BHARATHIAR UNIVERSITY::COIMBATORE-641 046
B. Sc. MATHEMATICS DEGREE COURSE - CBCS PATTERN
(For the students admitted from the academic year **2019-2020** and onwards)
Scheme of Examination

Part	Study Components	Course title	Ins. hrs/ week	Examinations				Credit
				Dur.hr	CIA	Marks	Total Marks	
	Semester I							
I	Language – I		6	3	25	75	100	4
II	English – I		6	3	25	75	100	4
III	Core Paper I - Classical Algebra		4	3	25	75	100	4
III	Core Paper II-Calculus		5	3	25	75	100	4
III	Allied A : Paper I Chosen by the college		7	3	25	75	100	4
IV	Environmental Studies #		2	3	-	50	50	2
	Semester II							
I	Language – II		6	3	25	75	100	4
II	English – II		6	3	25	75	100	4
III	Core Paper III Analytical Geometry*		4	3	25	75	100	4
III	Core Paper IV- Trigonometry, Vector Calculus and Fourier Series *		5	3	25	75	100	4
III	Allied A: Paper II Chosen by the college		7	3	25	75	100	4
IV	Value Education – Human Rights #		2	3	-	50	50	2
	Semester III							
I	Language – III		6	3	25	75	100	4
II	English – III		6	3	25	75	100	4
III	Core Paper V- Differential Equations and Laplace Transforms		3	3	25	75	100	4
III	Core Paper VI- Statics		3	3	25	75	100	4
III	Allied B - Paper III Chosen by the college		7	3	20	55	75	3
IV	Skill based Subject - Operations Research -I		3	3	20	55	75	3
IV	Tamil @ / Advanced Tamil# (OR) Non-major elective - I (Yoga for Human Excellence)# / Women's Rights#		2	3	50		50	2

	Semester IV						
I	Language – IV	6	3	25	75	100	4
II	English – IV	6	3	25	75	100	4
III	Core Paper VII-Dynamics	3	3	25	75	100	4
III	Core Paper VIII- Programming in C	3	3	**	**	100**	4
III	Allied B : Paper II – Chosen by the college	5	3	20	55	75	3
III	Practical - (Allied)	2	3	20	30	50	2
IV	Skill based Subject - Operations Research – Paper II	3	3	20	55	75	3
IV	Tamil @ /Advanced Tamil # (OR) Non-major elective -II (General Awareness #)	2	3	50		50	2
	Semester V						
III	Core Paper IX-Real Analysis-I	5	3	25	75	100	4
III	Core Paper X- Complex Analysis-I *	6	3	25	75	100	4
III	Core Paper XI- Modern Algebra-I	6	3	25	75	100	4
III	Core Paper XII- Discrete Mathematics	5	3	25	75	100	4
III	Elective I	5	3	20	55	75	3
IV	Skill based Subject - Operations Research Paper III	3	3	20	55	75	3
	Semester VI						
III	Core Paper XIII Real Analysis-II	5	3	25	75	100	4
III	Core Paper XIV Complex Analysis-II	6	3	25	75	100	4
III	Core Paper XV Modern Algebra-II	6	3	25	75	100	4
III	Elective II	5	3	20	55	75	3
III	Elective III	5	3	**	**	100**	4
IV	Skill Based Subject - Operations Research Paper IV	3	3	20	55	75	3
V	Extension Activities @ / Swachh Bharath***	-		50	-	50	2
	Total					3500	140

**** All Computer papers have theory and practical exams.**	**Theory**			20	55	100	
	Practical			10	15		

@ No University Examinations. Only Continuous Internal Assessment (CIA)
# No Continuous Internal Assessment (CIA). Only University Examinations.
*** Swachh Bharath Internship Scheme (SBIS) is to be added for 2 credits in the extension activities.
Allied subjects: 1.Physics, 2.Chemistry, 3.Accountancy & 4.Statistics.

List of Elective papers (Colleges can choose any one of the paper as electives)		
Elective – I	**A**	Astronomy- I
	B	Numerical Methods-I
Elective – II	**A**	Astronomy- II
	B	Numerical Methods-II
Elective – III	**A**	Graph Theory
	B	Automata Theory & Formal Languages
	C	Programming in C++ **
	D	Number Theory*

***Syllabus modified /Added from 2019-2020**

Semester: I - Core Paper- I

Subject Title: Classical Algebra

Credit hours-4

Subject description: This course focuses on the convergence and divergence of different types of series, also discusses the standard methods of solving both polynomial and transcendental type equations.

Goal: To enable the students to learn about the convergence and divergence of the series and to find the roots for the different types of the equation.

Objectives: On successful completion of this course the students should gain knowledge about the convergence of series and solving equations.

UNIT I:

Binomial, exponential theorems-their statements only- their immediate application to summation and approximation only.

UNIT II:

Logarithmic series theorem-statement and proof-Immediate application to summation and approximation only. Convergency and divergency of series –definitions, elementary results-comparison tests-De Alemberts and Cauchy's tests.

UNIT III:

Absolute convergence-series of positive terms-Cauchy's condensation test-Raabe's test.

UNIT: IV

Theory of equations: Roots of an equation- Relations connecting the roots and coefficients- transformations of equations-character and position of roots-Descarte's rule of signs-symmetric function of roots-Reciprocal equations.

UNIT V:

Multiple roots-Rolle's theorem - position of real roots of f(x) =0 - Newton's method of approximation to a root - Horner's method.

Treatment as in

Algebra-T.K .Manicavachasam Pillai, T.Natarajan, K-S Canapathy.
S. Viswanatham (Printers & Publishers Private Ltd-2006)

References:

1. Mathematics for B.Sc. Branch I -Vol. I- P. Kandasamy and K. Thilagavathy
(For B.Sc-I semester) S. Chand and Company Ltd, New Delhi, 2004.
2. Algebra. -- N.P.Bali- Laxmi publications

Core Paper- II
Subject Title : CALCULUS

credit hours-5

Subject description:

This course presents the idea of curvatures, integration of different types of functions, its geometrical applications, double, triple integrals and improper integrals.

Goal:

To enable the students to learn and gain knowledge about curvatures, integrations and its geometrical applications.

Objectives:

On successful completion of course the students should have gained the knowledge about the evolutes and envelopes, different types of integrations, its geometrical application, proper and improper integration.

UNIT I:

Curvature-radius of curvature in Cartesian and polar forms-evolutes and envelopes- pedal equations- total differentiation- Euler's theorem on homogeneous functions.

UNIT II:

Integration of $f'(x)/f(x)$, $f'(x)\sqrt{f(x)}$,$(px+q)/\sqrt{(ax^2+bx+c)}$], $[\sqrt{(x-a)/(b-x)}]$,
$[\sqrt{(x-a)(b-x)}$,$1/[\sqrt{(x-a)(b-x)}$,$1/(a\cos x+b\sin x+c)$,
$1/(a\cos^2 x+b\sin^2 x+c)$,Integration by parts-Bernoulli's Formula.

UNIT III:

Reduction formulae- problems- evaluation of double and triple integrals- applications to calculations of areas and volumes-areas in polar coordinates.

UNIT IV:

Change of order of integration in double integral- Jacobions.- change of variables in double and triple integrals.

UNITV:

Beta and Gamma integrals-their properties, relation between them- evaluation of multiple integrals using Beta and Gamma functions - Improper Integrals.

Treatment as in

1. Calculus vol 1 and vol 2"-- S. Narayanan and T.K.M. Pillai. Viswanathan Publishers

References:

1. Mathematics for BSc – Vol I and. II - P. Kandasamy & K.Thilagarathy S.Chand and Co-2004
2. A Text book of calculus- Shanthi Narayanan & J.N.Kapoor, S.Chand & Co.

Semester: II -
Core Paper- III

Subject Title: Analytical Geometry **Credit hours-4**

Subject Description:

This course gives emphasis to enhance student knowledge in three dimensional analytical geometry and the geometrical aspects of three dimensional figs, viz, sphere, cone and cylinder.

Goal:

To enable the students to learn and visualize the fundamental ideas about co-ordinate geometry.

Objectives:

On successful completion of the course students should have gained knowledge about the regular geometrical figures and their properties.

UNIT I:

Analytical Geometry 3D-stright.lines-coplanarity of straight-line-shortest distance (S.D) and equation of S.D between two lines-simple problems.

UNIT II:

Sphere: standard equation of sphere-results based on the properties of a sphere-tangent plane to a sphere- equation of a circle.

UNIT III:

Tangency of spheres- coaxial system of spheres- radical planes- Orthogonal spheres.

UNIT IV:

Cone and cylinder: Cone whose vertex is at the origin- envelope cone of a sphere-right circular cone-equation of a cylinder-right circular cylinder.

UNIT V:

Conicoids: Nature of a conicoid- standard equation of central conicoid –enveloping cone-tangent plane-condition for tangency –director Sphere- director plane

Treatment as in

1. Analytical Geometry by P. Durai Pandian & others
2. Solid Geometry by N.P. Bali- Laxmi Publications (P) Ltd

References:

1. Analytical Geometry of 2D by T.K. M. Pillai and Others – Visvanathan Publications-2006
2. Solid Geometry by M.L. Khanna- Jainath & Co Publishers, Meerut

Core Paper – IV
Subject Title: Trigonometry, Vector Calculus and Fourier series
Credit Hours: 5

Subject Description: This course presents the circular functions, hyperbolic functions, differentiation of functions in scalar and vector field.

Goals: To enable the students to learn about the expansion of trigonometrical functions and to gain knowledge about vector calculus, which will help them to solve the analytical geometry problems.

Objectives: On successful completion of this course, the students should have gained knowledge about expansion of trigonometric functions, line integral, surface integral, volume integral and Fourier series.

UNIT I:
Expansion in Series – Expansion of $\cos^n \theta$, $\sin^n \theta$, in a series of cosines and sines of multiples of θ – Expansions of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ in powers of sines , cosines and tangents – Expansion of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in powers of θ – hyperbolic functions and inverse hyperbolic functions.

UNIT II:
Logarithm of complex quantities - summation of series – when angles are in arithmetic progression – C + iS method of summation – method of differences.

UNIT III:
Scalar and vector fields –Differentiation of vectors – Gradient, Divergence and Curl.-Solenoidal and irrotational vectors-Laplacian Operator.

UNIT IV:
Integration of vectors – line integral – surface integral – Green's theorem in the plane – Gauss divergence theorem – Strokes theorem – (Statements only) - verification of the above said theorems.

UNIT V:
Periodic functions – Fourier series of periodicity 2π – half range series.

Treatment as in

1. Kandasamy. P, Thilagavathi. K " Mathematics for B.Sc. Branch I", Volume I, II and IV, S.Chand and Company Ltd, New Delhi, 2004. (for Unit I).

References:

1. P. Duraipandian, Laxmiduraipandian - Vector Analysis (Revised Edition-Reprint 2005) Emerald Publishers.

2. T.K. Manichavasagam Pillai and S.Narayanan, Trigonometry - Viswanathan Publishers and Printers Pvt. Ltd.

Semester: III **Core paper V**

Subject Title: Differential Equations and Laplace Transforms

Credit Hours: 3

Subject Descriptions:

This course presents the method of solving ordinary differential Equations of First Order and Second Order, Partial Differential equations. Also it deals with Laplace Transforms, its inverse and Application of Laplace Transform in solving first and second Order Differential Equations with constant coefficients.

Goals: It enables the students to learn the method of solving Differential Equations.

Objectives: End of this course, the students should gain the knowledge about the method of solving Differential Equations. It also exposes Differential Equation as a powerful tool in solving problems in Physical and Social sciences.

UNIT I:

Ordinary Differential Equations: Equations of First Order and of Degree Higher than one – Solvable for *p, x, y* – Clairaut's Equation – Simultaneous Differential Equations with constant coefficients of the form

i) $f_1(D)x + g_1(D)y = \phi_1(t)$

ii) $f_2(D)x + g_2(D)y = \phi_2(t)$

where f_1 , g_1 , f_2 and g_2 are rational functions $D = \frac{d}{dt}$ with constant coefficients ϕ_1 and ϕ_2 explicit functions of *t*.

UNIT II:

Finding the solution of Second and Higher Order with constant coefficients with Right Hand Side is of the form Ve^{ax} where *V* is a function of *x* – Euler's Homogeneous Linear Differential Equations.

UNIT III:

Partial Differential Equations: Formation of equations by eliminating arbitrary constants and arbitary functions – Solutions of P.D Equations – Solutions of Partial Differential Equations by direct integration – Methods to solve the first order P.D. Equations in the standard forms - Lagrange's Linear Equations.

UNIT IV:

Laplace Transforms: Definition – Laplace Transforms of standard functions – Linearity property – Firsting Shifting Theorem – Transform of $tf(t)$, $\frac{f(t)}{t}$, $f^1(t)$, $f^{11}(t)$.

UNIT V:

Inverse Laplace Transforms – Applications to solutions of First Order and Second Order Differential Equations with constant coefficients.

Treatment as in

Kandasamy. P, Thilagavathi. K "Mathematics for B.Sc – Branch – I Volume III", S. Chand and Company Ltd, New Delhi, 2004.

References:

1) S. Narayanan and T.K. Manickavasagam Pillai, Calculus, S. Viswanathan (Printers and Publishers) Pvt. Ltd, Chennai 1991
2) N.P. Bali, Differential Equations, Laxmi Publication Ltd, New Delhi, 2004
3) Dr. J. K. Goyal and K.P. Gupta, Laplace and Fourier Transforms, Pragali Prakashan Publishers, Meerut, 2000

Core Paper – VI

Subject Title: Statics **Credit hours: 3**

Subject Description:

This course contains the nature of forces acting on a surface, friction and center of gravity.

Goal:

To enable the students to realize the nature of forces and resultant forces when more than one force acting on a particle.

Objectives:

On successful completion of course the students should realize the concept about the forces, resultant force of more than one force acting on a surface, friction and center of gravity. Also he can differentiate static and dynamic forces.

UNIT-I

Forces acting at a point – Parallelogram law-triangle law –Converse of Triangle law-Polygon Law of Forces- Lami's Theorem.

UNIT- II

(□,□) theorem –Resolution of forces- Components of a force- Resultant of any number of Coplanar forces acting at a point- Conditions of equilibrium.

UNIT – III

Parallel Forces and Moments –Resultant of two parallel forces (Like and unlike)-Conditions of equilibrium of three coplanar forces- Moment of a force- Geometrical representation- Sign of the moment- Unit of moment – Varignon's Thorem on couples-Equilibrium of two couples-Equivalence of two couples

UNIT – IV

Moment of a force about a point-Varignons theorem - Co-planar forces acting on a rigid body – Theorem on three co-planar forces in equilibrium

UNIT – V

Reduction of a system of co-planar forces to a single force and a couple - necessary & sufficient conditions of equilibrium only – Equation to the line of action of the resultant.

Treatment as in

M.K.Venkataraman, Statics, Agasthiar Publications, Trichy, 1999.

References:

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

Semester III - Skill Based Subject - Operations Research – Paper I

Credit hours: 3

Subject description:

This course contains advantages, limitations and applications of O.R, formulation of Linear Programming Problems (L.P.P), methods to solve L.P.P. like simplex method, Charnes Penality Method and Two Phase Simplex method. Also it deals about duality in L.P.P and Transportation with applications

Goal:

It enables the students to use the mathematical knowledge in optimal use of resources.

Objectives:

On successful completion of this course students should have gained knowledge about optimal use of resources.

UNIT I:

Basics of O.R – Definition of O.R – Characteristics of O.R - Scientific methods in O.R – Necessary of O.R in Industry – O.R and Decision Making – Scope of O.R in Modern Management – Uses and limitations of O.R. Linear Programming Problem – Formulation of L.P.P .

UNIT II:

Graphical solutions of L.P.P – Problems. Simplex Method – Problems

UNIT III:

Charnes Penality Method (or) Big – M Method - Two Phase Simplex method – Problems.

UNIT IV:

Duality in L.P.P – Concept of duality – Duality and Simplex Method – Problems

UNIT V:

The transportation Problems – Basic feasible solution by L.C.M – NWC- VAM- optimum solutions – unbalanced Transportation problems

References:

1. Operations Research – Prem Kumar Gupta D. S. Hira, S. Chand & Company Ltd, Ram Nagar, New Delhi
2. Operations Research – Kandiswarup, P. K. Gupta, Man Mohan, S. Chand & Sons Education Publications, New Delhi, 12th Revised edition.
3. Operations Research Principles and Problems: S. Dharani Venkata Krishnan, Keerthi publishing house PVT Ltd.

Semester-IV-Core Paper-VII
Subject: Dynamics

Credit hours: 3

Subject Description: This course provides the knowledge about the field Kinematics, projectile, simple harmonic motion and impact of a particle on a surface.
Goal: To enable the students to apply Laws, Principles, Postulates governing the Dynamics in physical reality.
Objectives: End of this course, the student understand the reason for dynamic changes in the body.

UNIT – I

Projectiles: Path of a projectile-Greatest height-time of flight – Range -range on an inclined plane through the point of projection-Maximum range.

UNIT – II

Central Orbits: Radial and transverse components of velocity and acceleration – areal velocity of central orbits - Differential equation of central orbit in polar coordinates only.

UNIT – III

Simple Harmonic Motion: Amplitude, periodic time, phase-composition of two simple harmonic motions of the same period in a straight line and in two perpendicular lines.

UNIT – IV

Collision of elastic bodies : Impulsive force – Newton's experimental law- Principle of conservation of momentum- Direct Impact on a smooth fixed plane -Direct impact of two smooth spheres- loss of kinetic energy during direct impact.

UNIT – V

Oblique impact of a smooth sphere on fixed smooth plane – oblique impact of two smooth spheres - Loss of Kinetic energy during oblique impact.

Treatment as in
M.K.Venkataraman, Dynamics, 11th Ed. Agasthiar Publications, Trichy, 1994.

References:

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

SEMESTER IV: –CORE PAPER VIII (Theory & Practical)

Subject Title: Programming in C **No.of.Hours: 3**

Subject Description: This paper presents the importance of c language, its structure, Data types, Operators of C, Various control statements, Arrays, different types of functions and practical problems.
Goals: To enable the students to learn about the basic structure, Statements, arrays, functions and various concepts of C language.
Objectives: On successful completion of the course the students should have:
Learnt the basic structure, operators and statements of C language.
Learnt the decision making statements and to solve the problems based on it.
Learnt arrays, functions and solve the problems regarding about it.

UNIT I: Introduction – Importance of C Basic structure of C programme - Character set - Constants – Keywords and identifiers – Variables Data types – Declaration of variables – Assigning values to variables –Defining symbolic constants.

UNIT II: Arithmetic operators - Relational operators - logical operators – assignment operators –increment and decrement operates –Conditional operators – Special operators – Arithmetic expressions –Evaluation of expressions –Precedence of arithmetic operators – Some computational problems –Type conversion in expressions – operator precedence and associating mathematical functions.

UNIT III: Reading and Writing character – formatted input and output. Decision making with IF statement – Simple IF statement – The if ELSE statement - Nesting of IF…..ELSE statement – The ELSE IF ladder. The Switch statement –The ? Operator –The GOTO statement.

UNIT IV: The WHILE statement - the DO statement the FOR statement –Jumps in loops.

UNIT V: One, Two dimensional arrays – Initiating two dimensional arrays – Multidimensional arrays –Declaring and initializing string variables –reading strings from terminal – Writing strings on the screen – Arithmetic operations on characters.

TEXT BOOK:
E.Balagurusamy"Programming in ANSI C" Second Edition – Tata McGraw –Hill Publishing Company limited, New Delhi.
REFERENCE BOOKS:
1. Byron Gottfried "Programming with C"(Schaum's outline series)-Tata McGrawHill publishing company -1998.
2. Ashok N.Kamthane "Programming with Ansi and Turbo C", Pearson Education publishers, 2002
3.Hentry Mullish and Herbert L cooper , "The spirit of C" Jaico publisher , 1996.
4.THE ANSI C, Second edition , October 1992.BRIAN W.KERNIGHAN,DENNIS M.RITCHIE Published by Prentice- Hall of India Privated Limited, M-97,New Delhi- 110001.
5.ANSI C: With Microsoft C 5.1 and Quick C 2.0 C.Balasubramanian.1992, Tata McGraw-Hill Publishing company limited, New Delhi.
6. "PROGRAMMING IN C ", Kris A.Jamsa 1992 , Galgotia Publications Pvt.ltd.

SEMESTER IV : –CORE PAPER VIII (Practical)

Subject Title: Programming in C **No.of.Hours: 3**

C-PROGRAMMING PRACTICAL LIST.

1. **Write a C program to generate 'N' Fibonacci number.**
2. **Write a C program to print all possible roots for a given quadratic equation.**
3. **Write a C program to calculate the statistical values of mean, median.**
4. **Write a C program to calculate the statistical values of Standard Deviation and variance of the given data**
5. **Write a C program to sort a set of numbers.**
6. **Write a C program to sort the given set of names.**
7. **Write a C program to find factorial value of a given number 'N' using recursive function call.**
8. **Write a C program to find the product of two given matrix.**

SEMESTER IV - SKILL BASED SUBJECT

SUBJECT TITLE - OPERATIONS RESEARCH – PAPER II CREDIT HOURS: 3

Subject Description:

This course gives emphasis to enhance student knowledge in Assignment Problems, game theory, performance measures of queues and optimal use of Inventory.

UNIT I:

The Assignment Problems – Assignment algorithm – optimum solutions – Unbalanced Assignment Problems.

UNIT II:

Game Theory – Two person zero sum game – The Maxmini – Minimax principle – problems - Solution of 2 x 2 rectangular Games – Domination Property – (2 x n) and (m x 2) graphical method – Problems.

UNIT III:

Queueing Theory – Introduction – Queueing system – Characteristics of Queueing system – symbols and Notation – Classifications of queues – Problems in (M/M/1) : (∞/FIFO)

UNIT IV:

Problems in (M/M/1):(N/FIFO); (M/M/C) : (∞/FIFO); (M/M/C) : (N/FIFO) Models.

UNIT V:

Inventory control – Types of inventories – Inventory costs – EOQ Problem with no shortages – Production problem with no shortages – EOQ with shortages – Production problem with shortages – EOQ with price breaks.

References:

1. Operations Research – Prem Kumar Gupta D. S. Hira, S. Chand & Company Ltd, Ram Nagar, New Delhi
2. Operations Research – Kandiswarup, P. K. Gupta, Man Mohan, S. Chand & Sons Education Publications, New Delhi, 12th Revised edition.
3. Operations Research Principles and Problems: S. Dharani Venkata Krishnan, Keerthi publishing house PVT Ltd.

SEMESTER V - Core Paper – IX

Subject title: Real Analysis - I **Credit hours: 5**

Subject Description: This course focuses on the Real and Complex number systems, set theory, point set topology and metric spaces.

Goal: To introduce the concepts which provide a strong base to understand and analyze the real number system.

Objective: On successful completion of this course the students should gain the knowledge about real and complex numbers, sets and metric space.

UNIT I

The Real and Complex number systems the field axioms, the order axioms –integers –the unique Factorization theorem for integers –Rational numbers –Irrational numbers –Upper bounds, maximum Elements, least upper bound –the completeness axiom –some properties of the supremum –properties of the integers deduced from the completeness axiom- The Archimedian property of the real number system –Rational numbers with finite decimal representation of real numbers –absolute values and the triangle inequality –the Cauchy-Schwarz, inequality –plus and minus infinity and the extended real number system.

UNIT II

Basic notions of a set theory. Notations –ordered pairs –Cartesian product of two sets – Relations and functions – further terminology concerning functions –one –one functions and inverse –composite functions –sequences –similar sets-finite and infinite sets –countable and uncountable sets –uncountability of the real number system –set algebra –countable collection of countable sets.

UNIT III

Elements of point set topology: Euclidean space R^n –open balls and open sets in R^n. The structure of open sets in R^n –closed sets and adherent points –The Bolzano –Weierstrass theorem –the Cantor intersection Theorem.

UNIT IV

Covering –Lindelof covering theorem –the Heine Borel covering theorem –Compactness in R^n –Metric Spaces –point set topology in metric spaces –compact subsets of a metric space – Boundary of a set.

UNIT V

Convergent sequences in a metric space –Cauchy sequences –Completeness sequences – complete metric Spaces. Limit of a function –Continuous functions –continuity of composite functions. Continuous complex valued and vector valued functions.

Treatment as in

T.M.Apostol, Mathematical Analysis, 2nd ed., Narosa Publishing Company, Chennai, 1990.

Unit I	Chapter 1	Sections 1.2, 1.3, 1.6 to 1.16, 1.18 to 1.20
Unit II	Chapter 2	Sections 2.2 to 2.15
Unit III	Chapter 3	Sections 3.2 to 3.9
Unit IV	Chapter 3	Sections 3.10 to 3.16
Unit V	Chapter 4	Sections 4.2 to 4.5, 4.8 to 4.10

References

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

SEMESTER V - Core Paper – X

Subject title: Complex Analysis - I **Credit hours: 6**

Subject Description: This course provides the knowledge about complex number system and complex functions.

Goal: To enable the students to learn complex number system, complex function and complex integration.

Objectives: On successful completion of this course the students should gained knowledge about the origin, properties and application of complex numbers and complex functions.

UNIT I

Complex number system, Complex number –Field of Complex numbers – Conjugation – Absolute value -Argument –Simple Mappings.

i) $w = z + \alpha$ ii) $w = az$ iii) $w = 1/z$

invariance of cross-ratio under bilinear transformation –Definition of extended complex plane – Stereographic projection.

UNIT II

Complex functions: Limit of a function –continuity –differentiability – Analytical function defined in a region –necessary conditions for differentiability –sufficient conditions for differentiability –Cauchy-Riemann equation in polar coordinates –Definition of entire function.

UNIT III

Power Series: Absolute convergence –circle of convergence –Analyticity of the sum of power series in the Circle of convergence (term term differentiation of a series) Elementary functions : Exponential, Logarithmic, Trigonometric and Hyperbolic functions.

UNIT IV

Conjugate Hormonic functions: Definition and determination, Conformal Mapping: Isogonal mapping –Conformal mapping-Mapping z--->>f(z), where f is analytic, particularly the mappings.

$w= e^z$; $w =z^2$; w=sin z ; w =cosz ; w=z+ 1/z

UNIT V

Complex Integration: Simply and multiply connected regions in the complex plane. Integration of f(z) from definition along a curve joining z_1 and z_2. Proof of Cauchy's Theorem (using Goursat's lemma for a simply connected region). Cauchy's integral formula for higher derivatives (statement only)-Morera's theorem.

Treatment as in

P.Duraipandian and Laxmi Duraipandian, Complex Analysis, Emerald Publishers, Chennai –2, 1986.

Unit I	Chapter 1	Sections 1.1 to 1.3, 1.6 to 1.9
	Chapter 2	Sections 2.1 to 2.2, 2.6 to 2.9,
	Chapter 7	Section 7.1
Unit II	Chapter 4	Sections 4.1 to 4.10
Unit III	Chapter 6	Sections 6.1 to 6.11
Unit IV	Chapter 6	Sections 6.12 to 6.13
	Chapter 7	Sections 7.6 to 7.9
Unit V	Chapter 8	Sections 8.1 to 8.9

References

1. Churchill and Others, Complex Variable and Applications, Tata Mecgrow Hill Publishing Company Ltd, 1974.
2. Santhinarayan , Theory of functions of Complex Variable, S.Chand and Company, Meerut, 1995.
3. Tyagi B.S. Functions of Complex Variable, 17th Edition, Pragati Prakasham Publishing Company Ltd, Meerut, 1992-93.

SEMESTER V - *Core* Paper – XI

Subject title: Modern Algebra - I **Credit hours: 6**

Subject description: This course provides knowledge about sets, mappings, different types of groups and rings.
Goals: To enable the students to understand the concepts of sets, groups and rings. Also the mappings on sets, groups and rings.
Objective: On successful completion of course the students should have concrete knowledge about the abstract thinking like sets, groups and rings by proving theorems.

UNIT I

Sets – mappings – Relations and binary operations – Groups: Abelian group, Symmetric group Definitions and Examples – Basic properties.

UNIT II

Subgroups – Cyclic subgroup - Index of a group – Order of an element – Fermat theorem - A Counting Principle - Normal Subgroups and Quotient Groups.

UNIT III

Homomorphisms (Applications 1 and 2 are omitted) -Automorphisms – Inner automorphism - Cayley's theorem, permutation groups.

UNIT IV

Rings: Definition and Examples –Some Special Classes of Rings – Commutative ring – Field – Integral domain - Homomorphisms of Rings.

UNIT V

Ideals and Quotient Rings – More Ideals and Quotient Rings – Maximal ideal - The field of Quotients of an Integral Domain

Treatment as in

I.N. Herstein, Topics in Algebra, John Wiley & Sons, New York, 2003.

Unit I	Chapter 1	Sections 1.1 to 1.3,
	Chapter 2	Sections 2.1 to 2.3
Unit II	Chapter 2	Sections 2.4 to 2.6
Unit III	Chapter 2	Sections 2.7 to 2.10
Unit IV	Chapter 3	Sections 3.1 to 3.3
Unit V	Chapter 3	Sections 3.4 to 3.6.

References

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

SEMESTER – V - CORE PAPER XII

Subject Title: DISCRETE MATHEMATICS **Credit Hours: 5**

Subject Description: This course focuses on the mathematical logic, Relations& Functions, Formal languages and Automata, Lattices and Boolean Algebra and Graph Theories.

Goal: To enable the students to learn about the interesting branches of Mathematics.

Objectives: On successful completion of this course should gain knowledge about the Formal languages Automata Theory, Lattices & Boolean Algebra and Graph Theory.

UNIT-I:

Mathematical logic: Connections well formed formulas, Tautology, Equivalence of formulas, Tautological implications, Duality law, Normal forms, Predicates, Variables, Quantifiers, Free and bound Variables. Theory of inference for predicate calcules.
(1-2, 1-2.7. 1-2.9, 1-2.10, 1-2.11, 1-3, 1-5.1, 1-5.2, 1-5.4, 1-6.4)

UNIT-II:

Relations and functions: Composition of relations, Composition of functions, Inverse functions, one-to- one, onto, one-to-one& onto, onto functions, Hashing functions, Permutation function, Growth of functions. Algebra structures: Semi groups, Free semi groups, Monoids.
(2-3.5, 2-3.7, 2-4.2, 2-4.3, 2-4.6, 3-2, 3-5, 3-5.3,)

UNIT-III:

Formal languages and Automata: Regular expressions, Types of grammar, Regular grammar and finite state automata, Context free and sensitive grammars.
(3-3.1, 3-3.2, 4-6.2)

UNIT-IV:

Lattices and Boolean algebra: Partial ordering, Poset, Lattices, Boolean algebra, Boolean functions, Theorems, Minimization of Boolean functions(Karnaugh Method only).
(4-1.1, 4-2, 4-3, 4-4.2)

UNIT-V:

Graph Theory: Directed and undirected graphs, Paths, Reachability, Connectedness, Matrix representation, Euler paths, Hamiltonian paths, Trees, Binary trees simple theorems, and applications. (5-1.1, 5-1.2, 5-1.3, 5-1.4)

Text Books:

J.P Tremblay and R.P Manohar "Discrete Mathematical Structures with applications to computer science", Mc.Graw Hill, 1975.

Semester V - Skill Based Subject

Subject title: Operations Research – Paper III - Credit hours: 3

Subject Description:

This course presents applications and method to solve Integer Programming Problems, Non-linear Programming Problems and Dynamic Programming problems. It also includes Markov Analysis and Decision Analysis.

UNIT I:

Simulation-Introduction-simulation models-Event-Types of simulation- Generation of random numbers- Monte-Carlo simulation- simulation of queueing system.

UNIT II:

Network Scheduling by PERT/CPM- Introduction- Network and basic components- Rules of Network construction- Time calculation in Networks-CPM.
Pert Calculations- Cost Analysis- crashing the network- Problems.

Unit III:

Integer Programming Problem – Gomory's fractional cut Method – Branch Bound Method.

Unit IV:

Non-linear Programming Problems – General NLPP – Lagrange multiplier – Hessian bordered Matrix – Kuhn Tucker Condition – Problems

Unit V:

Dynamic Programming Problem – Recursive equation approach – D.P.P Algorithm – Solution of L.P.P by D.P.P.

References:

1. Operations Research – Prem Kumar Gupta D. S. Hira, S. Chand & Company Ltd, Ram Nagar, New Delhi
2. Operations Research – Kandiswarup, P. K. Gupta, Man Mohan, S. Chand & Sons Education Publications, New Delhi, 12th Revised edition.
3. Operations Research Principles and Problems: S. Dharani Venkata Krishnan, Keerthi publishing house PVT Ltd

SEMESTER VI - Core Paper – XIII

Subject Title: REAL ANALYSIS - II **Credit hours: 5**

Subject Description: This course presents nature of functions and mappings like continuity, connectivity, and derivative. It also includes the concept of monotonic functions with properties and Riemann - Stieltjes integral.

Goal: To introduce the concepts which provide a strong base to understand and analysis mathematics.

Objective: On successful completion of this course the students should gain the knowledge about the nature of functions mappings.

UNIT I

Examples of continuous functions –continuity and inverse images of open or closed sets – functions continuous on compact sets –Topological mappings –Bolzano's theorem.

UNIT II

Connectedness –components of a metric space – Uniform continuity : Uniform continuity and compact sets –fixed point theorem for contractions –monotonic functions.

UNIT III

Definition of derivative –Derivative and continuity –Algebra of derivatives – the chain rule –one sided derivatives and infinite derivatives –functions with non-zero derivatives –zero derivatives and local extrema –Roll's theorem –The mean value theorem for derivatives – Taylor's formula with remainder.

UNIT IV

Properties of monotonic functions –functions of bounded variation –total Variation –additive properties of total variation on (a, x) as a function of x – functions of bounded variation expressed as the difference of increasing functions –continuous functions of bounded variation.

UNIT V

The Riemann - Stieltjes integral : Introduction –Notation –The definition of Riemann –Stieltjes integral –linear properties –Integration by parts –change of variable in a Riemann –stieltjes integral –Reduction to a Riemann integral.

Treatment as in

Tom. M. APOSTOL, Mathematical Analysis, 2nd ed., Addison-Wisely. Narosa Publishing Company, Chennai, 1990.

Unit I	Chapter 4	Sections 4.11 to 4.15
Unit II	Chapter 4	Sections 4.16, 4.17, 4.19, 4.20, 4.21, 4.23
Unit III	Chapter 5	Sections 5.2 to 5.10 and 5.12
Unit IV	Chapter 6	Sections 6.2 to 6.8
Unit V	Chapter 7	Sections 7.1 to 7.7

References

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

SEMESTER VI - Core Paper – XIV

Subject title: COMPLEX ANALYSIS - II **Credit hours: 6**

Subject Description: This course provides the knowledge about complex functions with some fundamental theorems. Singularity and residues in complex functions, integrations of complex functions and meromorphic functions

Goal: To enable the students to learn complex number system, complex function and complex integration.

Objectives: On successful completion of this course the students should gained knowledge about the complex functions and its nature.

UNIT I

Results based on Cauchy's theorem(I) : Zeros-Cauchy's Inequality – Lioville's theorem – Fundamental theorem of algebra –Maximum modulus theorem –Gauss mean value theorem – Gauss mean value theorem for a harmonic function on a circle .

UNIT II

Results based on Cauchy's theorem (II) –Taylor's series –Laurent's series .

UNIT III

Singularities and Residues: Isolated singularities (Removable Singularity, pole and essential singularity) –Residues –Residue theorem.

UNIT IV

Real definite integrals: Evaluation using the calculus of residues – Integration on the unit circle –Integral with $-\infty$ and $+\infty$ as lower and upper limits with the following integrals:

i) P(x) /Q(x) where the degree of Q(x) exceeds that of P(x) at least 2.
ii) (sin ax).f(x), (cos ax).f(x), where a>0 and f(z) $\rightarrow$ 0 as z$\rightarrow\infty$ and f(z) does not have a pole on the real axis.
iii) f(x) where f(z) has a finite number of poles on the real axis.
Integral of the type $\int_0^x x^{a-1}/(1+x)\,dx$; 0< a <1;

UNIT V

Meromorphic functions: Theorem on number of zeros minus number of poles –Principle of argument: Rouche's theorem – Theorem that a function which is meromorphic in the extended plane is a rational function.

Treatment as in

P. Duraipandian and Laxmi Duraipandian, Complex analysis, Emerald Publishers, Chennai –2, 1997.

Unit I	Chapter 8	Sections 8.10, 8.11
Unit II	Chapter 9	Sections 9.1 to 9.3, 9.13.
Unit III	Chapter 9	Sections 9.5 to 9.12, 9.13.
	Chapter 10	Sections 10.1, 10.2 and 10.4.
Unit IV	Chapter 10	Sections 10.3 and 10.4.
Unit V	Chapter 11	Sections 11.1 to 11.3 (Omit theorems 11.5 and 11.6)

References

1. Churchill and Others, Complex Variable and Applications, Tata Mecgrow Hill Publishing Company Ltd, 1974.
2. Santhinarayan , Theory of functions of Complex Variable, S.Chand and Company ,Meerut, 1995.
3. Tyagi B.S , Functions of Complex Variable, 17th Edition, Pragati Prakasham Publishing Company Ltd, Meerut, 1992-93.

SEMESTER VI - Core Paper – XV

Subject title: MODERN ALGEBRA - II **Credit hours: 6**

Subject description:

This course provides knowledge about elementary operations on matrices, different types of matrices, rank of a matrix, spaces and linear transformations.

Goals:

It enables the students to understand the concept of matrices and linear transformations.

Objective:

On successful completion of course the students should have concrete knowledge about the elementary operations on matrices, characteristic vector of a square matrix, vector spaces and linear transformations.

UNIT I

Matrices: Introduction – Addition and Scalar Multiplication of Matrices – Product of Matrices –Transpose of a Matrix – Matrix Inverse – Symmetric and Skew - Symmetric Matrices.

UNIT II

Hermitian and Skew-Hermitian Matrices – Orthogonal and Unitary Matrices – Rank of a Matrix –Characteristic Roots and Characteristic Vectors of a Square Matrix.

UNIT III

Vector space: Elementary Basic Concepts – Subspace of a Vector space - Homomorphism – Isomorphism - Internal and External direct sums - Linear span - Linear Independence and Bases.

UNIT IV

Dual Spaces – Annihilator of a subspace - Inner Product Spaces – Norm of a Vector – Orthogonal Vectors - Orthogonal Complement of a subspace – Orthonormal set.

UNIT V

Linear Transformations: Algebra of Linear Transformations – Regular, Singular Transformations – Range of T – Rank of T - Characteristic Roots – Characteristic Vectors - Matrices.

Treatment as in

1. R.Balakrishnan and M. Ramabadran, Modern Algebra, Vikas Publishing House Pvt. Ltd, New Delhi, (Second Revised Edition 1994) (For Units I & II)

Unit I	Chapter 1	Sections 1.1 to 1.3, 1.5 to 1.7
Unit II	Chapter 1	Sections 1.8 and 1.9
	Chapter 2	Section 2.9
Chapter 3	Section 3.9	

2. I.N. Herstein, Topics in Algebra, John Wiley & Sons, New York, 2003. (For Units III, IV & V)

Unit III	Chapter 4	Sections 4.1 and 4.2

Unit IV	Chapter 4	Sections 4.3 and 4.4
Unit V	Chapter 6	Sections 6.1 , 6.2 and 6.3

References

1. Surjeet Singh and Qazi Zameeruddin, Modern Algebra, Vikas Publishing house, 1992.
2. A.R.Vasishtha, Modern Algebra, Krishna Prakashan Mandir, Meerut, 1994 – 95.
3. Seymour Lipschutz and Marc Lipson, Linear Algebra, 3rd Edition, McGraw Hill, 2001.

SEMESTER-VI
SKILL BASED SUBJECT
SUBJECT TITLE: OPERATIONS RESEARCH - PAPER -IV

SUBJECT DESCRIPTION:

This course enhances the students knowledge in decision analysis, sequencing the jobs to be carried out based on cost optimization; improve the power on replacement policies; analyse the cases according to their categories and improves the programming techniques.

Unit I:

DECISION ANALYSIS: – Decision Making environment – Decisions under uncertainty – Decision under risk – Decision – Tree Analysis.

UNIT--II:

SEQUENCING PROBLEMS

Introduction-problem of sequencing - basic terms used in sequencing- processing n--jobs through 2 machines - processing n –jobs through k machines -- processing 2 jobs through k machines(Problems only).

UNIT-III

REPLACEMENT PROBLEMS

Introduction - Replacement of equipment / assets that deteriorates gradually - replacement of equipment that fails suddenly and problems.

UNIT--IV:

INFORMATION THEORY:

Introduction- A measure of Information-Axiomatic Approach to Information- Entrpy-The expected information- Some properties of entropy function-Joint and conditional entropies.

UNIT -- V :

APPLICATIONS:

General solution of (mxn) rectangular games using simplex method - Reliability and system failure rates using replacement problems.

REFERENCES :

1. Operations research ; Kandiswarup ; P. K. Gupta ; Man Mohan ; S.Chand &sons education publications ; New Delhi.

2. Operations research : P K Gupta ; D S Hira ; S. Chand and company ltd. Ram Nagar; New Delhi.
3. Operations research principles problems ; S Dharani venkata krishnan ;keerthi publishing house Pvt. Ltd.

ELECTIVE I - A

SUBJECT TITLE: ASTRONOMY – I **CREDIT HOURS: 5**

Subject Description : This course focuses on the Solar system, Celestial sphere, Dip-Twilight & Keplar's laws.

Goal: To enable the students to understand the Astronomical aspects and about the laws governing the planet movements.

Objectives: On successful completion of this course the students should gain knowledge about Astronomy.

UNIT I:

General description of the Solar system. Comets and meteorites – Spherical trigonometry.

UNIT II:

Celestial sphere – Celestial co – ordinates – Diurnal motion – Variation in length of the day.

UNIT III:

Dip – Twilight – Geocentric parallex.

UNIT IV:

Refration – Tangent formula – Cassinis formula.

UNIT V:

Kepler's laws – Relation between true eccentric and mean anamolies.

Treatment as in "ASTRONOMY" by S.Kumaravelu and Susheela Kumaravelu.

Question paper setters to confine to the above text book only.

ELECTIVE I - B

NUMERICAL METHODS - I

Subject Description:

This course presents method to solve linear algebraic and transcendental equations and system of linear equations. Also Interpolation by using finite difference formulae.

Goal:

It exposes the students to study numerical techniques as powerful tool in scientific computing.

Objective:

On successful completion of this course the student gain the knowledge about solving the linear equations numerically and finding interpolation by using difference formulae.

Unit I: The solution of numerical algebraic and transcendental Equations:

Bisection method – Iteration Method – Convergence condition – Regula Falsi Method – Newton – Raphson method - Convergence Criteria – Order of Convergence.

Unit II: Solution of simultaneous linear algebraic equations:

Gauss elimination method – Gauss Jordan method – Method of Triangularization – Gauss Jacobi method – Gauss Seidel method

Unit III: Finite Differences:

Differences – operators – forward and backward difference tables – Differences of a polynomial – Factorial polynomial – Error propagation in difference table.

Unit IV: Interpolation (for equal intervals):

Newton's forward and backward formulae – equidistant terms with one or more missing values – Central differences and central difference table – Gauss forward and backward formulae – Stirlings formula.

Unit V: Interpolation (for unequal intervals):

Divided differences – Properties – Relations between divided differences and forward differences – Newton's divided differences formula – Lagrange's formula and inverse interpolation.

Treatment as in

Kandasamy. P, Thilagavathi. K and Gunavathi. K "Numerical methods" – S. Chand and Company Ltd, New Delhi – Revised Edition 2007. (Chapters: 3,4,5,6,7 and 8).

References:

1. Venkataraman M. K.,"Numerical Methods in Science and Engineering" National Publishing company V Edition 1999.
2. Sankara Rao K., "Numerical Methods for Scientists and Engineers" 2nd Edition Prentice Hall India 2004.

ELECTIVE II - A

Subject Title: ASTRONOMY II **Credit Hours -5**

Subject Description:

This course focuses on the Time, Annual Parallax, Precession, Nutation and The Moon, Eclipses.

Goal: To enable the students to learn about the interesting facts of Moon, Sun Planetory Motion.

Objectives: On successful completion of this course the students should gain knowledge about Astronomy.

UNIT-I:

Time: Equation of time – Convertion of time – Seasons – Calendar.

UNIT-II:

Annual Parallax – Abberation.

UNIT-III:

Precession – Nutation.

UNIT-IV:

The Moon – Eclipses.

UNIT-V:

Planetory Phenomenon – The Stellar system.

Treatment as in "ASTRONOMY" by Mr.S.Kumaravelu and Susheela Kumaravelu.

Question paper setters to confine to the above text book only.

ELECTIVE II-B

Numerical Methods II

Subject Description:

This course presents Numerical differentiation, Numerical integration and method to solve the differential equations.

Goal:

It exposes the students to study numerical techniques as powerful tool in scientific computing.

Objective:

On successful completion of this course the student gain the knowledge about solving the linear equations numerically and finding interpolation by using difference formulae.

Unit I: Numerical differentiations:

Newton's forward and backward formulae to compute the derivatives – Derivative using Stirlings formulae – to find maxima and minima of the function given the tabular values.

Unit II: Numerical Integration:

Newton – Cote's formula – Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

Unit III: Difference Equation:

Order and degree of a difference equation – solving homogeneous and non – homogeneous linear difference equations.

Unit IV:

Taylor series method – Euler's method – improved and modified Euler method – Runge Kutta method(fourth order Runge Kutta method only)

Unit V: Numerical solution of O.D.E(for first order only):

Milne's predictor corrector formulae – Adam-Bashforth predictor corrector formulae – solution of ordinary differential equations by finite difference method (for second order O.D.E).

Treatment as in

Kandasamy. P, Thilagavathi. K and Gunavathi. K "Numerical methods" – S. Chand and Company Ltd, New Delhi – Revised Edition 2007.
(Chapters: 9,10,11, Appendix and Appendix E).

References:

1. Venkataraman M. K.,"Numerical Methods in Science and Engineering" National Publishing company V Edition 1999.
2. Sankara Rao K., "Numerical Methods for Scientists and Engineers" 2^{nd} Edition Prentice Hall India 2004.

ELECTIVE III - A

Subject Title: GRAPH THEORY **Credit Hours-**5

Subject Description:

This course focuses on the Graphs, Sub Graphs, Trees, Planar graphs, Directed graphs. It also deals about matrix representation of Graphs.

Goal:

To enable the students to understand the basic concepts of Graph Theory.

Objectives:

On successful completion of this course the students should gain knowledge about Graph Theory.

UNIT I:

Graphs –Sub graphs – Degree of a vertex walks, paths and cycles in a Graphs – connectedness cut vertex and cut edge.

UNIT II:

Elur and Hamiltonion Graphs – Algorithm for Entoriom circuits – Bipartite Graphs –Trees.

UNIT III:

Matrix representation of a graph – vector spaces, associated with a graph – cycle spaces and cut set graphs.

UNIT IV:

Planar graphs – Enter's theorem on planar graphs – characterization of planar graphs (no proofs) of the difficult part of the characterization.

UNIT V:

Directed graphs – Connectivity – Enteoriom Digraphs – Tournaments.

Treatment as in "A First Course in Graph Theory" by A.Chandran (Macmillan)
Chapters 1 to 7.

Books for References:

1. Narasingh Deo, "Graph Theory" (Prentice Hall of India).
2. Harary: "Graph Theory" (Narosa Publishing HQCK**).**
3. 'Introduction to Graph Theory' by Dr. M. Murugan, Muthali Publishing House.

ELECTIVE III - B

AUTOMATA THEORY AND FORMAL LANGUAGES

UNIT – I

Introduction – phrase structure languages.

UNIT – II

Closure operations.

UNIT – III

Context free languages.

UNIT – IV

Finite state automata.

UNIT – V

Push down automata.

Content and treatment as in, 'Formal Languages and Automata' by Rani Sriomoney. Revised edition 1984.Pulishied by the Christian Literary Society, Madras-3 Chapters 1 to 6.

Reference Books:

1. Hopcrot and still man-Formal languages and their relation automata-Addision Wesley.
2. R.Y.Kulin-Automata theory-Machines and Languages-McGraw Hill.

SEMESTER VI; ELECTIVE III - C
Subject Title: PROGRAMMING IN C++ (Theory & Practical)

Subject Description: This paper presents the importance of class structure, operators, the types of inheritance and polymorphism, file handling.
Goals: To enable the students to learn about the class structure, operators, inheritance, polymorphism, file handling.
Objectives: On successful completion of the course the students should have
learnt class structure, member functions & data members.
Learnt the concept of inheritance, types and example problems.
Learnt the concepts of polymorphism, types and problems.
Learnt the concepts of File handling.

UNIT-I:
Evolution of C++ - applications of C++ - structure of C++ program. Tokens – keywords – identifiers and constants – basic data types – user-defined data types – constant pointers and pointers to constants – symbolic constants –type compatibility – declaration of variables – dynamic initialization of variables – reference variables – operators in C++ - scope resolution operator – memory management operators – manipulators – type cast operator – expressions and their types – special assignment expressions – implicit conversions – operator precedence.

UNIT-II:
Functions in C++ : The main function – function prototyping – call by reference – return by reference – inline functions – default arguments – const arguments – function overloading.
Managing Console I/O Operations: C++ streams – C++ stream classes – unformatted console I/O operations – formatted console I/O operations –managing output with manipulators.

UNIT-III:
Classes and Objects: Specifying a class – defining member functions – making an outside function inline – nesting of member functions – private member functions – arrays within a class – memory allocation for objects –arrays of objects – objects as function arguments – friend functions – returning objects – const member functions.
Constructors and Destructors: Introduction – constructors – parameterized constructors – multiple constructors in a class – constructors with default arguments – copy constructor.

UNIT-IV:
Operator Overloading: Introduction – defining operator overloading – overloading unary operators – overloading binary operators - overloading binary operators using friends – rules for overloading operators.

UNIT-V:

Inheritance: Introduction – defining derived classes – single inheritance – making a private member inheritable – multilevel inheritance – multiple inheritance – hierarchical inheritance – hybrid inheritance.

Text Books:

1. E.Balagurusamy - 'Object Oriented programming with C++', McGraw Hill.
2. Robert Lafore – 'Object oriented programming in Turbo C++, Galgotia publications Pvt.Ltd, New Delhi- 110002 11994.
3. Bjarne Stroutstrup – 'The C++ programming language', II Edition, Addision Wesley, 1991.

Reference Books:

1. D.Ravi Chandran – 'Programming with C++', Tata McGraw-Hill publishing company limited (1996), New Delhi.
2. Ashok N.Kamthane – 'Object Oriented Programming with ANSI and Turbo C++', Pearson Education publishers (2003).
3. John R.Hubbard – 'Programming with C++, 2nd Edition, TMH publishers(2002).

PROGRAMMING IN C++ - PRACTICAL LIST.

1. Write a function 'power( )'to raise a number 'm' to a power 'n'. The function takes a 'double' value for 'm' and 'int' value for 'n', and returns the result correctly. Use a default vale of 2 for 'n' to make the function to calculate squares when this argument is omitted. Write a 'main( )' that gets the values of 'm' and 'n' from the user to test the function.

2. Write a program to compute compound interest of a given amount AMT for 'n' years. Use function overloading so that the program gets input of interest rate RATE in any of the data type 'float' or 'int'.

3. Create a class which consist of employee detail ENO, ENAME, DEPT, BASIC SALARY. Write a member function to get and display them. Derive a class PAY from the above class and write a member function to calculate DA, HRA and PF depending on the grade and display the payslip in a neat format using console I/O.

4. Define two classes POLAR and RECTANGLE to represent points in the polar and rectangle system. Write a program to convert from one system to another.

5. Create a class FLOAT that contains one float data member. Overload all the four arithmetic operators so that they operate on the objects of FLOAT.

SEMESTER VI; ELECTIVE III – D

NUMBER THEORY

UNIT I:
Peano's Axiom - Mathematical Induction - The Binomial Theorem - Early Number Theory

UNIT II:
Divisibility Theory in Integers - The Division Algorithm - The g.c.d. - Enclidean Algorithm - The Diophontine Equation ax + by = c

UNIT III:
Primes and their Distributions - The fundamental Theorem of Arithmetic - The seive of Eratosthenes - The Gull Conjecture.

UNIT IV:
The Theory of Congruence - Basic Properties of Congruence - Special Divisibility test - Linear Congruence.-Prime modulus- Power residues.

UNIT V:
Fermat's Theorem - Fermat's factorization method - The Little theorem - Wilson's theorem.

Treatment as in

David M. Burton - Elementary Number theory.

Books for Reference

1. Ivan Nivan and H. Zuckerman - An Introduction to theory of Numbers.
2. Kumaravelu. S and SusheelaKumaravelu – Elements of Number Theory, Nagarcoil, 2002.
3. Neville Robinns, Beginning Number Theory, 2nd Ed., Narosa Publishing House Pvt. Ltd.,Delhi, 2007.