: 6.1

Unit IV

Probability: Mathematical Preliminaries-Permutation and Combination- Baye's Theorem (without Proof) – Problems in Probability.

Chapter 18: Page No: 726-759

Unit V

Theoretical Distributions: Binomial – Poisson – Normal distributions

Chapter 19: Page No: 769-800

*** Self-study (Questions may be asked from these portions also)**

Books for study:

1. J. P. Tremblay and R. P. Manohar, *Discrete Mathematical structures with Applications to Computer science*, TATA McGraw Hill. (Unit I, II and III).
2. R.S.N. Pillai and Bhagavathi, *Statistics*, Sultan Chand Publishers, reprint 2016. (Unit-IV & V).

Books for reference:

1. V. Sundaresan, K. S. Ganapathy Subramanian and K. Ganesan. *Discrete Mathematics.*, A.R Publications, July 2006.
2. Gupta S. P., *Statistics for Commerce Students*
3. P. Navnitham, *Business Mathematics & Statistics*, Jai Publishers, May 2017.

e- resources:

1. <https://nptel.ac.in/courses/111/106/111106052/>
2. <https://nptel.ac.in/courses/106/103/106103070/>
3. <https://nptel.ac.in/courses/110/107/110107114/>

Programme : BCA

Course Title : Allied Mathematics -I

Year : First Year

Hours/Week : 6

Course Code : 20UCA1AL1

Semester : I

Credits : 5

COURSE OBJECTIVES

1. To understand the concept of matrices and solving simultaneous algebraic equations numerically.
2. To use Newton's and Lagrange's method for computing the derivatives.
3. To solve real time problems using various statistical techniques.

COURSE OUTCOMES (CO)

CO1	Applying problem solving techniques to solve algebraic and transcendental equations.	K3
CO2	Understanding the concept of measures of central tendency, measures of dispersion.	K2
CO3	Analyzing the concepts of correlation and regression.	K4
CO4	Knowing to solve simultaneous linear algebraic equations.	K2 & K3

K1 – Remember; K2 – Understand; K3 – Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	L	M	L		S	S	S	S	L
CO2	S	S	M	M	L		S	M	S	M	L
CO3	S	S	L	M	M		S	S	S	M	L
CO4	S	S	M	L	M		S	S	L	M	S

S – Strong; M – Medium; L - Low

Unit I

The solution of Numerical Algebraic and Transcendental equations – Bisection method – Method of Successive approximations – Regula -Falsi Method –**Newton's method***.

Chapter: 3: Section:3.1-3.4

Unit II

Simultaneous Linear Algebraic Equations: Gauss Elimination* – Gauss Jordan Method – Method of Triangularization - Gauss Jacobi Method - Gauss Seidel Method.

Chapter:4: Section: 4.1-4.2, 4.4, 4.7-4.9

Unit III

Interpolation and Numerical Differentiation: Interpolation by Newton's and Lagrange's method
- Newton's forward difference, **backward difference*** to compute the derivatives.

Chapter:6: Section:6.1-6.3, Chapter:8: Section: 8.7, Chapter: 9: Section:9.1-9.3

Unit IV

Measures of central tendency: **Arithmetic mean***, Geometric Mean and Harmonic Mean, Median, Mode. Standard deviation, Co-efficient of variation

Chapter: 9: Page No: 124-156, 166-173, Chapter: 10: Section IV Only

Unit V

Correlation -Pearson's co-efficient of Correlation – Rank Correlation – Regression – **Linear Regression***

Chapter: 12; Page No: 396-420, Chapter: 13; Page No: 465-510

*** Self-study (Questions may be asked from these portions also)**

Books for study:

1. P. Kandasamy, K. Thilakavathy and K. Gunavathy, *Numerical methods*, S. Chand and Company PVT. LTD, Reprint 2016.
(Unit I, II and III).
2. R.S.N. Pillai and Bhagavathi, *Statistics*, Sultan Chand Publishers, reprint 2016.
(Unit-IV &V).

Books for reference:

1. M. K. Venkatraman, *Numerical methods for Science and Engineering*.
2. P. Navnitham, *Business Mathematics & Statistics*, Jai Publishers, May 2017. (Unit IV, V)

e- resources:

1. <https://nptel.ac.in/courses/122/102/122102009/>
2. <https://freevideolectures.com/course/4307/nptel-business-statistics/6>

Programme : BCA

Course Title : Allied Mathematics II

Year : First Year

Hours/Week : 6

Subject Code : 20UCA2AL2

Semester : II

Credits : 5

COURSE OBJECTIVES

1. To understand the concepts of discrete structures, formal languages.
2. To use finite state machines to model computer operations.
3. To solve real time problems using various statistical techniques.

COURSE OUTCOMES (CO)

CO1	Understanding the basic concepts of probability theory.	K2
CO2	Applying the concepts of formal languages and automata.	K3 & K4
CO3	To know the basic ideas of normal forms.	K1
CO4	Analyzing the use of probability distributions.	K4

K1 – Remember; K2 – Understand; K3 – Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	L	M		S	S	M	S	L
CO2	S	S	M	S	L		S	M	S	M	M
CO3	S	S	L	M	M		S	M	S	M	L
CO4	S	S	S	L	M		S	S	L	M	S

S – Strong; M – Medium; L - Low

Unit I

Mathematical Logic: Connectives, Negation, conjunction, Disjunction, Truth tables, **Conditional and biconditional***, well-formed formulas, tautologies, equivalence, duality. Tautological implications.

Chapter: 1: Section: 1-1, 1-2 (1-2.1-1-2.4, 1-2.6 - 1-2.11)

Unit II

Normal forms: Disjunctive, Conjunctive, Principal Disjunctive, Principal Conjunctive. Predicates
Calculus: Predicates, variable s, quantifiers, free and bound variables - Inference theory of the
Predicate Calculus*.

Chapter 1: Section:1-3, (1-3.1-1-3.4), 1-5 1-6

Unit III

Formal Definitions of a languages: Regular expressions, **types of grammar***, regular grammar, context free and context sensitive grammars, finite-state acceptors and regular grammars.

Chapter 3: 3-3.2, Chapter 6: 6.1

Unit IV

Probability: Mathematical Preliminaries-Permutation and Combination- Baye's Theorem (without Proof) – Problems in Probability.

Chapter 18: Page No: 726-759

Unit V

Theoretical Distributions: Binomial – Poisson – Normal distributions

Chapter 19: Page No: 769-800

*** Self-study (Questions may be asked from these portions also)**

Books for study:

1. J. P. Tremblay and R. P. Manohar, *Discrete Mathematical structures with Applications to Computer science*, TATA McGraw Hill. (Unit I, II and III).
2. R. S. N. Pillai and Bhagavathi, *Statistics*, Sultan Chand Publishers, reprint 2016. (Unit-IV & V).

Books for reference:

1. V. Sundaresan, K. S. Ganapathy Subramanian and K. Ganesan. *Discrete Mathematics.*, A.R Publications, July 2006.
2. Gupta S. P., *Statistics for Commerce Students*
3. P. Navnitham, *Business Mathematics & Statistics*, Jai Publishers, May 2017.

e- resources:

1. <https://nptel.ac.in/courses/111/106/111106052/>
2. <https://nptel.ac.in/courses/106/103/106103070/>
3. <https://nptel.ac.in/courses/110/107/110107114/>

Programme : B.Com

Course Title : Allied Mathematics I

Year : First Year

Hours/Week : 6

Subject Code : 20UCM1A11

Semester : I

Credits : 5

COURSE OBJECTIVE

1. To understand the concepts of set theory, simple interest and compound interest related with banking.
2. To study the concepts of statistics and measures of central tendencies.
3. To use mathematical knowledge to analyze measures of dispersion.

COURSE OUTCOMES (CO)

CO1	Remembering the basic concepts of set theory.	K1
CO2	Understanding the concepts of rate of interest, discounting and EMI.	K2 & K3
CO3	Knowing the types of sampling techniques.	K2
CO4	Analyzing the functions and limitations of statistics.	K4

K1 – Remember; K2 – Understand; K3 – Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	L	M		M	L	M	S	L
CO2	S	S	M	S	S		S	S	S	S	M
CO3	S	S	M	L	M		S	M	M	S	M
CO4	M	M	S	L	M		M	M	L	M	L

S – Strong; M – Medium; L - Low

Unit – I

Set Theory: Types of sets- Set Operations – Laws and **properties of Sets***- De Morgan's laws- Applications to business and economic problems.

Part –I: Business Mathematics; Section:3; Page No: 104 - 138

Unit – II

Simple and Compound Interest – Effective rate and nominal rate of interest - **Annuities*** – Discounting, Equated Monthly instalment(EMI)

Part –I: Business Mathematics; Section:2; Page No: 43 - 88

Unit – III

Statistics: Concepts - Scope, uses, functions and limitations of Statistics – Collection of Data – Primary and Secondary Data sources – **Types of Sampling*** – Classification, Tabulation and interpretation.

Part –II: Business Statistics; Section:1-5; Page No: 1 - 91

Unit -IV

Measures of central tendencies: Arithmetic Mean*, Median and Mode, Geometric mean Harmonic mean.

Chapter: 9; Page No:124-156, 166-180

Unit -V

Measures of Dispersion: Range*, Mean deviation, Quartile deviation, Standard deviation, Co-efficient of variation.

Chapter:10; Page No: 241- 290

*** Self-study (Questions may be asked from these portions also)**

Books for study:

1. P. Navnitham, *Business Mathematics & Statistics*, Jai Publishers, May 2017. (Unit- I, II & III)
2. R.S.N Pillai and Bhagavathi, *Statistics*, Sultan Chand Publishers, reprint 2016. (Unit- IV&V)

Book for reference:

Dr. P. R. Vittal, *Business Mathematics and Statistics*, Margam Publishers, 2002.

e- resources:

1. <https://freevideolectures.com/course/4307/nptel-business-statistics/6>
2. <https://www.youtube.com/watch?v=Bt1Bi9qhpmE>

Programme : B. Com

Course Title : Allied Mathematics II

Year : First Year

Hours/Week : 6

Subject Code : 20UCM2AL2

Semester : II

Credits : 5

COURSE OBJECTIVE

1. To understand the concepts of Matrices and linear programming problems
2. To study the concepts of analysis of time series.
3. To know the types and methods in index numbers.

COURSE OUTCOMES (CO)

CO1	Remembering the basic operations of matrices.	K1
CO2	Understanding the formulation and problem-solving methods in LPP	K2
CO3	Applying correlation and regression in business problems	K3
CO4	Analyzing time series and its applications	K4

K1 – Remember; K2 – Understand; K3 – Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	L		M	S	M	S	M
CO2	S	S	S	L	M		S	S	M	L	M
CO3	M	S	S	M	L		S	M	S	M	L
CO4	S	S	S	S	S		S	L	M	S	M

S – Strong; M – Medium; L - Low

Unit – I

Matrix: Basic Concepts – **Addition and Multiplication of Matrices***–Properties- Inverse of Matrix – Rank of a Matrix.

Part –I Business Mathematics: Section:4: Page No: 147 – 162; 175-195

Unit – II

Linear Programming Problem: Formulation - Solutions by Graphical Method, Simplex method: feasible solution, unbounded solution, infeasible solution.

Part –I Business Mathematics: Section:9: Page No: 330-366

Unit – III

Correlation: Meaning and definition – Scatter diagram – Pearson’s co-efficient of Correlation – Rank Correlation – Regression – **Linear Regression*** – Simple problems.

Chapter 12: Page No: 396-420; Chapter 13: Page No: 465-480

Unit -IV

Time Series Analysis: Definition, Uses, Components of Time Series Analysis, Measurement of Secular

Trend: Graphic Method, Semi average Method, **Moving average Method***, Method of least squares.

Chapter 15: Page No: 591-625

Unit -V

Index Numbers: Definition, Characteristics, Uses, **Types and Methods***, Cost of Living Index: Growth Rate and Growth Index, Choice Based Index Numbers, Chain Base Index Numbers, limitations.

Chapter 14: Page No: 526- 573

*** Self-study (Questions may be asked from these portions also)**

Books for study:

1. P. Navnitham, *Business Mathematics & Statistics*, Jai Publishers, July 2017.
(Unit- I & II)
2. R.S.N Pillai and Bhagavathi, *Statistics*, Sultan Chand Publishers, reprint 2016.
(Unit- III, IV & V)

Book for reference:

S.P. Gupta, *Statistics for Commerce Students*.

e- resources:

1. <https://nptel.ac.in/courses/111/104/111104027/>
2. <https://nptel.ac.in/courses/109/104/109104182/>

Programme : B.Com (CA)

Course Title : Allied Mathematics I

Year : First Year

Hours/Week : 6

Subject Code : 20UCC1AL1

Semester : I

Credits : 5

COURSE OBJECTIVE

1. To understand the concepts of set theory, simple interest and compound interest related with banking.
2. To study the concepts of statistics and measures of central tendencies.
3. To use mathematical knowledge to analyze measures of dispersion.

COURSE OUTCOMES (CO)

CO1	Remembering the basic concepts of set theory.	K1
CO2	Understanding the concepts of rate of interest, discounting and EMI.	K2 & K3
CO3	Knowing the types of sampling techniques.	K2
CO4	Analyzing the functions and limitations of statistics.	K4

K1 – Remember; K2 – Understand; K3 – Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	L	M		M	S	M	M	L
CO2	S	S	M	S	L		S	S	M	S	L
CO3	S	S	M	L	M		S	S	M	S	M
CO4	M	S	S	L	M		S	M	L	M	L

S – Strong; M – Medium; L - Low

Unit – I

Set Theory: Types of sets- Set Operations – Laws and **properties of Sets***- De Morgan’s laws- Applications to business and economic problems.

Part –I: Business Mathematics; Section:3; Page No: 104 - 138

Unit – II

Simple and Compound Interest – Effective rate and nominal rate of interest - **Annuities*** – Discounting, Equated Monthly instalment(EMI)

Part –I: Business Mathematics; Section:2; Page No: 43 - 88

Unit – III

Statistics: Concepts - Scope, uses, functions and limitations of Statistics – Collection of Data – Primary and Secondary Data sources – **Types of Sampling*** – Classification, Tabulation and interpretation.

Part –II: Business Statistics; Section:1-5; Page No: 1 - 91

Unit -IV

Measures of central tendencies: Arithmetic Mean*, Median and Mode, Geometric mean Harmonic mean.

Chapter: 9; Page No:124-156, 166-180

Unit -V

Measures of Dispersion: Range*, Mean deviation, Quartile deviation, Standard deviation, Co-efficient of variation.

Chapter:10; Page No: 241- 290

*** Self-study (Questions may be asked from these portions also)**

Books for study:

1. P. Navnitham, *Business Mathematics & Statistics*, Jai Publishers, May 2017. (Unit- I, II & III)
2. R.S.N Pillai and Bhagavathi, *Statistics*, Sultan Chand Publishers, reprint 2016. (Unit- IV&V)

Book for reference:

Dr. P. R. Vittal, *Business Mathematics and Statistics*, Margam Publishers, 2002.

e- resources:

1. <https://freevideolectures.com/course/4307/nptel-business-statistics/6>
2. <https://www.youtube.com/watch?v=Bt1Bi9qhpmE>

Programme : B.Com (CA)

Course Title : Allied Mathematics II

Year : First Year

Hours/Week : 6

Subject Code : 20UCC2AL2

Semester : II

Credits : 5

COURSE OBJECTIVE

1. To understand the concepts of Matrices and linear programming problems
2. To study the concepts of analysis of time series.
3. To know the types and methods in index numbers.

COURSE OUTCOMES (CO)

CO1	Remembering the basic operations of matrices.	K1
CO2	Understanding the formulation and problem-solving methods in LPP	K2
CO3	Applying correlation and regression in business problems	K3
CO4	Analyzing time series and its applications	K4

K1 – Remember; K2 – Understand; K3 – Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	L		M	S	M	S	M
CO2	S	M	S	L	M		S	S	M	L	M
CO3	S	S	S	M	L		S	M	S	M	L
CO4	S	S	M	S	S		S	L	M	S	M

S – Strong; M – Medium; L - Low

Unit – I

Matrix: Basic Concepts – **Addition and Multiplication of Matrices***–Properties- Inverse of Matrix – Rank of a Matrix.

Part –I Business Mathematics: Section:4: Page No: 147 – 162; 175-195

Unit – II

Linear Programming Problem: Formulation - Solutions by Graphical Method, Simplex method: feasible solution, unbounded solution, infeasible solution.

Part –I Business Mathematics: Section:9: Page No: 330-366

Unit – III

Correlation: Meaning and definition – Scatter diagram – Pearson’s co-efficient of Correlation – Rank Correlation – Regression – **Linear Regression*** – Simple problems.

Chapter 12: Page No: 396-420; Chapter 13: Page No: 465-480

Unit -IV

Time Series Analysis: Definition, Uses, Components of Time Series Analysis, Measurement of Secular Trend: Graphic Method, Semi average Method, **Moving average Method***, Method of least squares.

Chapter 15: Page No: 591-625

Unit -V

Index Numbers: Definition, Characteristics, Uses, **Types and Methods***, Cost of Living Index: Growth Rate and Growth Index, Choice Based Index Numbers, Chain Base Index Numbers, limitations.

Chapter 14: Page No: 526- 573

*** Self-study (Questions may be asked from these portions also)**

Books for study:

1. P. Navnitham, *Business Mathematics & Statistics*, Jai Publishers, July 2017.
(Unit- I & II)
2. R.S.N Pillai and Bhagavathi, *Statistics*, Sultan Chand Publishers, reprint 2016.
(Unit- III, IV & V)

Book for reference:

S.P. Gupta, *Statistics for Commerce Students*.

e- resources:

1. <https://nptel.ac.in/courses/111/104/111104027/>
2. <https://nptel.ac.in/courses/109/104/109104182/>

Programme : B.Com PA

Course Code: 20UPA1AL1

Course Title : Allied 1-MATHEMATICS FOR BUSINESS

Hours / Week : 6

Year : FIRST

Semester : I

Credits: 5

Course Objectives:

- To understand the concepts of Simple Interest and compound interest.
- To learn the concepts of Matrices and Linear programming problems.
- To study the concepts of Differentiation. And its applications in real world business problems.
- To study the concepts of Integration. And its applications in real world business problems.

Course Outcome:

CO1	Understanding the concepts student must be able to solve Profit and loss problems.	K2 &K3
CO2	Remembering the basic concepts matrix student must be able to perform matrix arithmetic operations.	K1
CO3	Understanding differentiation the student must possess the basic knowledge of solving simple differential equation.	K2&K3
CO4	Understanding integration the student must be able to solve Integration problems.	K2 & K3
CO5	Analyzing the Linear Programming Problem, the student should have the knowledge to solve simplex and graphical method.	K4

K1 – Remember; K2 – Understand; K3 – Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M		S	S	M	S	L
CO2	S	S	M	S	S		S	S	S	S	M
CO3	S	S	M	M	M		S	M	M	S	L
CO4	M	S	S	M	M		M	M	L	M	L
CO5	S	S	M	M	S		S	M	S	M	L

S – Strong; M – Medium; L - Low

Unit-I

Simple and Compound Interest-Effective rate of Interest – **Sinking Fund*** – Annuity – Present Value- Discounting bills – True Discount – Banker’s Gain.

Pg. No: (43-88)

Unit-II

Matrix: **Basic Concepts*** -Addition and Multiplication of Matrices -Inverse of a Matrix- Rank of Matrix-Solving a system of simultaneous linear equations by inverse method.

Pg. No: (147-200)

Unit-III

Differentiation: Simple Differentiation of Algebraic Functions-Uses of the Derivatives-Marginal concept-Elasticities-Increasing and decreasing functions, Break-even point*- Maxima and minima Problems-Application to Business problems.

Pg. No: (247-296)

Unit-IV

Integration: Indefinite integrals - standard Forms-Determination of c-Definite Integrals- Method of substitution -**Method of partial fractions*** -Method of Integration by Parts- Application to Business problems.

Pg. No: (303-322)

Unit-V

Linear Programming Problem: Introduction to Operation Research-Meaning and scope of Operation Research-Limits of Operation Research -Formulation of Linear Programming Problem - Graphical Method of Linear Programming Problem- Simplex Method.

Pg. No: (328-366)

*** Self-study (Questions may be asked from these portions also)**

Book for study:

P. Navanitham, *Business Mathematics & Statistics*, Jai Publishers, May 2017.

Books for references:

1. Sundaresan and Jayaseelan, *Introduction to business Mathematics*, Sultan Chand Co & Ltd, New Delhi.
2. D. C Sanchetti. and V. K Kapoor, *Business Mathematics*, Sultan Chand Co & Ltd, New Delhi.
3. G. K. Ranganath, C. S. Sampangi Ram and Y. Rajan- *A Text book Business Mathematics*, Himalaya Publishing House.
4. Dr. P. R. Vittal, *Business Mathematics and Statistics*, Margam Publishers, 2002.

e- resources:

1. <https://nptel.ac.in/courses/109/107/109107115/>
2. <https://www.youtube.com/watch?v=KaLA1cWhQIA>
3. https://onlinecourses.nptel.ac.in/noc21_ma16/preview
4. <https://nptel.ac.in/courses/111/104/111104144/>
5. <https://nptel.ac.in/courses/111/104/111104027/>

Programme: B.Com. PA

Course Code: 20UPA2AL2

Title: Allied 2 - Statistics for Business

Hours: 6 hrs/week

Class: I Year

Semester: II

Credits: 5

Course Objectives:

- To understand the basic concepts of Measure of central tendencies and Probability.
- To learn the concepts of Standard deviation, Coefficient of variation.
- To study the concepts of correlation and concurrent deviation.
- To learn the concept of time series and Index number calculation.

Course Outcomes:

CO1.	Understand the basic concepts of Measure of central tendencies the student must be able to solve mean, median and mode.	K2 & K3
CO2.	Understand the concepts standard deviation the student must be able to solve mean deviation and Skewness	K2
CO3.	Applying the concepts correlation and concurrent deviation in business problems	K3
CO4.	Analyzing time series and Index Number and its applications	K4
CO5.	Applying the concept must able to solve problems related to probability	K3

K1 – Remember; K2 – Understand; K3 – Apply; K4 - Analyze

	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	L		M	S	M	S	L
CO2	S	M	S	L	M		S	S	M	L	L
CO3	S	S	S	M	L		S	M	S	M	L
CO4	S	S	M	S	S		S	M	M	S	L
CO5	S	S	M	M	S		S	S	S	M	L

S – Strong; M – Medium; L - Low

Unit - I

Measures of central tendencies*, Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode.

Pg. No: (125-180)

Unit - II

Meaning of Dispersion-Range*, Quartile Deviation, Mean Deviation, Standard Deviation and Co-efficient of Variation. Skewness-Meaning-Measures of skewness-Pearson’s and Bowley’s co-efficient of skewness.

Pg. No: (241-290), (338-354)

Unit - III

Correlation-Meaning and definition-Scatter diagram, Karl Pearson’s co-efficient of correlation,

Spearman's Rank Correlation*, Co-efficient of concurrent deviation.

Pg. No: (396-441)

Unit - IV

Time Series-Meaning, Components and Models-Business forecasting -- Methods of estimating trend-Graphic, Semi-Average*, Moving average and method of least squares - Seasonal Variation -- Method of Simple average. Index Numbers-Meaning, Uses and Methods of Construction* -- Un-Weighted and Weighted index numbers-Tests of an index number – Cost of living index number.

Pg. No: (526-572), (591-609)

Unit - V

Probability – Concept and Definition* —Addition and Multiplication theorems of probability (statement only) – Simple problems based on Addition and Multiplication theorems * only- Bayes theorem(without proof)Simple problems only.

Pg. No: (726-759)

*** Self-study (Questions may be asked from these portions also)**

Book for study:

R. S. N Pillai and Bhagavathi, *Statistics*, Sultan Chand Publishers, reprint 2016.

Books for references:

1. S.P Gupta, *Statistics Statistical Methods*.
2. P. Navanitham, *Business Mathematics & Statistics*, Jai Publishers, July 2017.
3. D.C.Sancheti and V.K.Kapoor. *Statistics -Theory, Methods & Application*.
4. Frederick E.Croxton and J. Dudley. Cowden, *Applied General Statistics*.

e- resources:

1. <https://freevideolectures.com/course/4307/nptel-business-statistics/6>
2. <https://nptel.ac.in/courses/109/104/109104182/>
3. <https://www.youtube.com/watch?v=soZRfdnkUQg>