

Sri Sankara Arts & Science College
(Autonomous)
Department of Mathematics

Effective from the academic year 2019-2020
B.Sc., Mathematics
Scheme of Examination

B.Sc Mathematics Credits

Si. No	Study Components	B.Sc.,		
		Number of papers	Credits per paper	Total Credits
1	Language courses(lc)	4	3	12
2	English language courses	4	3	12
3	Core Paper	15	4	60
4	Elective Papers	3	5	15
5	Allied Papers & Praticals	6	/3+3+4/+ /3+3+4/	20
6	Part IV course:			
	a).Advance Tamil /non-major elective	2	2	4
	b).Skill based courses	4	3	12
	c). Environmental studies	1	2	2
	d).Value education	1	2	2
7	Part V: Extension activities	1	1	1
Total				140

Effective from the academic year 2019-2020
B.Sc., Mathematics
Scheme of Examination

I Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part I-Language Paper-I	3	4	25	75	100
Part II- English Paper-I	3	4	25	75	100
Part III Core Paper I : Algebra and Trigonometry	4	5	25	75	100
Core Paper II: Differential Calculus	4	4	25	75	100
Allied Paper I	4	9	25	75	100
Part IV Basic Tamil/Adv. Tamil/Non Major Elective-I	2	2	25	75	100
Soft Skills-I	3	2	50	50	100

II Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part I-Language Paper-II	3	4	25	75	100
Part II- English Paper-II	3	4	25	75	100
Part III Core Paper III : Integral Calculus	4	5	25	75	100
Core Paper IV: Differential Equations	4	4	25	75	100
Allied Paper II	6	9	25	75	100
Part IV Basic Tamil/Adv. Tamil/Non Major Elective-II	2	2	25	75	100
Soft Skills-II	3	2	50	50	100

III Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part I-Language Paper-III	3	4	25	75	100
Part II- English Paper-III	3	4	25	75	100
Part III Core Paper V : Fourier Series and Integral Transforms	4	5	25	75	100
Core Paper VI: Analytical Geometry	4	4	25	75	100
Allied Paper III	4	9	25	75	100
Part-IV- Soft Skills-III	3	2	50	50	100

IV Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part I-Language Paper-IV	3	4	25	75	100
Part II- English Paper-IV	3	4	25	75	100
Part III Core Paper VII : Numerical Methods	4	5	25	75	100
Core Paper VIII: Statics	4	4	25	75	100
Allied Paper IV	6	9	25	75	100
Part-IV Environment studies	2	2	25	75	100
Soft Skills-III	3	2	50	50	100

V Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part III- Core Paper IX : Algebra -I	4	6	25	75	100
Core Paper X : Real Analysis - I	4	6	25	75	100
Core Paper XI: Dynamics	4	6	25	75	100
Elective Paper-I Choose from Group-A	5	5	25	75	100
Elective Paper-I Choose from Group-B	5	5	25	75	100
Part-IV Value Education	2	2	25	75	100

Group-A

1. Fundamentals of Accounting
2. Special Functions
3. Graph Theory

Group-B

1. Elementary Number Theory
2. C- Programming
3. Discrete Mathematics

VI Semester

Course Components /Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Part III- Core Paper XII : Algebra -II	4	6	25	75	100
Core Paper XIII : Real Analysis -II	4	6	25	75	100
Core Paper XIV: Complex Analysis	4	6	25	75	100
Core Paper XV: Operations Research	4	6	25	75	100
Elective Paper-III Choose from Group-C	5	6	25	75	100
Part-V Extension Activity	1	-	-	-	-

Group-C

1. Mathematical Modeling
2. Matrix Theory
3. Astronomy

CORE PAPER - I ALGEBRA AND TRIGONOMETRY

To teach the concept of basic algebra and trigonometry.

After the completion of the course the student will be able to solving the problem on basic mathematics

ALGEBRA

Unit- 1

Polynomial equations - Imaginary and irrational roots - Relation between roots and coefficients - Symmetric functions of roots in terms of coefficients - Transformations of equations - Reciprocal equations

Chapter 6: section 9 to 12, 15, 15.1,15.2,15.3, 16, 16.1,16.2.

Unit-2

Increase or decrease the roots of the given equation - Removal of term - Descartes' rule of signs - Cardan's method of solution of a cubic polynomial - Summation of Series using Binomial - Exponential and Logarithmic series.

Chapter 6: section 17, 19, 24, 34, 34.1

Chapter 3: section 10,

Chapter 4: section 3, 3.1, 7.

Unit-3

Symmetric - Skew Symmetric – Hermitian - Skew Hermitian - Orthogonal Matrices - Eigen values - Eigen Vectors - Cayley - Hamilton Theorem - Similar matrices - Diagonalization of a matrix.

Chapter 2: section 6.1 to 6.3, 9.1, 9.2 , 16 , 16.1,16.2 16.3

TRIGONOMETRY

Unit –4

Expansions of power of $\sin\theta$, $\cos\theta$ - Expansions of $\cos^n\theta$, $\sin^n\theta\cos^m\theta$, $\sin^m\theta$

Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ - Expansion of $\tan(\theta_1+\theta_2+\dots+\theta_n)$ - Expansion of $\sin X$, $\cos X$, $\tan X$ in terms of X - Sum of roots of trigonometry equations - formation of equation with trigonometric roots.

Chapter 2: section 2.1, 2.1.1, 2.1.2, 2.1.3,

Chapter 3: section 3.1 to 3.6

Unit-5

Hyperbolic functions - Relation between circular and hyperbolic functions - Formulas in hyperbolic functions - Inverse hyperbolic functions - Inverse function of exponential functions - Values of Log $(u+iv)$ - Complex index.

Chapter 4: section 4.1 to 4.7,

Chapter 5: section 5.1 to 5.3

Contents and treatment as in

Unit - 1 and 2, Algebra Volume I by T. K. Manicavachagom Pillay, T.Natarajan, K.S.Ganapathy, Viswanathan Publication.

Unit – 3 Algebra Volume II by T. K. Manicavachagom Pillay, T.Natarajan, K.S.Ganapathy, Viswanathan Publication.

Unit - 4 and 5

Trigonometry by P. Duraipandian and Kayalal Pachaiyappa, Muhil Publishers.

Reference:

1. Algebra by S. Arumugam (New Gama publishing house, Palayamkottai)
2. Trigonometry by P. Duraipandian and Kayalal Pachaiyappa, Muhil Publishers

CORE PAPER -II

DIFFERENTIAL CALCULUS

To teach the concept of basic Calculus and application of integration

After the completion of the course the student will be able to solving problem on calculus

Unit- 1

Successive differentiation - n^{th} derivative- standard results – trigonometrical - transformation – formation of equations using derivatives – Leibnitz's theorem and its applications

Chapter 3: section 1.1 to 1.6, 2.1 and 2.2

Unit- 2

Total differential of a function – special cases – implicit functions - partial derivatives of a function of two functions - Maxima and Minima of functions of 2 variables- Lagrange's method of undetermined multipliers.

Chapter 8: section 1.3 to 1.5 and 1.7, section 4, 4.1 and 5.

Unit- 3

Envelopes – method of finding envelopes – Curvature- circle, radius and centre of curvature- Cartesian formula for radius of curvature – coordinates of the centre of curvature – evolute-and involute - radius of curvature and centre of curvature in polar coordinates – p-r equation

Chapter 10: section 1.1 to 1.4 and section 2.1 to 2.7

Unit- 4

p-r equations- angle between the radius vector and the tangent – slope of the tangent in the polar coordinates – the angle of intersection of two curves in polar coordinates- polar sub tangent and polar sub normal – the length of arc in polar coordinates.

Chapter 9: section 4.1 to 4.6

Unit- 5

Asymptotes parallel to the axes – special cases – another method for finding asymptotes - asymptotes by inspection – intersection of a curve with an asymptote.

Chapter 11: section 1 to 4, section 5.1 , 5.2,6 and 7

Content and treatment as in

Calculus Vol- 1 by S. Narayanan and T.K. Manicavachagom pillay - S.Viswanathan publishers – 2006

Reference:

1. Calculus by Thomas and Fenny, Pearson Publication

CORE PAPER- III INTEGRAL CALCULUS

To teach the concept of basic integral, Euler integral, line, volume and surface integrals
After the completion of the course the student will be able to find the areas and volume of defined and undefined shapes

Unit- 1

Reduction formulae –Types $\int x^n e^{ax} dx$, $\int x^n \cos ax dx$, $\int x^n \sin ax dx$, $\int \cos^n x dx$
 $\int \sin^n x dx$, $\int \sin^m x \cos^n x dx$, $\int \tan^n x dx$, $\int \cot^n x dx$, $\int \sec^n x dx$, $\int \operatorname{cosec}^n x dx$
 $\int x^n (\log x)^m dx$. Bernoulli's formula.

Chapter 1: section 13, 13.1 to 13.10,14,15.1

Unit- 2

Multiple Integrals - definition of the double integrals - evaluation of the double integrals- double integrals in polar coordinates – triple integrals – applications of multiple integrals – volumes of solids of revolution – areas of curved surfaces

Chapter 5: sections 1, 2.1,2.2,3.1,4,6.1,6.2,6.3,7

Unit- 3

Beta and Gamma functions- indefinite integral – definitions – convergence of $\Gamma(n)$ – recurrence formula of Γ functions – properties of β -function- relation between β and Γ functions

Chapter 7: sections 1.1 to 1.4 , 2.1 to 2.3, 3, 4,

Unit-4

Introduction, Gradient, divergence, curl, directional derivative, unit normal to a surface. Solenoidal and irrotational. Laplacian Differential Operator.

Chapter 2: sections 2.1 to 2.11

Unit-5

Line, surface and volume integrals; Theorems of Gauss, Stokes and Green. (Without proof) – Problems.

Chapter 4 Page.no; 132-135,156-160,167-170

Content and treatment as in

Calculus Vol- II by S. Narayanan and T.K. Manicavachagom pillay - S. Viswanathan publishers – for Unit 1 , Unit 2 , Unit 3

Vector Analysis by Duraipandian. Chand publishers for unit 4 & 5

Reference :-

1. Integral Calculus and differential equations, Dipak Chatterjee (TATA McGraw Hill Publishing company Ltd.)
2. Vector Algebra and Analysis by Narayanan and T.K.Manickvachagom Pillay S .Viswanathan Publishers.
3. Vector Analysis: Murray Spiegel (Schaum Publishing Company, New York)

CORE PAPER- IV DIFFERENTIAL EQUATIONS

To teach the concept of basic ODE and PDE

After the completion of the course the student will be able to solving problems for differential

Unit- 1

Homogenous equations - Exact equations - Integrating factor - Linear equations - Reduction of order.

Chapter 2: sections 7-11

Unit- 2

Second order linear differential equations introduction - General solution of homogenous equations - The use of known solution to find another - Homogeneous equation with constant coefficients - Method of undetermined coefficients - Method of variation of parameters.

Chapter 3: sections 14-19

Unit -3

System of first order equations - Linear systems - Homogeneous linear systems with constant coefficients. (Omit non-homogeneous system of equations)

Chapter 10: sections 55 and 56

Unit-4

Formation of P.D.E by eliminating arbitrary constants and arbitrary functions - complete integral; Singular integral - general integral - Lagrange's equations $Pp + Qq = R$.

Chapter 0 sections 0.4 and 0.5

Unit-5

Charpit's method and Special types of first order equations.

Chapter 0 sections 0.11, 0.11.1

Contents and treatment as in

1. Differential equations with Applications and Historical Notes by George F. Simmons Second Edition, Tata Mcgraw Hill Publications. Unit 1, 2 and 3
2. Introduction to Partial Differential Equations Second Edition by K.Sankara Rao, PHI Learning Private Limited. Unit 4 and 5

Reference:-

1. Differential Equations by Simmons.
2. Partial Differential Equations by Sneddon.
3. Ordinary and partial differential equations by Dr.M.D.Raisinghania S.Chand

CORE PAPER V
FOURIER SERIES AND INTEGRAL TRANSFORMS

To teach the concept of basic application of integrals

After the completion of the course the student will be able to solving problem on special type of integrals.

Unit- 1

Fourier Series – periodic functions- Dirichlet condition – odd and even function – full and half range Fourier Series – change of intervals.

Chapter 12: section 12.1 to 12.11

Unit-2

Laplace Transformation – Laplace transform of standard function – periodic functions.

Chapter 13: section 13.1 to 13.15

Unit-3

Inverse Laplace Transformation – inverse transform by partial fractions –inverse transform by differentiation and integration.

Chapter 13: section 13.20 to 13.28

Unit- 4

Application of Laplace Transformation – solution of linear differential equation upto second order.

Chapter 13: section 13.29 to 13.32

Unit- 5

Integral Transform – Application of Laplace and Fourier – convolution theorem – Parseval's identity – solution of boundary value problem.

Chapter 14: section 14.1to 14.14

Contents and treatment as in

Advanced Engineering Mathematics by H.K. Dass, S Chand and company

References:-

1. Engineering Mathematics volume 3 : M.K. Venkataraman (National Publishing Co.)
2. Engineering Mathematics volume 3 : P.Kandasamy and others (S.Chand and Co.)
3. Advanced Engineering Mathematics: Stanley Grossman and William R.Devit (Harper and Row publishers)

CORE PAPER - VI
ANALYTICAL GEOMETRY

To teach the concept of basic 2D and 3D

After the completion of the course the student will be able to difference between 2D and 3D problems

Unit- 1

Pair of straight line – homogenous equation of n^{th} degree in x and y – condition that the general equation of the second degree to represent a pair of straight line

Chapter 3

Unit-2

System of circles – polar equation –radical axis of two circles – orthogonal circles – equation of any two co-axal system – general form.

Chapter 5 & 9 (section 9.10-9.13)

Unit-3

The plane – equations of planes bisecting the angle between two planes – straight determine as the intersection of two planes.

Chapter 2 (section 2.8- 2.11)

Chapter 3

Unit- 4

The Sphere – equation of sphere when center and radius are given - general equation of sphere - length of tangent from the point to the sphere.

Chapter 4

Unit- 5

Central quadrics and cone - equation of then surface – right circular cone – intersection of straight line and a quadric cone.

Chapter 5

Contents and treatment as in “Analitic Geomentry part I (UNIT I & II) and Part II (UNIT III, IV & V) by T.K.ManikavachagomPilai and T.Natrajan, S.Viswanathan Publishers.

References:-

1. Analytical Solid Geometry of 3D by Shanthi Narayan and Dr.P.K. Mittal
2. P. Duraipandian, Laxmi Duraipandian and D.Muhilan, Analytical Geometry 3 Dimensional Emerald publishers,
3. N.P.Bali, Solid Geometry, Laxmi Publications(P)Ltd, Edition

CORE PAPER VII NUMERICAL METHODS

To teach the concept of basic numerical methods.

After the completion of the course the student will be able to solving problem on numerical differentiation, numerical integration and solution to ordinary differential equations.

Unit - 1

Algebraic and Transcendental Equations

Chapter-3: section 3.0-3.6

Unit - 2

Simultaneous Equations

Chapter-4: section 4.3-4.5 and 4.8

Unit - 3

Eigen Values and Vectors of a Matrix

Chapter-5: section 5.0 -5.2

Interpolation

Chapter-7: section 7.1 and 7.3

Unit - 4

Numerical Differentiation and Integration

Chapter-8: section 8.1-8.3 and 8.5-8.7

Unit - 5

Numerical Solutions of Ordinary Differential Equations

Chapter-10: section 10.0-10.5

Contents and treatment as in Numerical Methods by Dr. P.Kandasamy, Dr. K. Thilagavathy and Dr. K. Gunavathi. S.Chand and Company Ltd

Reference Book

1. Numerical Methods With Programming in C by T. Veerarajan and T. Ramachandran.
2. Introductory Methods of Numerical Analysis by S.S.Sastry
3. Numerical Methods by S.Arumugam, A.Thangapandi Issac and A.Somasundram, Scitech Publication.

CORE PAPER- VIII STATICS

To teach the concept of basic stability of the particles.

After the completion of the course the student will be able to solving problem of motion equation

Unit-1

Newton's laws of motion - resultant of two forces on a particle- Equilibrium of a particle- Limiting Equilibrium of a particle on an inclined plane

Chapter 2: section 2.1, 2.2,

Chapter 3 - section 3.1 and 3.2

Unit-2

Forces on a rigid body – moment of a force – general motion of a rigid body- equivalent systems of forces – parallel forces – forces along the sides of a triangle – couples

Chapter 4: section 4.1 to 4.6

Unit-3

Resultant of several coplanar forces- equation of the line of action of the resultant- Equilibrium of a rigid body under three coplanar forces – Reduction of coplanar forces into a force and a couple.- problems involving frictional forces

Chapter 4: section 4.7 to 4.9

Chapter 5: section 5.1, 5.2

Unit-4

Centre of mass – finding mass centre – a hanging body in equilibrium – stability of equilibrium – stability using differentiation

Chapter 6: section 6.1 to 6.3

Chapter 7: section 7.1, 7.2

Unit-5

Virtual work – hanging strings- equilibrium of a uniform homogeneous string – suspension bridge

Chapter 8: section 8.1

Chapter 9: section 9.1, 9.2

Contents and treatment as in “Mechanics – P. Duraipandian, Laxmi Duraipandian, Muthamizh Jayapragasham, S. Chand and Co limited

Reference Book

1. Dynamics – K. ViswanathaNaik and M. S. Kasi, Emerald Publishers.
2. Dynamics – A. V. Dharmapadam, S. Viswanathan Publishers.
3. Mechanics – Walter Grenier

CORE PAPER- IX

ALGEBRA - I

To teach the concepts of basic group, ring theory

After the completion of the course the student will be able to solving problem on group theory and ring theory.

Unit -1

Introduction to groups – Subgroups - cyclic groups and properties of cyclic groups Lagrange's Theorem - A counting principle.

Chapter 2: section 2.4 and 2.5

Unit -2

Normal subgroups and Quotient group - Homomorphism - Automorphism.

Chapter 2: section 2.6 to 2.8

Unit - 3

Cayley's Theorem - Permutation groups.

Chapter 2: section 2.9 and 2.10

Unit -4

Definition and examples of ring- Some special classes of rings - homomorphism of rings - Ideals and quotient rings - More ideals and quotient rings.

Chapter 3: section 3.1 to 3.5

Unit – 5

The field of quotients of an integral domain - Euclidean Rings - The particular Euclidean ring.

Chapter 3: section 3.6 to 3.8

Contents and treatment as in “Topics in Algebra” – I. N. Herstein, Wiley Eastern Ltd.

Reference Book :-

1. Modern Algebra by M.L.Santiago, Mcgraw Hill Education India Pvt Ltd.
2. Modern Algebra by S. Arumugam and others, New Gamma publishing House, Palayamkottai.
3. Modern Algebra by Visvanathan Nayak

CORE PAPER-X

REAL ANALYSIS –I

To teach the concept of set, function, sequence and series of real numbers.

After the completion of the course the student will be able to solve problems on sets, functions, sequence and real numbers.

Unit – 1

Sets and elements - Operations on sets - functions - real valued functions - equivalence – countability - real numbers -least upper bounds.

Chapter 1: section 1. 1 to 1.7

Unit – 2

Definition of a sequence and subsequence - limit of a sequence - convergent sequences - divergent sequences - bounded sequences - monotone sequences.

Chapter 2: section 2.1 to 2.6

Unit – 3

Operations on convergent sequences - operations on divergent sequences - limit superior and limit inferior - Cauchy sequences.

Chapter 2: section 2.7 to 2.10

Unit- 4

Convergence and divergence - series with non-negative numbers - alternating series - conditional convergence and absolute convergence - tests for absolute convergence - series whose terms form a non-increasing sequence - the class l^2

Chapter 3 : section 3.1 to 3.4, 3.6, 3.7 and 3.10

Unit – 5

Limit of a function on a real line;. Metric spaces; Limits in metric spaces.Function continuous at a point on the real line, reformulation, Function continuous on a metric space.

Chapter 4: section 4.1 to 4.3

Chapter 5: section 5.1-5.3

Contents and Treatment as in “Methods of Real Analysis” : Richard R. Goldberg (Oxford and IBH Publishing Co.)

Reference :-

1. Principles of Mathematical Analysis by Walter Rudin
2. Mathematical Analysis by Tom M Apostol

CORE PAPER- XI DYNAMICS

To teach the concept of basic nature of the motions.

After the completion of the course the student will be able to solving problem on Simple harmonic motion, Projectile and etc.

Unit -1

Basic units – velocity – acceleration- coplanar motion – rectilinear motion under constant forces – acceleration and retardation – thrust on a plane – motion along a vertical line under gravity – line of quickest descent - motion along an inclined plane – motion of connected particles.

Chapter 1 - section 1.1 to 1.4,

Chapter 10 - section 10.1 to 10.6

Unit – 2

Work, Energy and power – work – conservative field of force – power – Rectilinear motion under varying Force simple harmonic motion (S.H.M.) – S.H.M. along a horizontal line- S.H.M. along a vertical line – motion under gravity in a resisting medium.

Chapter 11 - section 11.1to 11.3

Chapter 12 - section 12.1 to 12.4

Unit – 3

Forces on a projectile- projectile projected on an inclined plane- Enveloping parabola or bounding parabola – impact – impulse force - impact of sphere - impact of two smooth spheres – impact of a smooth sphere on a plane – oblique impact of two smooth spheres

Chapter 13 - section 13.1 to 13.3

Chapter 14 - section 14.1, 14.5

Unit – 4

Circular motion – Conical pendulum – motion of a cyclist on a circular path – circular motion on a vertical plane – relative rest in a revolving cone – simple pendulum – central orbits -general orbits - central orbits- conic as centered orbit.

Chapter 15 - section 15.1 to 15.6

Chapter 16 - section 16.1 to 16.3

Unit – 5

Moment of inertia. Two dimensional motion of a rigid body –equations of motion for two dimensional motion – theory of dimensions- definition of dimensions.

Chapter 17 -section 17.1

Chapter 18 - section 18.1, 18.2,

Chapter 19 - section 19.1

Contents and treatment as in “dynamic “ – A.V.Dharmapadan, S. Visvanathan printer and publishers-

Reference Books:

1. Dynamics – K. Viswanatha Naik and M. S. Kasi, Emerald Publishers.
2. Dynamics – A. V. Dharmapadam, S. Viswanathan Publishers.
3. Mechanics – Walter Grenier

CORE PAPER-XII

ALGEBRA– II

To teach the concepts of advance linear algebra.

After the completion of the course the student will be able to solving problem on type of matrixs.

Unit – 1

Vector spaces. Elementary basic concepts; linear independence and bases

Chapter 4: section 4.1 and 4.2

Unit – 2

Dual spaces

Chapter 4: section 4.3

Unit – 3

Inner product spaces.

Chapter 4: section 4.4

Unit – 4

Algebra of linear transformations; characteristic roots.

Chapter 6: section 6.1 and 6.2

Unit – 5

Matrices; canonical forms; triangular forms.

Chapter 6: section 6.3 and 6.4

Contents and treatment as in “ Topics in algebra ., I.N.Herstein wiley Eastern Ltd., (second edition).

Reference :

1. Surjeetsingh, Qazizameerudding, Modern algebra vikas publishing house 8th edition 2006.
2. seymorelipschutz, Beginning linear algebra , Tata Mc'graw hill , 2005
3. S.G Venkatachalapthy, modern algebra marghan publications. 2008
4. Ward chenay dewed Kincaid , Linear algebra theory and applications 1st Edition 2010.

CORE PAPER-XIII REAL ANALYSIS - II

To teach the concept of set, function, sequence and series of real numbers.

After the completion of the course the student will be able to solve problems on sets, functions, sequence and real numbers.

UNIT-I

Continuous function on metric spaces, Functions continuous at a point on the real line – open sets – closed sets- discontinuous functions on \mathbb{R}^1

Chapter : 5 section : 5.1,5.4,5.5,5.6. (omit 5.2,5.3) Page no. 113-115, 121-131.

UNIT-II

Connectedness, completeness and compactness. More about open sets- connected sets-bounded set and totally bounded set- complete metric space- compact metric spaces- continuous functions on compact metric space- continuity of the inverse function –uniform continuity.

Chapter : 6 section : 6.1-6.8 Page no. 133-155.

UNIT-III

Calculus Sets of measure zero- definition of the Riemann integral- Existence of the Riemann integral – Properties of the Riemann integral.

Chapter : 7 section : 7.1-7.4 Page no.156-169.

UNIT-IV

Derivatives- Rolle's theorem. Mean value theorem - Fundamental theorems of calculus.

Chapter : 7 section : 7.5,7.9 Page no. 170-194

UNIT-V

The elementary functions and sequence and series of the function. Taylor's theorem- L Hospital rule- sequence and series of the function.

Chapter : 8 section : 8.5, 8.7 (omit 8.1,8.2,8.3,8.5,8.6)

Chapter : 9 section : 9.1-9.4 (omit 9.5,9.6,9.7)

Contents and treatment as in “ Methods of Real analysis by Richard R.Goldberg.

Reference:

1. A First course in mathematical Analysis by D.Somasundram and B.Choudhary , Narosa publication.
2. Principles of mathematical analysis by Walter Rudin.
3. Mathematical Analysis by Tom.M.Apostol.

CORE PAPER-XIV COMPLEX ANALYSIS

To teach the concept of basic complex numbers and analytic function

After the completion of the course the student will be able to solving problem on complex plane

Unit – 1

Functions of a complex variable - mappings, limits - theorems on limits, continuity, derivatives, differentiation formulae - Cauchy-Riemann equations - sufficient conditions for differentiability- Cauchy-Riemann equations in polar form - Analytic functions - Harmonic functions.

Chapter 2 - Page 35-78

Unit – 2

Linear functions - The transformation $w = 1/z$ - linear fractional transformations - an implicit form - exponential and logarithmic transformations – transformation $w = \sin z$ - Preservation of angles.

Chapter 8 - Page 311-324, 330-336.

Unit – 3

Complex Valued functions- contours - contour integrals - Anti derivatives - Cauchy-Goursat theorem. Cauchy integral formula - derivatives of analytic function – Liouville's theorem and fundamental theorem of algebra -maximum moduli of functions.

Chapter 4 - Page 117-135, 142-156, 164-178

Unit – 4

Convergence of sequences and series – Taylor's series –Laurent's series - zeros of analytic functions.

Chapter 5 - Page 181-205

Unit – 5

Residues - Residue theorems- Three types of isolated singular points- Residues at poles- Zeros and poles of order "m" - Evaluation of improper integrals – Improper integrals involving sines and cosines - Definite integrals involving sines and cosines – Argument principle and Rouché's theorem.

Chapter 6 - Page 229-249,261-276

Chapter 7 - Page 288-296

Contents and treatment as in Complex variables and Applications (Eighth Edition) by James Ward Brown and Ruel V.Churchill, Mc.Grawhill Inc.

Reference book:

1. Complex analysis by P.Duraipandian and kayalal pachaiappas, S.Chand publications
2. Complex Analysis by venkatachalapathy.
3. Introduction to complex analysis S.Ponnuswamy, Narosa publishers.

CORE PAPER-XIV

OPERATIONS RESEARCH

To teach the concept of basic operation research.

After the completion of the course the student will be able to solving problem on linear programming.

UNIT-I

Linear Programming Formulation and Graphical method Formulation and Graphical solution- Requirements for employing LPP Techniques – Mathematical Formulation of LPP- basic assumptions- Graphical methods of the solution of a LPP –Some more cases.

Chapter : 2 section : 2.1-2.6 (omit 2.7,2.8) Page no.2.1-2.32

UNIT-II

General linear programming problem and Transportation modal General linear programming problem – canonical and standard forms of LPP- the simplex method – the simplex algorithm- artificial variables techniques- the big M method- the two phase method.

Transportation modal: mathematical formulation of a transportation problem- methods for finding initial basic feasible solution- NWCR-LCM-VAM- MODI method –unbalanced transportation problem- maximization case in transportation.

Chapter : 3 section : 3.1-3.2 Page no.3.1-3.53.

Chapter : 7 section : 7.1-7.5 Page no. 7.1-7.53.

UNIT-III

Assignment problem and sequencing problem. Mathematical formulation of an assignment problem- comparison with transportation modal- Difference between the Transportation problem and Assignment problem. Hungarian method- unbalanced Assignment problem.- maximization case in Assignment problem – restrictions in assignment – Travelling salesman problem.

Sequencing problems: sequencing problems- the following simplifying assumptions are made while procedure for determine the optimal sequence for n jobs on 2 machines- processing n jobs on three machines- processing n jobs on m machines- processing of two jobs on n machines- Graphical method.

Chapter : 8 section : 8.1-8.9 Page no. 8.1 - 8.39.

Chapter : 14 section : 14.1-14.7 Page no. 14.1 - 14.12.

UNIT-IV

Game theory – two person zero sum games- the maximin – minimax principal- saddle point and value on the game – games without saddle points – mixed strategies.- matrix odd ment method for $n \times n$ games graphical method for $2 \times n$ or $2 \times m$ games – linear programming method.

Chapter : 16 section : 16.1-16..8 Page no. 16.1- 16.45.

UNIT –V

PERT- CPM- Planning – Scheduling – Control – Basic Terminologies –Rules for Constructing a project network – ford and Fulkerson's Rule – Network computations – Floats – PERT – Difference between PERT and CPM- Cost consideration in PERT and CPM- Project scheduling with Limited Resources.

Chapter : 15 section : 15.1-15.9 Page no. 15.1-15.63.

Contents and treatment as in Operation Research (Resource management Techniques) V.Sundaresan A.R.S Publication 10th edition.

Reference book:

Operation research by J.K Sharma

Elective Paper: I

FUNDAMENTALS OF ACCOUNTING

To enable the students to learn the Principles and Concepts of Accountancy

UNIT – I

Accounting: Meaning- Definition –Nature and Scope of Accounting-Objectives Advantages – Accounting Cycles, Concepts and Conventions – Accounting Rules – Journal, Ledger and Trial Balance.

UNIT – II

Subsidiary books- meaning - types of subsidiary books- Purchase- Purchase Return - Sales - Sales Return Book - Cash Book-Single Column, Double Column and Triple column cash book.

UNIT III

Bank Reconciliation Statements: Reconciliation between Cash Book, Pass Book and overdraft - Problems relating to the preparation of Bank Reconciliation Statement

UNIT – IV

Preparation of final accounts – Trading, Profit and loss account and balance sheet (With Adjustments)

UNIT – V

Bills of exchange: Definition – features – advantages- types – Bills honoured and maturity- Bills discounted with bank – Bills endorsed to creditor – Bills for collection – Retiring of bill before due date – Dishonour of bill. Note: The Syllabus will have 20 % Theory and 80 % Problems.

Recommended book: 1. T.S.Reddy and A.Murthy Financial Accounting, Margham Publishers, 24, Rameshwaram Road, T.Nagar, Chennai -600017, 7th Edition – 2016.

Reference Books:

1. T.S. Grewal, Introduction to Accountancy, Sultan Chand & Company Ltd, 7361 Ram Nagar, New Delhi – 110 055, Edition 2014.
2. K.L.Narang, S.P.Jain, Advanced Accountancy, Kalyani Publishers, B-I/1292, Rajinder Nagar, Ludhiana – 141008, 18th Edition – 2014.
3. N. Vinayagam, P.L. Mani, K.L. Nagarajan, Principles of Accountancy, Eurasia Publishing House, Edition-2013
4. V. Rajasekaran & R. Lalitha, “Financial Accounting”, Pearson India Limited, New Delhi, 1st Edition, 2011.

Elective Paper: II
SPECIAL FUNCTIONS

To teach the concept of advanced equation and its applications

After the completion of the course the student will be able to solving problem on different type the equation.

Unit – 1

Introduction and Review of power series – Series solution of first order differential equations
Chapter 5 Sections 26 and 27.

Unit-2

Second order linear differential equations-Regular, singular points.
Chapter 5 Sections 28 and 29

Unit – 3

Regular singular points continued: Gauss's hyper geometric equations.
Chapter 5 Sections 30 and 31

Unit – 4

Legendre polynomials-Properties of Legendre polynomials
Chapter 8 Sections.44 and 45

Unit – 5

Bessel functions and Gamma functions-Properties of Bessel Functions.
Chapter 8 Sections 46 and 47

Contents and treatment as in Differential equations with Applications and Historical Notes by George F. Simmons Second Edition ,TataMcgraw Hill Publications.

Reference Books

1. Differential Equations by D. Raisinghania.2.Differential Equations by Ganesh C.Gorian

Elective Paper: III **GRAPH THEORY**

To teach the concept of advanced graphical and its applications

After the completion of the course the student will be able to solving problem on using the vertex and edges using the graphs.

Unit – 1

Graphs, sub graphs, degree of a vertex, isomorphism of graphs, independent sets and coverings, intersection graphs and line graphs, adjacency and incidence matrices, operations on graphs,
Chapter 2 Sections 2.0 – 2.9

Unit – 2

Degree sequences and graphic sequences – simple problems. Connectedness, walks, trails, paths, components, bridge, block, connectivity – simple problems.
Chapter 3 Sections 3.0 – 3.2 , Chapter 4 Sections 4.0 – 4.4

Unit – 3

Eulerian and Hamiltonian graphs

Chapter 5 Sections 5.0 – 5.2

Unit – 4

Trees – simple problems. Planarity : Definition and properties, characterization of planar graphs.
Chapter 6 Sections 6.0 – 6.2 ,Chapter 8 Sections 8.0 – 8.2

Unit – 5

Digraphs and matrices, tournaments, some application connector problem

Chapter 10 Sections 10.0 – 10.4 ,Chapter 11 Sections 11.0 – 11.1

Content and treatment as in Invitation to Graph Theory by S.Arumugam and S.Ramachandran, New Gamma Publishing House, Palayamkottai

Reference Books:

1. A first book at graph theory by John Clark and Derek Allan Holton, Allied publishers
2. Graph Theory by S.Kumaravelu and SusheelaKumaravelu,Publishers authors C/o 182 Chidambara Nagar, Nagarkoil

Elective Paper: IV
ELEMENTARY NUMBER THEORY

To teach the concept of basic mathematics using number.

After the completion of the course the student will be able to solving problem on relationship between the numbers.

Unit 1

Introduction – divisibility- primes- The Binomial theorem

Chapter 1 Sections - 1.1 to 1.4

Unit 2

Congruences, Solution of Congruences, Chinese Remainder Theorem- primitive roots and power Residues- Number Theory from an Algebraic view point - Groups, rings and fields.

Chapter – 2 Sections 2.1 to 2.3, 2.8 (cor 2.42, Th 2.43 and cor 2.44 are omitted) - 2.10.- 2.11

Unit 3

Quadratic Residues , Quadratic reciprocity , The Jacobi Symbol

Chapter – 3 Sections 3.1 to 3.3

Unit 4

Greatest Integer Function, Arithmetic function, The Mobius Inversion formula Combinational Number Theory

Chapter – 4 Sections 4.1 to 4.3 and 4.5

Unit 5

The equation $ax+by=c$, Simultaneous Linear Equations, Pythagorean Triangle, Assorted examples.

Chapter – 5 Sections 5.1 to 5.4

Content and treatment as in - An introduction to the Theory of Numbers (Vth edition) by Ivan Niven, Herbert S. Zuckerman and Hugh L. Montgomery John Wiley & Sons, Inc.2001.

Reference Books:

1. Elementary theory of numbers, C.Y.Hsiung, Allied publishers,
2. Elementary Number Theory, Allyn and Bacon Inc., Boston,
3. Introduction to Analytic Number Theory, Tom. M. Apostol, Narosa Publishing House, New Delhi,

Elective Paper: V
PROGRAMMING LANGUAGE 'C' WITH PRACTICALS&THEORY

To teach the concept of language C.

After the completion of the course the student will be able to solving problem very short time using the C language of some special programme.

Unit - 1

Introduction. Constants-Variables-Data-types (Fundamental and user defined) Operators-Precedence of operators – Library functions –Input ,Output statements-Escape sequences-Formatted outputs – Storage classes -Compiler directives.

Chapter 2 Sections 2.1 - 2.8 , Chapter 3 Sections 3.1 – 3.7, 3.12 ,Chapter 4 Sections 4.2 – 4.5

Unit – 2

Decision making and branching: Simple if, if e lse, nested if, else if ladder and switch statement – conditional operator – go to statement. Decision making and looping : while, do while and for statement – nested for loops – continue and break statements.

Chapter 5 Sections 5.1 – 5.9 ,Chapter 6 Sections 6.1 – 6.5

Unit - 3

Arrays : One dimensional and 2 dimensional arrays – declarations – initialization of arrays– Operation on strings-String handling functions.

Chapter 7 Sections 7.1 – 7.4 ,Chapter 8 Sections 8.1 – 8.8

Unit – 4

Functions : Function definition and declaration – Categories of functions – recursion – Concept of pointers. Function call by reference - call by value.

Chapter 9 Sections 9.1 – 9.13 Chapter 11 Sections11.1-11.5

Unit – 5

Definition, operations on files- file operation functions. Chapter 12, Sections 12.1 – 12.

Content and Treatment as in Programming in ANSI C 2nd edition by E.Balagurusamy, Tata-Mcgraw Hill Publishing Company.

Reference Books:

1. Venugopal, programming in C
2. Gottfried, B.S : programming with C , Schaum"s outline series, TMH 2001
3. YashvantKanitkar, Let us 'C ' BPB Publications

PRACTICALS Writing “C” programs for the following:

1. To convert centigrade to Fahrenheit
2. To find the area, circumference of a circle
3. To convert days into months and days
4. To solve a quadratic equation
5. To find sum of n numbers
6. To find the largest and smallest numbers
7. To generate Pascal’s triangle, Floyd’s triangle
8. To find the trace of a matrix
9. To add and subtract two matrices
10. To multiply two matrices
11. To generate Fibonacci series using functions
12. To compute factorial of a given number, using functions
13. To add complex numbers using functions
14. To concatenate two strings using string handling functions
15. To check whether the given string is a palindrome or not using string handling functions

Elective Paper: VI
DISCRETE MATHEMATICS

To teach the concept of discrete mathematics.

After the completion of the course the student will be able to solving problem very logically.

Unit- 1

Set, some basic properties of integers, Mathematical induction, divisibility of integers, representation of positive integers Chapter 1 - Sections 1.1 to 1.5

Unit – 2

Boolean algebra, two element Boolean algebra, Disjunctive normal form, Conjunctive normal form Chapter 5 - Sections 5.1 to 5.4

Unit – 3

Application, Simplification of circuits, Designing of switching circuits, Logical Gates and Combinatorial circuits.

Chapter 5 - Section 5.5, 5.6

Unit – 4

Sequence and recurrence relation, Solving recurrence relations by iteration method, Modeling of counting problems by recurrence relations, Linear (difference equations) recurrence relations with constant coefficients, Generating functions, Sum and product of two generating functions, Useful generating functions, Combinatorial problems.

Chapter 6 - Section 6.1 to 6.6

Unit – 5

Introduction, Walk, Path and cycles, Euler circuit Chapter 7 - Sections 7.1 to 7.3

Contents and treatment as in introduction to Discrete Mathematics, 2nd edition, 2002 by M. K. Sen and B. C. Chakraborty, Books and Allied Private Ltd., Kolkata.

Reference Books:

1. Discrete mathematics for computer scientists and mathematicians by J. L. Mertz, Abraham Kendel and T. P. Baker prentice-hall, India.
2. Discrete mathematics for computer scientists by John Truss-Addison Wesley.
3. Elements of Discrete Mathematics, C. L. Liu, New York McGraw-Hill, 1977

Elective Paper: VII
MATHEMATICAL MODELING

To teach the concept of situations requiring mathematical modeling.

After the completion of the course the student will be able to solving problem based on modeling

Unit-1

Mathematical Modeling : Simple situations requiring mathematical modeling, characteristics of mathematical model.

Chapter 1 Sections 1.1-1.5

Unit – 2

Mathematical Modeling through differential equations: Linear Growth and Decay Models. Non-Linear growth and decay models, Compartment models.

Chapter 2 Sections 2.1- 2.4

Unit – 3

Mathematical Modeling, through system of Ordinary differential equations of first order: Prey-predator models, Competition models, Model with removal and model with immigrations.

Epidemics: simple epidemic model, Susceptible-infected-susceptible(SIS) model, SIS model with constant number of carriers.

Medicine: Model for Diabetes Mellitus.

Chapter 3 Sections 3.11,3.12,3.2.and 3.51

Unit – 4

Introduction to difference equations.

Chapter 5 Sections 5.1 and 5.2

Unit - 5

Mathematical Modeling, through difference equations:Harrod Model, cobweb model application to Actuarial Science

Sections 5.3 (5.3.3 not included)

Content and treatment as in

J N Kapur, Mathematical Modeling, New Age International publishers.(2009)

Reference Books:-

1. Mathematical Modeling by Bimal k . Mishra and Dipak K.Satpathi

Elective Paper: VIII
MATRIX THEORY

After the completion of the course the student will be able to solving problem using matrix

Unit-1

Determinants
Page 948-978

Unit – 2

Algebra of matrices
Page 979-1004

Unit – 3

Rank of matrices
Page 1005 - 1015

Unit – 4

In Consistency of linear system of equation and their solution.
Page 1016-1044

Unit - 5

Eigen valus, vector and Caley Hamilton theorem, Diagonalisation.
Page 1045-1095

Content and treatment as in

Mathematical physis by H.K.Dass and DR. Ramaverma, S.chand Publications.

Reference:

1. Algebra: by S. Arumugam (New Gama publishing house, Palayamkottai)

Elective Paper: IX
ASTRONOMY

To teach the concept of introduce the students to space science.

After the completion of the course the student will be able to know the important features of the planets , sun, moon and stellar universe

UNIT 1

Selestial sphere – Diurnal motion – Simple problems.

UNIT 2

Zones of earth – Terrestrial latitudes and longitudes – Rotation of earth, Dip of the horizon – Simple problems.

UNIT 3

Twilight – Simple problems – Astronomical refraction – Simple problems (No derivativation).

UNIT 4

Kepler’s law – Simple problems

Page 172-189. (Use results of 159, 160 to solve the problems. No needed to derive the results).

UNIT 5

Moon phases of moon – Eclipse – Introduction – Umbra and Pen umbra – Lunar Eclipse – Solar eclipse – Condition for the occurrence of Lunar and Solar Eclipse.

Page 334 – 377. (Use results of 270, 271, 272 to solve the problems. No needed to derive the results).

RECOMMENDED TEXT

S. Kumaravelu and Susheela Kumaravelu. (2004) Astronomy. SKV PUBLISHERS, NAGARKOIL.

Reference book:

1. Astronomy for graduate & post graudege classes byr rukmani ramachandran,
2. Astronomy by G.V.Ramachandran, mission press, palayamkottai.

Department Offers the Allied Papers

For B.Sc., Mathematics & Computer Science, MBA, M.Com

Title of the Paper	Statistics-I
To teach the concept of sampling distribution , and theory of estimations , some special tests After the completion of the course the student will be able to analysis the data using specific tests	
Unit I	Sampling Distribution, Chapter-1, Sec 1.1-1.17
Unit II	Sampling Distribution Concepts, Chapter-2, Sec 2.1-2.14
Unit III	Theory of Estimation, Chapter-3, Sec 3.1-3.16
Unit IV	Test of Significance, Chapter-4, Sec 4.1-4.14
Unit V	Chi-Square Test, Chapter-5, Sec 5.1-5.11
Recommended Text Book	Statistics for management by P.N.Arora and S.Arora, S.Chand publications.
Reference Book	1. Guptha, S.C and Kapoor.V.K, Fundamentals of Mathematical Statistics, S. Chand & Sons, 2002. 2. S. P. Gupta, Statistical Methods, S. Chand, 2002. 3. John. E. Freund's , "Mathematical statistics with applications, Dorling EindersleyPvt.Ltd, 2014.

Department Offers the Allied Papers

For B.Sc., Mathematics & Computer Science, MBA, M.Com

Title of the Paper	Statistics-II
	To teach the concept of basic complex numbers and analytic function After the completion of the course the student will be able to solving problem on complex plane
Unit I	F-Distribution and ANOVA Table, Chapter-6, Sec 6.1-6.14
Unit II	Correlation Analysis, Chapter-7, Sec 7.1-7.16
Unit III	Regression Analysis, Chapter-8, Sec 8.1-8.17
Unit IV	Non- Parametric Methods, Chapter-10, Sec 10.1-10.9
Unit V	Non- Parametric Methods, Chapter-10, Sec 10.10-10.15
Recommended Text Book	Statistics for management by P.N.Arora and S.Arora, S.Chand publications.
Reference Book	1. Guptha, S.C and Kapoor.V.K, Fundamentals of Mathematical Statistics, S. Chand & Sons, 2002. 2. S. P. Gupta, Statistical Methods, S. Chand, 2002.

Department Offers the Allied Papers
For B.Sc Computer Science, BCA, Physics, CST

Mathematics -I

UNIT – I

Numerical Methods: Newton-Raphson method; Newton's forward and backward interpolation formulae for equal intervals, Lagrange's interpolation formula.

UNIT- II

Symmetric, Skew-Symmetric, Orthogonal, Hermetian, Skew-Hermetian and Unitary matrices. Eigen values and Eigen-vectors, Cayley-Hamilton theorem (without proof)

UNIT- III

Polynomial equations with real coefficients, irrational roots, complex roots, symmetric functions of roots, transformation of equation by increasing or decreasing roots by a constant, reciprocal equation.

UNIT IV

Expansions of $\sin(n\theta)$ and $\cos(n\theta)$ in a series of powers of $\sin\theta$ and $\cos\theta$ - Expansions of $\sin^n\theta$, $\cos^n\theta$, $\tan^n\theta$ in a series of sines, cosines and tangents of multiples of " θ " - Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in a series of powers of " θ ".

UNIT V

Successive differentiation, n^{th} derivatives, Leibnitz theorem (without proof) and applications, Jacobians, Curvature and radius of curvature in Cartesian co-ordinates,

Recommended Text

Allied Mathematics by Dr. A. Singaravelu.

Reference Book:

All Allied Mathematics books.

Department Offers the Allied Papers
For B.Sc Computer Science, BCA, Physics, CST

Mathematics -II

Unit-I

Bernoulli's formula. Reduction formulae $-\int_0^{\frac{\pi}{2}} \sin^n x dx$, $\int_0^{\frac{\pi}{2}} \cos^n x dx$, $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x dx$ (m, n being positive integers), Fourier series for functions in $(\alpha, \alpha + 2\pi)$,

Unit-II

Ordinary Differential Equations: second order non- homogeneous differential equations with constant coefficients of the form $ay'' + by' + cy = X$ where X is of the form $e^{\alpha x} \cos \beta x$ and $e^{\alpha x} \sin \beta x$

Unit-III

Partial Differential Equations: Formation, complete integrals and general integrals, four standard types and solving Lagrange's linear equation $Pp + Qq = R$

Unit-IV

LAPLACE TRANSFORMS:

Laplace transformations of standard functions and simple properties, inverse Laplace transforms, Application to solution of linear differential equations up to 2nd order- simple problems.

Unit – IV

VECTOR DIFFERENTIATION

Introduction, Scalar point functions, Vector point functions, Vector differential operator ∇ , Gradient, Divergence, Curl, Solenoidal, irrotational, identities.

Recommended Text

Allied Mathematics by Dr. A. Singaravelu.

Reference Book:

All Allied Mathematics books.

Department Offers the Allied Papers
For BCA, CST

Mathematics –III

Unit-1:

Introduction- Mathematical Preliminaries- Errors: Computations, Formula - Errors in a Series Approximation- Roots of Equations- Linear Equations: Bisection, False Position Methods- Newton-Raphson Method- Secant Method.

Unit-2:

Simultaneous Linear Equations: Gauss Elimination, Gauss-Jordan, LU Decomposition Methods- Gauss-Seidel Method

Unit-3:

Numerical Differentiation- Errors in Numerical Differentiation- Cubic Spline Method- Numerical Integration- Trapezoidal Rule- Simpson's 1/3 and 3/8 Rules-

Unit-4:

Romberg Integration- Ordinary Differential Equations- Taylor's Series Method- Euler's Method- Runge-Kutta 2nd and 4th Order Methods

Unit-5:

Sampling- Frequency Distribution- Cumulative Frequency Function- Grouped Sample- Measures of Central Tendency: Mean, Median and Mode- Geometric Mean- Harmonic Mean

Recommended Texts

1. S.S.Sastry, 2005, Introductory Methods of Numerical Analysis, 4th Edition, Prentice- Hall of India Pvt. Ltd..(For Unit 1,2)
2. SC.Gupta, Fundamental of Mathematical Statistics (For Unit3,4,5)

Department Offers the Allied Papers
For BCA

Mathematics -IV

UNIT-I

Mathematical Formulation of LPP- basic assumptions- Graphical methods of the solution of a LPP –

UNIT-II

Transportation modal: mathematical formulation of a transportation problem- methods for finding initial basic feasible solution- NWCR-LCM-VAM- MODI method –unbalanced transportation

UNIT-III

Assignment problem.Hungarian method- unbalanced Assignment problem.- maximization case in Assignment problem – restrictions in assignment – Travelling salesman problem.

UNIT-IV

Sequencing problems: sequencing problems- the following simplifying assumptions are made while procedure for determine the optimal sequence for n jobs on 2 machines- processing n jobs on three machines- processing n jobs on m machines- processing of two jobs on n machines- Graphical method.

UNIT –V

PERT- CPM- Planning – Scheduling – Control – Basic Terminologies –Rules for Constructing a project network – ford and Fulkerson’s Rule – Network computations .

Recommended Text:

Operation Research (Resource management Techniques) V.Sundaresan A.R.S Publication 10th edition.

Reference book:

Operation research by J.K Sharma

SRI SANKARA ARTS AND SCIENCE COLLEGE
AUTONOMOUS
CHOICE BASED CREDIT SYSTEM (CBCS)
M.Sc Mathematics
(Effective from the academic year 2019 – 2020)

M.Sc Mathematics

S.No	Study Components	M.Sc.,		
		Number of papers	Credits per paper	Total Credits
1	Core Papers	15	4	60
2	Elective Papers	5	3	15
3	Extra Disciplinary Papers	2	3	6
4	Internship	1	2	2
5	Soft Skills	4	2	8
Total				91

Effective from the academic year 2019-2020
M.Sc Mathematics
Scheme of Examination

I Semester

Course Components/ Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Core Paper I Algebra-I	4	6	25	75	100
Core Paper II Mathematical Analysis	4	6	25	75	100
Core Paper III Ordinary Differential Equations	4	6	25	75	100
Core Paper IV Graph Theory	4	6	25	75	100
Elective Paper-I Choose one from Group -A	3	3	25	75	100
Soft Skill Paper-I	2	1	40	60	100

GROUP - A

1. Automata Theory
2. Advance Discrete Mathematics
3. Number Theory

II Semester

Course Components/ Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Core Paper V Algebra-II	4	5	25	75	100
Core Paper VI Measure Theory and Integration	4	5	25	75	100
Core Paper VII Partial Differential Equations	4	5	25	75	100
Core Paper VIII Probability Theory	4	5	25	75	100
Elective Paper-II Choose one from Group -B	3	5	25	75	100
Extra Disciplinary Paper-I Choose one paper from Group C	3	5			
Soft Skill-II	2	1	40	60	100
Internship	2	-	-	-	-

GROUP - B

1. Fuzzy Theory
2. Wavelets
3. Advanced Mathematical Programming

GROUP-C

1. C++
2. Financial Mathematics
3. Mathematical Economics

III Semester

Course Components/ Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Core Paper IX Complex Analysis-I	4	6	25	75	100
Core Paper X Topology	4	6	25	75	100
Core Paper XI Operations Research	4	6	25	75	100
Elective Paper-III Choose one paper from Group D	3	5	25	75	100
Extra Disciplinary Paper-I Choose one paper from Group E	3	5	25	75	100
Soft Skill-III	2	2	40	60	100

GROUP - D

1. Calculus of Variation and Integral Equation
2. Optimization Techniques

GROUP - E

1. Java Programming
2. Data structure and Algorithms

IV Semester

Course Components/ Title of the Paper	Credits	Ins Hours	CIA	EXT	Total
Core Paper XII Complex Analysis-II	4	5	25	75	100
Core Paper XIII Functional Analysis	4	5	25	75	100
Core Paper XIV Differential Geometry	4	5	25	75	100
Core Paper XV Mechanics	4	5	25	75	100
Elective Paper-IV Choose one paper from Group F	3	4	25	75	100
Elective Paper-IV Choose one paper from Group G	3	4	25	75	100
Soft Skill-IV	2	2	40	60	100

GROUP - F

1. Design and Analysis of Algorithms
2. Fluid Dynamics

GROUP - G

1. Tensor Analysis and relativity theory
2. Stochastic Process

CORE PAPER- I ALGEBRA-I

To introduce the concept and to develop knowledge on Algebraic Structures like Ring, Field, vector space and modules

UNIT I

Group actions on a set, Sylow theorems - Applications of Sylow theorems.
Chapter 2: Section 2.12

UNIT II

Direct products - Finite abelian groups- Modules
Chapter 2: Sections 2.13 and 2.14 Chapter 4: Section 4.5

UNIT III

Linear Transformations - Canonical forms -Triangular form – Nilpotent transformations.
Chapter 6: Sections 6.4 , 6.5

UNIT IV

Jordan form - rational canonical form.
Chapter 6:Sections 6.6 and 6.7

UNIT V

Trace and transpose - Hermitian, unitary, normal transformations, real quadratic form.
Chapter 6 : Sections 6.8, 6.10 and 6.11 (Omit 6.9)

Recommended Text:

I.N. Herstein. Topics in Algebra (II Edition) Wiley, 2002.

Reference Book

1. M. Artin, Algebra, Prentice Hall of India, 1991.
2. P. B. Bhattacharya, S. K. Jain, and S.R. Nagpaul, Basic Abstract Algebra (II Edition) Cambridge University Press, 1997. (Indian Edition)
3. D. S. Dummit and R. M. Foote, Abstract Algebra, 2nd edition, Wiley, 2002.
4. I. S. Luther and I. B. S. Passi, Algebra, Vol. I - Groups(1996); Vol. II Rings, (1999) Narosa Publishing House , New Delhi.
5. N. Jacobson, Basic Algebra, Vol. I & II Hindustan Publishing Company, New Delhi.

CORE PAPER-II MATHEMATICAL ANALYSIS-I

To give the students a thorough knowledge of the various aspects of Real line and the Lebesgue theory. This course give the knowledge for any advanced learning in Pure Mathematics.

Unit I

Basic Topology: Metric spaces-Compact sets - Perfect sets - Connected sets.
Chapter-2:Pages 30-43

Unit II

Continuity: Limits of functions - continuous functions - continuity and compactness.
Chapter-4:Pages 83-93

Unit III

Continuity: continuity and connectedness - discontinuities - monotonic functions - infinite limits and limits at infinity.
Chapter-4:Pages 93-98

Unit IV

Differentiation: Mean Value theorems - The Continuity of the derivatives - L' Hospitals rules - Derivatives of higher order - Taylor's theorem.
Chapter-5:Pages 107-111

Unit V

The Lebesgue Theory: Set functions - construction of the Lebesgue measure - Measure spaces - Measurable functions.
Chapter-11:Pages 300-313

Recommended Text Book

Principles of Mathematical Analysis, Walter Rudin, Third Edition, McGraw Hill Education (2013)(India) Private Limited

Reference Book

1. Tom Apostol, Mathematical Analysis, Addison – Wesley Publishing Company, London 1971.
2. Richard R.Goldberg, Methods of Real Analysis, Oxford & IBH Publishing Company(Last reprint),2017.
3. H.L.Roydan, Real Analysis, Pearson Education (Singapore) Pvt. Ltd. Third Edition, (Reprint)
4. Malik. S. C, and SavitaArora. Mathematical Analysis, Wiley Eastern Limited. New Delhi, 1991.

CORE PAPER- III

ORDINARY DIFFERENTIAL EQUATIONS

To develop strong background on finding solutions to linear differential equations with constant and variable coefficients and also with singular points, to study existence and uniqueness of the solutions of first order differential equations.

UNIT-I :

Linear equations with constant coefficients: Second order homogeneous equations-Initial value problems-Linear dependence and independence - Wronskian and a formula for Wronskian - Non-homogeneous equation of order two.

Chapter 2: Sections 1 to 6

UNIT-II :

Linear equations with constant coefficients: Homogeneous and non-homogeneous equation of order n –Initial value problems-Annihilator method to solve non-homogeneous equation.

Chapter 2 : Sections 7 to 11.

UNIT-III :

Linear equations with variable coefficient: Initial value problems -Existence and uniqueness theorems – Solutions to solve a non- homogeneous equation – Wronskian and linear dependence – Reduction of the order of a homogeneous equation – Homogeneous equation with analytic coefficients-The Legendre equation.

Chapter : 3 Sections 1 to 8 (omit section 9)

UNIT-IV :

Linear equation with regular singular points Second order equations with regular singular points –Exceptional cases – Bessel equation .

Chapter 4 : Sections 3, 4 and 6 to 8 (omit sections 5 and 9)

UNIT-V :

Existence and uniqueness of solutions to first order equations: Equation with variable separated – Exact equation – Method of successive approximations – the Lipschitz condition – Convergence of the successive approximations and the existence theorem.

Chapter 5 : Sections 1 to 6 (omit Sections 7 to 9)

Recommended Text

E.A.Coddington, An introduction to ordinary differential equations (3rd Printing) Prentice-Hall of India Ltd.,New Delhi, 1987.

Reference Book

1. George F Simmons, Differential equations with applications and historical notes, Tata McGraw Hill, New Delhi, 1974.
2. M. D.Raisinghania, Advanced Differential Equations, S.Chand& Company Ltd. New Delhi,2001
3. S.G. Deo, Lakshmikantham, V. Raghavendra, Textbook of Ordinary Differential Equations, Second Edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 1997.

CORE PAPER- IV GRAPH THEORY

To study the concepts of graphs, subgraphs, connected graphs, Hamilton cycles, coloring of graphs, independent sets, cliques, vertex coloring, and colouring of maps

UNIT-I

Graphs, subgraphs and Trees : Graphs and simple graphs – Graph Isomorphism – The Incidence and Adjacency Matrices – Subgraphs – Vertex Degrees – Paths and Connection – Cycles – Trees – Cut Edges and Bonds – Cut Vertices.

Chapter 1:Section 1.1 – 1.7

Chapter 2:Section 2.1 – 2.3

UNIT-II

Connectivity, Euler tours and Hamilton Cycles : Connectivity – Blocks – Euler tours – Hamilton Cycles.

Chapter 3:Section 3.1 – 3.2

Chapter 4:Section 4.1 – 4.2

UNIT-III

Matchings, Edge Colourings : Matchings – Matchings and Coverings in Bipartite Graphs – Edge Chromatic Number – Vizing's Theorem.

Chapter 5:Section 5.1 – 5.2

Chapter 6:Section 6.1 – 6.2

UNIT-IV

Independent sets and Cliques, Vertex Colourings : Independent sets – Ramsey's Theorem – Chromatic Number – Brooks' Theorem – Chromatic Polynomials.

Chapter 7:Section 7.1 – 7.2

Chapter 8:Section 8.1 – 8.2, 8.4

UNIT-V

Planar graphs : Plane and planar Graphs – Dual graphs – Euler's Formula – The Five- Colour Theorem and the Four-Colour Conjecture.

Chapter 9:Section 9.1 – 9.3, 9.6

Recommended Text

J.A.Bondy and U.S.R. Murthy , Graph Theory and Applications , Macmillan, London, 1976.

Reference Book

1. J.Clark and D.A.Holton ,A First look at Graph Theory, Allied Publishers, New Delhi , 1995.

2. R. Gould. Graph Theory, Benjamin/Cummings, Menlo Park, 1989.

3. A.Gibbons, Algorithmic Graph Theory, Cambridge University Press, Cambridge, 1989.

4. R. Balakrishnan, K. Ranganathan, A Textbook of Graph Theory, Springer International Edition, New Delhi, 2008.

CORE PAPER V
ALGEBRA – II

To teach the concept of Ring theory and fields

After the completion of the course the student will be able to problems about ring and fields

UNIT - I

Extension fields - Transcendence of e .

Chapter 5: Section 5.1 and 5.2

UNIT – II

Roots or Polynomials.- More about roots

Chapter 5: Sections 5.3 and 5.5

UNIT – III

Elements of Galois Theory.

Chapter 5: Section 5.6

UNIT – IV

Finite fields - Wedderburn's theorem on finite division rings

Chapter 7: Sections 7.1 and 7.2 (Theorem 7.2.1 only)

UNIT – V

Galois groups over the Rationals -- A theorem of Frobenius.

Chapter 5: Sections 5.8

Chapter 7: Sections 7.3

Recommended text book:

I.N. Herstein. Topics in Algebra (II Edition) Wiley 2002.

Reference Book

1.M. Artin, Algebra, Prentice Hall of India, 1991.

2. P. B. Bhattacharya, S. K. Jain, and S.R. Nagpaul, Basic Abstract Algebra (II Edition)
Cambridge University Press, 1997. (Indian Edition)

3. D. S. Dummit and R. M. Foote, Abstract Algebra, 2nd edition, Wiley, 2002.

CORE PAPER VI MEASURE THEORY AND INTEGRATION

To teach the concept of measure set and functions

After the completion of the course the student will be able to solve the Lebesgue integrals problems.

Unit-I

Measurable Sets: Length of sets - Outer Measure - Lebesgue Measure - Properties of Measurable sets,

Chapter 3:Section 3.1-3.4

Unit-II

Measurable Sets: Borel sets and their Measurability - further properties of Measurable sets - Characterisations of Measurable sets

Chapter 3: Section 3.5-3.7

Unit-III

Measurable Sets: Non Measurable sets. Measurable functions: Definition - properties of Measurable functions - step functions - operations on Measurable functions.

Chapter 3: Section 3.8

Chapter 4: Section 4.1- 4.4

Unit-IV

Measurable Functions: Characteristic function - simple function - Continuous function - sets of Measure zero.

Chapter 4:Section 4.5-4.8

Unit-V

Lebesgue Integral: Riemann Integral - Lebesgue Integral of a Bounded function -

Comparison of Riemann Integral and Lebesgue Integral - Properties of the Lebesgue integral for bounded Measurable functions.

Chapter 5:Section 5.1-5.4

Recommended text

Lebesgue Measure and Integration P.K.Jain, V.P Gupta, Pankaj Jain New Age International Publishers, 2nd Edition 2011.

Reference Book

1. G. de Barra, Measure Theory and Integration, New Age International,2003
2. H.L. Royden, Real Analysis, Third Edition, Prentice Hall of India, New Delhi, 2007.
3. Walter Rudin, Real and Complex Analysis, Mc-Graw Hill Book Company, New York, 1970.

CORE PAPER VII PARTIAL DIFFERENTIAL EQUATIONS

To teach the concept of Riemann methods

After the completion of the course the student will be able to solve the partial differential equations.

UNIT-I

Mathematical Models and Classification of second order equation : Classical equations- Vibrating string – Vibrating membrane – waves in elastic medium – Conduction of heat in solids – Gravitational potential – Second order equations in two independent variables – canonical forms – equations with constant coefficients – general solution

Chapter 3: Sections 3.1- 3.6,

Chapter 4: Sections 4.1 - 4.4

UNIT-II

Cauchy Problem : The Cauchy problem – Cauchy-Kowalewsky theorem – Homogeneous wave equation – Initial Boundary value problem- Non-homogeneous boundary conditions – Finite string with fixed ends.

Chapter 5: Sections 5.1 - 5.6

UNIT-III

Cauchy Problem: Non-homogeneous wave equation – Riemann method – Goursat problem – spherical wave equation – cylindrical wave equation.

Chapter 5: Sections 5.7 - 5.11

UNIT-IV

Method of separation of variables: Separation of variable- Vibrating string problem – Existence and uniqueness of solution of vibrating string problem.

Chapter 7: Sections 7.1 - 7.4

UNIT-V

Method of separation of variables: Heat conduction problem – Existence and uniqueness of solution of heat conduction problem – Laplace and beam equations

Chapter 7: Sections 7.5 - 7.7

Recommended Text

Tyn Myint-U and Lokenath Debnath, Partial Differential Equations for Scientists and Engineers (Third Edition), North Hollan, New York, 1987.

Reference Book

1. R.C Mc.Owen, Partial Differential Equations, 2nd edition Pearson Education. New Delhi,2005.
2. Ian.Sneddon, Elements of Partial Differential Equations, McGraw Hill, New Delhi, 1983.

CORE PAPER VIII PROBABILITY THEORY

To teach the concept of probability and stochastic convergence
After the completion of the course the student will be able to solve the problem about Chebyshev.

UNIT-I

Random Events and Random Variables: Random events – Probability axioms – Combinatorial formulae – conditional probability – Bayes Theorem – Independent events – Random Variables – Distribution Function – Joint Distribution – Marginal Distribution – Conditional Distribution – Independent random variables – Functions of random variables.

Chapter 1: Sections 1.1 - 1.7,

Chapter 2: Sections 2.1 - 2.9

UNIT-II

Parameters of the Distribution: Expectation- Moments – The Chebyshev Inequality – Absolute moments – Order parameters – Moments of random vectors – Regression of the first and second types.

Chapter 3: Sections 3.1 - 3.8

UNIT-III

Characteristic functions: Properties of characteristic functions – Characteristic functions and moments – semi-invariants – characteristic function of the sum of the independent random variables – Determination of distribution function by the Characteristic function – Characteristic function of multidimensional random vectors – Probability generating functions.

Chapter 4: Sections 4.1 - 4.7

UNIT-IV

Some Probability distributions: One point , two point , Binomial – Polya – Hyper geometric – Poisson (discrete) distributions – Uniform – normal gamma – Beta – Cauchy and Laplace (continuous) distributions.

Chapter 5: Section 5.1 - 5.10 (Omit Section 5.11)

UNIT-V

Limit Theorems: Stochastic convergence – Bernoulli law of large numbers – Convergence of sequence of distribution functions – Levy-Cramer Theorems

Chapter 6: Sections 6.1 - 6.6(Omit Sections 6.5)

Recommended Text

M. Fisz, Probability Theory and Mathematical Statistics, John Wiley and Sons, New York, 1963.

Reference Book

1. R.B. Ash, Real Analysis and Probability, Academic Press, New York, 1972
2. K.L.Chung, A course in Probability, Academic Press, New York, 1974.

CORE PAPER -IX COMPLEX ANALYSIS-I

To study metric space and elementary properties of analytic functions and familiar with the concept of complex integration so as to apply Cauchy's theorem.

Unit -I

Elementary point set topology: Sets and Elements – Metric spaces – connectedness – Compactness – Continuous function – Topological space.

Chapter 3: Section 1. 1.1 – 1.6 (page no. 50 – 66)

Unit-II

Elementary Conformal Mappings: Conformality: Arcs and closed curve – Analytical function in regions – Conformal Mappings. Linear transformations: The linear group – the cross ratio – symmetry. The use of Level curves – A surveys of Elementary mappings – elementary Riemann surface.

Chapter 3: Section 2: 2.1 – 2.3 (page no. 67 -75)

Section 3: 3.1 – 3.3 (page no. 76 – 82)

Section 4: 4.1 – 4.3 (page no. 89 – 99).

Unit -III

Cauchy Integral formula: The index of a point with respect to a closed curve – the integral formula – higher derivatives. Local properties of analytic functions: removable singularities – Taylors theorem Zeros and poles – the local mapping – the maximum principle.

Chapter 4: Section 2: 2.1 – 2.3 (page no. 114 – 122)

Section 3: 3.1 – 3.4 (page no. 124 – 135).

Unit-IV

The general form of Cauchy's theorem: Chains and Cycles – Simple connectivity – Homotopy – The general statement of Cauchy's theorem - The proof of Cauchy's theorem – Multiply connected regions – Residue theorem – the Argument Principle.

Chapter 4: Section 4: 4.1 – 4.5 and 4.7 (omit 4.6)

Section 5: 5.1 and 5.2 (page no. 137 – 154)

Unit-V

Evaluation of Definite Integrals and Harmonic functions: Evaluation of definite integrals – Definition of Harmonic functions and basic properties – Mean value property – Poisson formula.

Chapter 4: Section 5: 5.3 only

Section 6: 6.1 – 6.5 (page no. 154 – 172)

Recommended text book:

Lars V. Ahlfors, Complex Analysis, (3rd edition) McGraw Hill Co., Newyork, 1979.

Reference book

1. H.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford, 2003.
2. T.W Gamelin, Complex Analysis, Springer International Edition, 2004.
3. S.Ponnusamy, Foundations of Complex Analysis, Second Edition, Narosa Publishing House, India, 2005.

CORE PAPER - X
TOPOLOGY

To develop analytical thinking and the study of Continuity, Connectivity, Connectedness, Compactness in Topological spaces and the separation axioms.

Unit - I

Topological spaces and Continuous Functions :Topological spaces – basic for a topology – the order topology – the product topology on $X \times Y$ – the subspace topology – closed sets and limit points – continuous functions – the product topology.

Chapter -2:Section 12-19 (Page Nos 75 – 112)

Unit - II

Topological spaces and Continuous Functions :The metric topology – the quotient topology.

Chapter-2 Section 20-22(Page Nos 119 – 145)

Unit - III

Connectedness and Compactness :Connected space – connected subspaces of the real line – Components and local connectedness – Compact spaces.

Chapter-3:Section 23-26 (Page Nos 147 – 170)

Unit – IV

Connectedness and Compactness:Compact subspaces of the real line – limit point compactness – local compactness

Chapter-3:Section 27-29 (Page Nos 172 – 185)

Unit - V

Countability and Separation Axioms:The countability axioms – the separation axioms – Normal spaces – The Urysohn Lemma – The Urysohn metrization theorem – The Tietze extension theorem.

Chapter-4:Section 30-35 (Page Nos 189 – 222).

Recommended text book

Topology James R. Munkres Second Edition Pearson Education, Inc. and Dorling Kindersley publishing Inc.

Reference Book:

1. T. W. Gamelin and R.E. Greene, Introduction to Topology, The Saunders Series, 1983.
2. G. F. Simmons, Introduction to Topology and Modern Analysis, Mcgraw-Hill book company, 2001.

CORE PAPER-XI OPERATIONS RESEARCH

To enlighten the students in the field of Operations Research which has many applications in management techniques.

Unit – I

Decision Theory: Introduction – steps of decision making process – types of decision making environments – decision making under uncertainty – decision making under risk – posterior probabilities and Bayesian analysis – decision trees analysis – decision making with utilities.

Chapter 11: Sec. 11.1-11.8 (Page Nos 339 – 376)

Unit - II

Project Management : PERT and CPM : Introduction – basic difference between PERT and CPM – phases of project management – PERT/CPM network components and precedence relationships – critical path analysis – project scheduling with uncertain activity times – project time cost trade off.

Chapter 13: Sec. 13.1 -13.7 (Page Nos 417 – 454)

Unit - III

Deterministic Inventory Control Models : Introduction – the meaning of inventory control – functional role of inventory – reasons for carrying inventory – Factors involved in inventory problem analysis – Inventory model building – Single item Inventory control models without shortages – Single item inventory models with shortages

Chapter 14: Sec. 14.1 -14.8 (Page Nos 474 – 500)

Unit - IV

Queues Theory : Introduction – The structure of a Queuing system – performance measures of a Queuing system – probability distributions in queuing system – Classification of Queuing models – Single server Queuing models – Multi-server Queuing models – Finite calling population Queuing models.

Chapter 16 : Sec. 16.1-16.8 (Page Nos 559 – 595)

Unit -V

Replacement and Maintenance Models: Introduction – Types of failure – Replacement of items whose efficiency deteriorates with time – Replacement of items that completely fail – Other replacement problems.

Chapter 16: Sec. 16.1-16.5 (Page Nos 613 – 643)

Contents and treatment as in

J.K.Sharma, Operations Research ,MacMillan India, New Delhi, 2001

Reference Book:

1. Hamdy A. Taha, Operations Research: An Introduction, Ninth Edition, Prentice Hall, New Delhi, 2011.
2. KantiSwarup, P.K. Gupta and Man Mohan, Operations Research, Eighth Edition, Sulltan Chand & Sons, New Delhi, 1997.

CORE PAPER XII MECHANICS

To study mechanical systems under generalized coordinate systems, virtual work, energy and momentum, to study mechanics developed by Newton, Lagrange, Hamilton Jacobi Theory.

UNIT-I

Mechanical systems: The Mechanical system - Generalised coordinates - Constraints - Virtual work - Energy and Momentum

Chapter 1 : Sections 1.1-1.5 (Page Nos 1 – 40)

UNIT-II

Lagrange's equations: Derivation of Lagrange's equations- Examples - Integrals of motion.

Chapter 2 : Sections 2.1-2.3 (Omit Section 2.4) (Page Nos 43 – 83)

UNIT-III

Hamilton's equations: Hamilton's Principle - Hamilton's Equation - Other variational principle.

Chapter 4 : Sections 4.1 - 4.3 (Omit section 4.4) (Page Nos 147 – 178)

UNIT-IV

Hamilton-jacobi theory: Hamilton Principle function - Hamilton-Jacobi Equation

Chapter 5 : Sections 5.1 -5.2 (omit – 5.3) (Page Nos 187 – 203)

UNIT-V

Canonical transformation: Differential forms and generating functions - Lagrange and Poisson brackets.

Chapter 6 : Sections 6.1 and 6.3 (omit sections 6.2 6.4, 6.5 and 6.6) (Page Nos 214 – 227 & 241-248)

Recommended text book

D. T. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985.

Reference Books

1. H. Goldstein, Classical Mechanics, (2nd Edition) Narosa Publishing House, New Delhi.
2. N.C.Rane and P.S.C.Joag, Classical Mechanics, Tata McGraw Hill, 1991.

CORE PAPER XIII COMPLEX ANALYSIS – II

To teach the concept of Riemann theta function and Normal families

After the completion of the course the student will be able to solve the Taylors series

UNIT- I

Power Series Expansion: Sequences – Series – Uniform Convergence – Power Series – Abel's Limit Theorem – Weierstrass 's Theorem – the Taylors Series – the Laurent Series.

Partial Fractions and Factorization: Partial Fractions – Infinite Products – Canonical Products – the Gamma Function.

Chapter 2: Section 2.1 -2.5, Chapter 5: Section 1.1 to 2.4

UNIT – II

Entire Function: Jensen's Formula – the Riemann Theta Function – Product Development – Extension of $\zeta(s)$ to the Whole Plane – the Functional Equations – Zero of the Zeta Function.

Chapter 5: Section 3.1,

Chapter 5: Section 4.1 - 4.4

UNIT – III

Normal Families: Equicontinuity – Normality and Compactness – Arzela's Theorem – Families of Analytic Funtions – the Classical Definition.

Chapter 5: Section 5.1 - 5.5

UNIT – IV

Riemann Mapping Theorem: Statement and Proof – Boundary Behaviour – Use of the Reflection Principle.

Conformal Mapping of Polygons: Behaviour at an Angle – Schwarz-C hristoffel Formula – Mapping on a Rectangle.

Chapter 6: Section 1.1 - 1.6,

Section 2.1 - 2.3

UNIT – V

Simply Periodic Function and Doubly Periodic Function: Representation by Exponentials – Fourier Development Functions of Finite Order – the Period Module – Unimodular Transformations – the Canonical basis – General Properties of Elliptic Functions.

Chapter 7: Section 1.1 - 1.3,

Section 2.1 - 2.4

Recommended text

Lars.F.Ahlfors, Complex Analysis (3rd Edition) McGraw Hill Book Company, New York 1979.

Reference book

1.H.A. Presfly, Introduction to Complex Analysis, Clarendon Press, Oxford, 1990.

2.J.B.Corway, Function of one complex variables, Springer – Verlag , International Student Edition, Narosa Publishing Co.

3.E.Hille, Analytic Function Theory(vol -2), Gonm & Co, 1959.

CORE PAPER XIV FUNCTIONAL ANALYSIS

To teach the concept of Banach and Hilbert Spaces and to introduce Banach algebras.

Unit -I

Fundamentals of Normed Spaces: Normed spaces- Continuity of linear maps
Chapters 2:Section 5,6 (omit sections 6.8)

Unit-II

Fundamentals of Normed Spaces:Hahn-Banach Theorems- Banach Spaces.
Chapters 2:Section 7,8 (omit sections 7.11,7,.12, 8.4)

Unit -III

Bounded linear maps on Banach spaces: Uniform boundedness principle-Closed Graph and Open Mapping theorems-Bounded Inverse Theorem- Spectrum of a bounded operator.
Chapter 3:Section 9-12 (omit sections 9.4 to 9.7, 11.2, 11.4, 11.5, 12.6, 12.7)

Unit-IV

Spaces of Bounded linear functionals: Duals and Transposes- Weak and weak *convergence- Reflexivity.

Chapter 4:Section 13,15,16 (omit sections 13.7, 13.8, 14, 15.5 to 15.7, 16.5 to 16.9)

Unit -V

Geometry of Hilbert spaces :Inner Product Spaces- Orthonormal sets- Best approximation- Projection and Riesz Representaion theorems.

Chapter 6: section 21-24 (omit sections 23.2, 23.4, 23.6, 24.7, 24.8)

Recommended text book

B.V. Limaye, Functional Analysis,3rd edition New Age International pvt ltd.publishers , New Delhi 2017.

Reference books

1. J.B.Conway, A Course in functional analysis, Spring Verlag Kreyszig, Introductory Functional Analysis with Applications, Springer Verlag.
2. W. Rudin, Functional Analysis, Tata McGraw-Hill publishing company, New Delhi, 1973.

CORE PAPER XV DIFFERENTIAL GEOMETRY

To teach the concept of surface and curves

After the completion of the course the student will be able to solve the problems about tangent.

UNIT- I

Theory of Space Curve: Definition of a space curve – arc length – tangent – normal and binormal – curvature and torsion – tangent surface, involutes and evolutes- intrinsic equations – fundamental existence theorem for space curves – helices.

Chapters 1: Section 1 - 9(except sec 6)

UNIT -II

Intrinsic Properties of a Surface: Definition of a surface – curves on a surface – surface of revolution – helicoids – metric – direction coefficients – families of curves – isometric correspondence – intrinsic properties.

Chapter 2: Section 1 - 9

UNIT- III

Geodesics: Geodesics – canonical geodesic equations – normal property of geodesics – existence theorems.

Chapters 2: Section 10 - 13

UNIT- IV

Geodesic Curvature: Geodesic curvature – gauss-bonnet theorem – Gaussian curvature – surface of constant curvature.

Chapter 2: Section 15 - 18

UNIT- V

Non intrinsic properties of a surface, the second fundamental form – principal curvature – lines of curvature – developable – developable associated with space curves and with curves on surface.

Chapter 3 – Sections 1- 6

Recommended text book

T.J.WILLMORE, An Introduction to Differential Geometry , Oxford University Press, (17th Impression) New Delhi 2002(Indian Print).

Reference book

1. D.SOMASUNDARAM, Differential Geometry.
2. J.A. Thorpe Elementary Topics in Differential Geometry, under – graduate Text in Mathematics, Springer – Verlag 1979.
3. Struik, D. T . Lectures on classical Differen

ELECTIVE - I

Automata Theory

To make the students understand the nuances of the automata and grammar

To make them understand application of these techniques in computer

To student contest free grammar

Unit -I

Finite Automata and Regular expression

Book 1

Chapter 2 :Section 2.1-2.4

Unit -II

Context free Grammar

Book 1

Chapter 2 :Section 2.5,

Chapter 4 :Section 4.1-4.3,4.5,4.6

Unit -III

Push Down Automaton

Book 1

Chapter 5 :Section 5.2,5.3

Unit- IV

Finite Automata and Lexical Analysis

Book 2

Chapter 3 :Section3.1-3.8

Unit -V

Basic parsing Techniques

Book 2

Chapter 5 :Section 5.1-5.5

Recommended text book

Book1

1.John E Hopcroft and Jeffrey d.Ullman Introduction to Automata Theory Languages and computations Narosa publishing House Chennai -2 .

Book2

2.A.V Aho and Jeffrey d.Ullman principles of compiler design Narosa publishing House Chennai -2

Reference Book

1. A. Salomaa, Formal Languages, Academic Press, New York, 1973.

2. John C. Martin, Introduction to Languages and theory of Computations (2nd Edition) Tata-McGraw Hill Company Ltd., New Delhi, 1997

ELECTIVE - II

Advanced Discrete Mathematics

This course aims to explore the topics like lattices and their applications , finite fields, polynomials and coding theory.

Unit- I

Lattices

Chapter 1:Section 1,2 and 3

Unit -II

Applications of Lattices

Chapter 2:Section 1 and 2

Unit- III

Finite Fields

Chapter 3:Section 2

Unit -IV

Polynomials

Chapter 3:Section 3 and 4

Unit -V

Coding Theory

Chapter 4:Section 1 and 2

Recommended text book

Rudolf Lidl and Gunter Pilz, Applied Abstract Algebra, Springer-Verlag, New York, 1984

Reference book

1. A.Gill, Applied Algebra for Computer Science, Prentice Hall Inc., New Jersey.
2. J.L.Gersting, Mathematical Structures for Computer Science(3rd Edn.), Computer Science Press, New York.
3. S.Wiitala, Discrete Mathematics- A Unified Approach, McGraw Hill Book Co.

ELECTIVE: III
NUMBER THEORY AND CRYPTOGRAPHY

To teach the concept of public key and private key by using number theory
After the completion of the course the students will be able to break and create the secrets

UNIT-I

Elementary Number Theory – Time Estimates for doing arithmetic – divisibility and Euclidean algorithm – Congruences – Application to factoring.

UNIT-II

Introduction to Classical Crypto systems – Some simple crypto systems – Enciphering matrices DES

UNIT-III

Finite Fields and quadratic Residues – Reciprocity

UNIT-IV

Public Key Cryptography

UNIT-V

Primality , Factoring and Elliptic Curves

Recommended text book

Neal Koblitz, A Course in Number Theory and Cryptography, Springer-Verlag, New York, 1987

Reference Books

1. Niven and Zuckermann, An Introduction to Theory of Numbers (Edn. 3), Wiley Eastern Ltd., New Delhi, 1976
2. David M. Burton, Elementary Number Theory, WmC. Brown Publishers, Dubuque, Iowa, 1989
3. K. Ireland and M. Rosen, A Classical Introduction to Modern Number Theory, Springer Verlag, 1972

ELECTIVE- IV FUZZY THEORY

To teach the concept of Graphs and Relations

After the completion of the course the student will be able to solve the Fuzzy logic problems.

UNIT – I

Fundamental Notions

Chapter I: Section 1 - 8

UNIT – II

Fuzzy Graphs

Chapter II: Section 10 - 18

UNIT – III

Fuzzy Relations

Chapter II: Section 19 - 29

UNIT – IV

Fuzzy Logic

Chapter III: Section 31 - 40 (Omit Section 37,38,41)

UNIT – V

The Laws of Fuzzy Composition

Chapter IV: Section 43 - 49

Recommended text book

A.Kaufman, Introduction to the theory of fuzzy subsets, vol I, Academic press, New York, 1975.

Reference books

H.J.Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers, Chennai, 1996.

George J.Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic – Theory and Applications, Prentice Hall India, New Delhi, 2001.

ELECTIVE - V WAVELETS

To introduce discrete Fourier Transform, Wavelets in \mathbb{R} , \mathbb{Z} , \mathbb{Z}_n and connection with differential equations.

UNIT-I

The Discrete Fourier Transforms

Chapter 2: Section 2.1 - 2.3

UNIT-II

Wavelets on \mathbb{Z}_n

Chapter 3: Section 3.1 - 3.3

UNIT-III

Wavelets on \mathbb{Z}

Chapter 4: Section 4.1 - 4.7

UNIT-IV

Wavelets on \mathbb{R}

Chapter 5: Section 5.1 - 5.5

UNIT-V

Wavelets and Differential Equations

Chapter 6: Section 6.1 - 6.3

Recommended text book

Michael W. Frazier, An Introduction to Wavelets through Linear Algebra, Springer Verlag, Berlin, 1999

Reference Books

1. C.K. Chui, An Introduction to Wavelets, Academic Press, 1992

2. E. Hernandez and G. Weiss, A First Course in Wavelets, CRC Press, New York, 1996

3. D.F. Walnut, Introduction to Wavelet Analysis, Birkhauser, 2004.

ELECTIVE - VI
ADVANCED MATHEMATICAL PROGRAMMING

To teach the concept of NLPP and Integer Linear Programmings

After the completion of the course the student will be able to solve the ILP problems.

UNIT – I

Integer Linear Programming : Types of Integer Linear Programming Problems – Concept of Cutting Plane – Gomory’s All Integer Cutting Plane Method – Gomory’s Mixed Integer Cutting Plane Method- Branch and Bound Method

Chapter 7

UNIT – II

Dynamic Programming : Characteristics of Dynamic Programming Problem - Developing Optimal Decision Policy- Dynamic Programming under Certainty – DP approach to solve LPP

Chapter 22

UNIT – III

Non-linear Programming Methods : Examples of NLPP – General NLPP – Graphical Solution – Quadratic Programming .

Chapter 24: Sections 24.1 -24.4 (Omit Beale’s method)

UNIT – IV

Linear Programming Problem – Simple problems. Parametric Linear Programming : Variation in the coefficients c_j , Variations in the Right hand side, b_i

Chapter 4 : Section 4.1-4.3

Chapter 29

UNIT – V

Goal Programming : Difference between LP and GP approach – Concept of Goal Programming – Goal Programming Model formulation – Graphical solution method of Goal Programming.

Chapter 8 : Section 8.1 - 8.5

Recommended text book

J.K.Sharma, Operations Research,(fourth edition) Macmillan, New Delhi, 2009.

Reference Book

1. Hamdy A. Taha, Operations Research: An Introduction, Ninth Edition, Prentice Hall, New Delhi, 2011.
2. KantiSwarup, P.K. Gupta and Man Mohan, Operations Research, Eighth Edition, Sulltan Chand & Sons, New Delhi, 1997.

ELECTIVE–VII STOCHASTIC PROCESS

This course aims to introduce advanced topics in Markov process, Markov chains and Renewal theory.

UNIT-I

Markov Chains :Classification of General Stochastic Processes – Markov Chain – Examples – Transition Probability Matrix – Classifications of States – Recurrence – Examples of recurrent Markov Chains.

Chapter 1: Section 3 only

Chapter 2: Sections 1 - 6 (Omit section 7)

UNIT-II

Limit Theorems of Markov Chains: Discrete renewal equation and its proof – Absorption probabilities – criteria for recurrence – Queuing models – Random walk.

Chapter 3: Sections 1 -7

UNIT-III

Continuous Time Markov Chains: Poisson Process – Pure Birth Process – Birth and Death Process – Birth and Death process with absorbing states – Finite State Continuous time Markov Chains.

Chapter 1: Section 2 (Poisson Process)

Chapter 4: Sections 1,2 and 4 - 7 (Omit sections 3 and 8)

UNIT-IV

Renewal Processes: Definition and related concepts – Some special Renewal processes – Renewal equation and Elementary Renewal Theorem and its applications.

Chapter 5: Sections 1 to 6.

UNIT-V

Brownian Motion : Definition – Joint probabilities for Brownian Motion – Continuity of paths and the maximum variables – Variations and extensions – Computing some functionals of Brownian Motion by Martingale methods.

Chapter 1: Section 2 (Brownian Motion)

Chapter 6: Sections 1 to 5 and 7A only (Omit Sections 6, and 7B,C)

Recommended text book

S.Karlin and H.M.Taylor. A First Course in Stochastic Processes(2nd edition), Academic Press, New York, 1975.

Reference Book

- 1.J. Medhi, Stochastic Processes (2nd Edition), New Age International, 1992.
2. S. Karlin, A first course in Stochastic Processes, (2nd Edition), Academic Press, 1958.
3. U.N. Bhat, Elements of Applied Stochastic Processes, John Wiley Sons, 1972.

ELECTIVE –VIII CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS

The aim of the course is to introduce to the students the concept of calculus of variation and its applications and second to introduce various types of integral equations and how to solve these equations.

Unit -I

The Method of Variations in Problems with Fixed Boundaries

Chapter 6 :Sections 1 - 7 (Elsgolts)

Unit -II

Vibrational Problems with Moving Boundaries and certain other problems and Sufficient conditions for an Extremum

Chapter 7 : Sections 1 - 4 (Elsgolts)

Chapter 8 : Sections 1- 3(Elsgolts)

Unit -III

Variational Problems Involving a conditional Extremum

Chapter 9 : Sections 1 - 3. (Elsgolts)

Unit IV

Integral Equations with Separable Kernels and Method of successive approximations

Chapter 1 : Sections 1.1 - 1.7 (Kanwal)

Chapter 2 : Sections 2.1 - 2.5 (Kanwal)

Chapter 3 : Sections 3.1 - 3.5 (Kanwal)

Unit- V

Classical Fredholm Theory , Symmetric Kernels and Singular Integral Equations

Chapter 4 : Sections 4.1 - 4.5 (Kanwal)

Chapter 7 : Sections 7.1 - 7.6 (Kanwal)

Chapter 8 : Sections 8.1 - 8.5 (Kanwal)

Recommended text book

For Units I, II and III: L. Elsgolts , Differential Equations and the Calculus of variations, Mir Publishers, Moscow, 1973 (2nd Edition)

For Units IV and V: Ram P.Kanwal,Linear Integral Equations, Academic Press, New York, 1971.

Reference Book

1. A. S. Gupta, Calculus of Variations with Applications, PHI, New Delhi, 2005. (for Units I and II)
2. Ram P. Kanwal, Linear Integral Equations, Theory and Techniques, Academic Press, New York, 1971. (for Units III, IV and V)
3. M. D. Raisinghania, Integral Equations and Boundary Value Problems, S. Chand & Co., New Delhi, 2007.
4. Sudir K. Pundir and Rimple Pundir, Integral Equations and Boundary Value Problems, Pragati Prakasam, Meerut. 2005.

ELECTIVE -IX OPTIMIZATION TECHNIQUES

To understand the theory behind optimization techniques, Local theory of optimization, global theory of optimization. Kuhn-Tucker Theorem high light some of the applications of optimization techniques.

Unit -I

Local theory:Optimisation of functional - Gateaux and Frechet Differentials - Frechet derivatives - Extrema - Euler-Lagrange Equations - Problems with variable end points. (Sec 7.1-7.6 Pages 169-184)

Unit -II

Global theory:Convex and concave functionals - Conjugate convex, concave functionals - Dual optimization problems - Min-Max theorem of game theory. (Sec 7.8, 7.10-7.13 Pages 190, 191, 195-208)

Unit- III

Local theory of constrained optimisation:Lagrange multiplier theorem - Inverse function theorem – Equality and Inequality constraints - Kuhn-Tucker theorem. (Sec 9.1-9.4 Pages 239-253)

Unit -IV

Iterative methods of optimization:Methods of solving equations - Successive approximation - Newton's method - Descent methods - Steepest descent. (Sec 10.1-10.5 Pages 271-289)

Unit -V

Conjugate direction methods:Conjugate gradient method - Methods for solving constrained problems - Projection method - The Primal-Dual method – Penalty Functions. (Sec 10.8-10.11 Pages 294-307)

Recommended text book

1. David G. Luenberger, Optimization by Vector Space Methods, Wiley Professional Paperback series, 1997.

References

1. C. Nelson Dorn, A Vector Space Approach to Models and Optimization, Robert Krieger Publishing Co., 1986. Chander Mohan and Kusum Deep, Optimization Techniques, New Age International, 2010

ELECTIVE - X
TENSOR ANALYSIS AND RELATIVITY THEORY

The course aims to introduce vector algebra and vector calculus and special relativity and relativistic kinematics, dynamics and accelerated systems.

UNIT-I

Tensor algebra: Systems of Different orders - Summation Convention - Kronecker Symbols - Transformation of coordinates in S_n - Invariants - Covariant and Contravariant vectors - Tensors of Second Order - Mixed Tensors - Zero Tensor - Tensor Field - Algebra of Tensors - Equality of Tensors - Symmetric and Skew –symmetric tensors - Outer multiplication, Contraction and Inner Multiplication - Quotient Law of Tensors - Reciprocal Tensor of Tensor - Relative Tensor - Cross Product of Vectors.

Chapter I : I.1 - I.3, I.7 and I.8

Chapter II : II.1 - II.19

UNIT-II

Tensor calculus: Riemannian Space - Christoffel Symbols and their properties

Chapter III: III.1 and III.2

UNIT-III

Tensor calculus (Contd . . .) Covariant Differentiation of Tensors - Riemann - Christoffel Curvature Tensor - Intrinsic Differentiation.

Chapter III: III.3 - III.5

UNIT-IV

Special theory of relativity :Galilean Transformation - Maxwell's equations - The ether Theory - The Principle of Relativity. Relativistic Kinematics : Lorentz Transformation equations - Events and simultaneity - Example - Einstein Train - Time dilation - Longitudinal Contraction - Invariant Interval - Proper time and Proper distance - World line - Example - twin paradox - addition of velocities - Relativistic Doppler effect.

Chapter 7 : Sections 7.1 and 7.2

UNIT-V

Relativistic dynamics :Momentum - Energy - Momentum - energy four vector - Force - Conservation of Energy - Mass and energy - Example - inelastic collision - Principle of equivalence - Lagrangian and Hamiltonian formulations.

Accelerated Systems : Rocket with constant acceleration - example - Rocket with constant thrust

Chapter 7 : Sections 7.3 and 7.4

Recommended Texts

1. U.C. De, Absos Ali Shaikh and Joydeep Sengupta, Tensor Calculus, Narosa Publishing House, New Delhi, 2004. (For Units I,II and III)
2. D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985. (Units IV andV)

Reference Books

1. J.L.Synge and A.Schild, Tensor Calculus, Toronto, 1949.

ELECTIVE - XI

DESIGN AND ANALYSIS OF ALGORITHMS

To teach the concept of data structures and algorithm

After the completion of the course the student will be able to know the program about binary tree

UNIT -I

Algorithms:Introduction- Algorithm - Algorithm specification: Pseudocode Conventions, Recursive algorithms - Performance analysis: Space Complexity, Time Complexity, Asymptotic Notation, Practical Complexities.

Sections: 1.1, 1.2, 1.3.1 to 1.3.4

UNIT -II

Data structures and Queues Arrays – ordered lists- Representation of Arrays-Stack and Queues – Fundamentals-Evaluation of Expressions.

Sections:2.2,2.4,3.1,3.3

UNIT -III

Linked lists and trees Linked Lists - Singly Linked Lists- Linked Stacks and Queues-More on Linked Lists-Simple algorithms of Doubly Linked Lists (insertion and deletion only).Trees- Binary Trees- Binary Tree Representations- Binary Tree Traversal.

Sections:4.1,4.2,4.5,4.8,5.2,5.3,5.4

UNIT -IV

Search and Sort Divide and conquer - General method - Binary search - Finding the maximum and minimum in a set of items - Merge sort - Quick sort - Selection sort. Basic Traversal and Search Techniques for graphs: Breadth First Search - Depth First Search.

Sections: 3.1 to 3.5,6.2

UNIT -V

Interpolations:Backtracking - The 8-Queens problem - Algebraic problems - The general method - Evaluation and interpolation - Horner's rule -Lagrange interpolation - Newtonian interpolation.

Sections: 7.1,7.2,9.1,9.2

Recommended text book

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer algorithms, Galgotia Publications Pvt. Ltd., 2004. (Unit I, IV, V)
2. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures, Galgotia Book Source.,1981.(Unit II, III)

References Text

- 1.A.V. Aho, J.E.Hopcroft, J.D. Ullman, The Design and Analysis of Computer Algorithms, Addison-Wesley Publ. Comp., 1974.

ELECTIVE - XII FLUID DYNAMICS

To teach the concept of Velocity of fluid and polars
After the completion of the course the student will be able to solve the problems about viscous flow

UNIT-I

Kinematics of Fluids in motion: Real fluids and Ideal fluids – Velocity of a fluid at a point, Stream lines, path lines, steady and unsteady flows – Velocity potential – The vorticity vector – Local and particle rates of changes – Equations of continuity – worked examples – Acceleration of a fluid – Conditions at a rigid boundary.

Chapter 2: Sec 2.1 - 2.10

UNIT-II

Equations of motion of a fluid: Pressure at a point in a fluid at rest – Pressure at a point in a moving fluid – Conditions at a boundary of two inviscid immiscible fluids – Eulers's equation of motion – Discussion of the case of steady motion under conservative body forces.

Chapter 3: Sec 3.1 - 3.7

UNIT- III

Some three dimensional flows: Introduction – Sources, ranks and doublets – Images in a rigid infinite plane – Axis symmetric flows – stokes stream function

Chapter 4: Sec 4.1, 4 .2, 4.3, 4.5

UNIT- IV

Some two dimensional flows: Meaning of two dimensional flow – Use of Cylindrical polar coordinate – The stream function – The complex potential for two dimensional, irrotational incompressible flow – Complex velocity potentials for standard two dimensional flows – Some worked examples – Two dimensional Image systems – The Milne Thompson circle Theorem.

Chapter 5: sec 5.1 - 5.8

UNIT – V

Viscous flows: Stress components in a real fluid – Relations between Cartesian components of stress – Translational motion of fluid elements – The rate of strain quadric and principle stresses – some further properties of the rate of strain quadric – Stress analysis in fluid motion – Relation between stress and rate of strain – The coefficient of viscosity and Laminar flow – The Navier – Stokes equations of motion of a Viscous fluid.

Chapter 8: sec 8.1 - 8.9

Recommended text

F.Chorlton, Text Book of Fluid Dynamics, CBS Publications. Delhi ,1985.

Reference book:

1. G.B. Batchelor, An Introduction of fluid Mechanics, Foundation Books, New Delhi, 1993

ELECTIVE - XIII
ALGEBRAIC THEORY OF NUMBERS

To teach the concept of algebraic numbers

After the completion of the course the student will be able to solve the problems about ring of integers

UNIT – I

Algebraic background: Rings and Fields – Factorization of Polynomials – Field Extensions – Symmetric Polynomials – Modules – Free Abelian Groups.

Chapter I: Section 1.1 - 1.6

UNIT – II

Algebraic Numbers: Algebraic Numbers – Conjugates and Discriminantes – Algebraic Integers – Integral Bases – Norms and Traces – Rings of Integers.

Chapter II: Section 2.1 - 2.6

UNIT – III

Quadratic and Cyclotomic Fields: Quadratic Fields and Cyclotomic Fields. Factorization into Irreducibles: Trivial Factorization – Factorization into Irreducibles – Examples of Non-unique Factorization into Irreducibles.

Chapter III: Section 3.1 - 3.2

Chapter IV: Section 4.2 - 4.4

UNIT – IV

Prime Factorization – Euclidean Domains – Euclidean Quadratic Fields – Consequences of Unique Factorization – The Ramanujan – Nagell Theorem.

Chapter IV: Section 4.5 - 4.9

UNIT – V

Ideals: Prime Factorization of Ideals – The Norms of an Ideal- Non-unique Factorization Cyclotomic Fields.

Chapter V: Section 5.2 - 5.4

Recommended text book

Steward and D.Tall - Algebraic Number Theory and Fermat's Last Theorem(3rd Edition)
A.K.Peters Limited, Natrick, Mass,2002.

Refernce books:

- 1.Z.I.Bosevic and I.R. Safarevic, Number Theory, Academic Press, New York, 1966.
- 2.J.W.S. Cassels and A.Frohlich, Algebraic Number Theory, Academic Press, New York, 1967.
- 3.P.Ribenboim, Algebraic Numbers, Wiley, New York, 1972.
- 4.P.Samuel, Algebraic Theory of Numbers, Houghton Mifflin Company, Boston, 1970.
- 5.A.Weil, Basic Number Theory, Springer, New York, 1967.

ELECTIVE - XIV

DIFFERENCE EQUATIONS

To introduce the process of discretization, Discrete version of Differential Equations, Discrete oscillation and the asymptotic behaviour of solutions of certain class of difference equations for linear cases only. Solution of difference equations using z-transforms is stressed.

UNIT-I

Linear difference equations of higher order :Difference Calculus - General Theory of Linear Difference Equations - Linear Homogeneous Equations with Constant coefficients - Linear non-homogeneous equations - Method of Undetermined coefficients, the method of variation of constants - Limiting behavior of solutions.

Chapter 2: Sections 2.1 - 2.5

UNIT-II

System of difference equations :Autonomous System - The Basic Theory - The Jordan form - Linear periodic system.

Chapter 3: Section 3.1 - 3.4

UNIT-III

The z-transform method :Definition, Example and properties of Z-transform - The Inverse Z-transform and solution of Difference Equations: Power series method, partial fraction method, the inverse integral method - Volterra Difference Equation of convolution types - Volterra systems.

Chapter 5: Sections 5.1 - 5.3, 5.5 (omit 5.4)

UNIT-IV

Asymptotic behaviour of difference equation :Tools and Approximations - Poincare's Theorem - Second order difference equations - Asymptotic diagonal systems - Higher order Difference Equations.

Chapter 8 : Sections 8.1 - 8.5

UNIT-V

Oscillation theory :Three-term difference Equation - Non-linear Difference Equations - Self-Adjoint second order equations.

Chapter 7 : Sections 7.1 - 7.3

ecommended text book

Saber N. Elaydi, An Introduction to Difference Equations, Springer Verlag, New York, 1996.

Reference Books

1. R.P.Agarwal., Difference Equations and Inequalities, Marcel Dekker, 1999.
2. S. Goldberg, Introduction to Difference Equations, Dover Publications, 1986
3. V. Lakshmi kantham and Trigiante, Theory of Difference Equations, Academic Press, New York, 1988.

ELECTIVE - XV MATHEMATICAL STATISTICS

This course introduces sampling theory, significance tests, estimation, testing of hypotheses, ANOVA and sequential analysis with rigorous mathematical treatment.

UNIT-I

Sample moments and their functions :Notion of a sample and a statistic - Distribution of the arithmetic mean of independent normally distributed random variables – The χ^2 - distribution – The distribution of the statistics – Student's t - distribution - Fisher's Z - distribution - Snedecor's F - distribution - Distribution of sample mean from non-normal populations.

Chapter 9 : Sections 9.1-9.8

UNIT-II

Significance test :Kolmogorov Theorem 10.11.1 - Smirnov Theorem 10.11.2 - Concept of a statistical test - Parametric tests for small samples and large samples - 2 test - Tests of Kolmogorov and Smirnov type - The Wald-Wolfovitz and Wilcoxon -Mann-Whitney tests - Independence Tests by contingency tables.

Chapter 10 : Section 10.11

Chapter 12 :Sections 12.1 - 12.7

UNIT-III

Estimation: Preliminary notion - Consistent estimation - Unbiased estimates - Sufficiency of an estimate - Efficiency of an estimate - Asymptotically most efficient estimates - methods of finding estimates - confidence Interval.

Chapter 13 : Sections 13.1 - 13.8

UNIT-IV

Analysis of Variance :One way classification and two-way classification. Hypotheses Testing: The Power functions and OC function - Most Powerful test - Uniformly most powerful test - unbiased test.

Chapter 15 : Sections 15.1 and 15.2

Chapter 16 : Sections 16.1 -16.5

UNIT-V

Sequential analysis :SPRT - Auxiliary Theorem - Wald's fundamental identity - OC function and SPRT – The expected value of - Determination of A and B - Testing a hypothesis concerning p of zero – one distribution - Testing a hypothesis concerning the expected value m of a Normal population.

Chapter 17 : Sections 17.1-17.9

Recommended text book

M. Fisz , Probability Theory and Mathematical Statistics, John Wiley and sons, New Your, 1963.

Reference Books

1. E.J.Dudewicz and S.N.Mishra , Modern Mathematical Statistics, John Wiley and Sons, New York, 1988.