Department of Mathematics
Mahatma Gandhi University
(Choice Based Credit Sysytem)
M,Sc Mathematics
Scheme of Instruction And Examinations
(W.e.f The Academic year 2015-16)

Semester -I

S.No	Sub Code	Subject	Hrs/Week	Duration of Exam	Internal Assessment	External Marks	Total Marks	Credits
1	MM101	Algebra	6	3	20	80	100	6
2	MM102	Real Analysis	6	3	20	80	100	6
3	MM103	Discrete Mathematics	6	3	20	80	100	6
4	MM104	Elementary Number theory	6	3	20	80	100	6
5	MM105	Mathematical Methods	6	3	20	80	100	6
6	MM 199	Seminar and Tutorials	2(extra)				25	1
7	ADDON Paper	Communicative English& Soft Skills	2	2	10	40	50	2
Total			**34**				**575**	**33**

Semester- II

S.No	Sub Code	Subject	Hrs/Week	Duration of Exam	Internal Assessment	External Marks	Total Marks	Credits
1	MM201	Advanced Algebra	6	3	20	80	100	6
2	MM202	Advanced Real Analysis	6	3	20	80	100	6
3	MM203	Functional Analysis	6	3	20	80	100	6
4	MM204	Theory of Ordinary Differential Equations	6	3	20	80	100	6
5	MM205	Topology	6	3	20	80	100	6
6	MM 299	Seminar and Tutorial	2(extra)				25	1
7	ADDON Paper	Human values and Ethics	2	2	10	40	50	2
Total			**34**				**575**	**33**

Semester -III

S.No	Sub Code	Subject	Hrs/Week	Duration of exam	Internal Assessment	Semester exam	Total marks	Credits
1	MM301	Complex Analysis	6	3	20	80	100	6
2	MM302	Elementary Operator Theory	6	3	20	80	100	6
3		**Elective**	6	3	20	80	100	6
	MM303A	Mechanics						
	MM303B	Operations Research						
	MM303C	Dynamical systems						
4		**Elective**	6	3	20	80	100	6
	MM304A	Analytical Number theory						
	MM304B	Numerical Techniques						
	MM304C	Graph Theory						
5		**Elective**	6	3	20	80	100	6
	MM305A	Algebraic Number Theory						
	MM305B	Integral Equations						
	MM305C	Differential Geometry						
6 -	**Interdisciplinary**	**paper**	4	3	20	80	100	4
7	MM399	Seminar and tutorial	2(extra)				25	1
		Total	**36**				**625**	**35**

Semester -IV

S. No.	Sub. Code.	Subject	Instructions Hrs./ Week	Duration of Exam	Intern-al Assessment	Semester Exam	Total marks	Credits
1.	MM 401	Advanced Complex Analysis	6	3	20	80	100	5
2.	MM 402	General Measure Theory	6	3	20	80	100	5
3.		**Elective**	6	3	20	80	100	5
	MM 403A	Fluid Mechanics						
	MM 403 B	Banach Algebra						
	MM 403 C	Prime Number Theory						
4.		**Elective**	6	3	20	80	100	5
	MM 404A	Finite Difference Method						
	MM404B	Applications of Functional analysis						
	MM 404C	Commutative rings						
5		**Elective**	6	3	20	80	100	5
	CBMM 405A	Calculus of variations						
	CBMM405B	Elements of Information Technology						
	MM 405CT	OOPs through C++						
	MM405CP	Practical: OOPs through C++	2	3			50	Grade
6	Interdisciplinary	Paper	4	3	20	80	100	4
7.	MM 499	Seminar and tutorial	2(extra)				25	1
		Total	**36**				**675**	**35**

Dept of Mathematics
Mahatma Gandhi University
(Choice Based Credit System)
M.ScMathematics
Scheme of Instructions andExaminations
(W.e.f the Academic Year 2015-16)

Year	Semester	Theory Paper No	Paper Title	Hrs/Week	Credits	Marks
I	First	Paper-I	Algebra	6	6	100
		Paper-II	Real Analysis	6	6	100
		Paper-III	Discrete Mathematics	6	6	100
		Paper-IV	Elementary Numer Theory	6	6	100
		Paper-V	Mathematical Methods	6	6	100
			Seminars and Tutorials	2(extra)	1	25
		ADDON Paper	Communicative English and soft skills	2	2	50
	Second	Paper-I	Advanced Algebra	6	6	100
		Paper-II	Advanced Real Analysis	6	6	100
		Paper-III	Functional Analysis	6	6	100
		Paper-IV	Theory of Ordinary Differential Equations	6	6	100
		Paper-V	Topology	6	6	100
			Seminars and Tutorials	2(extra)	1	25
		ADDON Paper	Human Values and Ethics	2	2	50
II	Third	Paper-I	Complex Analysis	6	6	100
		Paper-II	Elementary Operator theory	6	6	100
		Paper-III	Core Elective	6	6	100
		Paper-IV	Core Elective	6	6	100
		Paper-V	Core elective	6	6	100
			Seminars and Tutorials	2(extra)	1	25
			Inter disciplinary Paper	4	4	100
	Fourth	Paper-I	Advanced Complex Analysis	6	6	100
		Paper-II	General Measure Theory	6	6	100
		Paper-III	Core Elective	6	6	100
		Paper-IV	Core Elective	6	6	100
		Paper-V	Core Elective/Practica	6/2	6/grade	100/50
			Seminars and Tutorials	2(extra)	1	25
			Interdisciplinary paper	4	4	100
Total				140	136	2450

Minutes of the BOS Meeting

The BOS Meeting was convened on 02/09/2015 at 10:30pm in the Dept of Mathematics Osmania University, Hyderabad to approve the M,Sc Mathematics(Previous) syllabus and CBCS system W.e.f. The Academic year 2015-16 and the following members were present in the meeting.

1) Prof B. Shanker OU, HYD
   Chairmen BOS in Mathematics, MGU
2) Prof. M. V. Ramanamurthy ,HYD
   Member on BOS in Mathematics ,MGU
3) Prof T. Vasanthi
   Member on BOS in Mathematics, MGU
4) Dr.G. Upender Reddy ,MGU
   Member on BOS in Mathematics, MGU
5) Dr. P. Maddileti, MGU
   Member on BOS in Mathematics, MGU
6) Mrs. Hymavathi. D, MGU
   Member and Convener on BOS in Mathematics, MGU.

RESOLUTIONS:

1) It is resolved to offer to implement CBCS system in Toto as per the UGC directions.
2) It is resolved to offer Add on papers communicative English and soft skills in I semester and Human values and Ethics in II semester.
3) It is also resolved to offer Interdisciplinary papers in III and IV semesters.
4) It is resolved to approved the syllabus of M,Sc Mathematics (Previous and final) W.e.f. the Academic year 2015-16.

The above resolutions are approved by the BOS Committee members .

1) Prof B. Shanker OU, HYD
   Chairmen BOS in Mathematics, MGU

2) Prof. M. V. Ramanamurthy OU,HYD
   Member on BOS in Mathematics ,MGU

3) Prof .T. Vasanthi,
   Member on BOS in Mathematics, MGU

4) Dr.G. Upender Reddy ,MGU
   Member on BOS in Mathematics, MGU

5) Dr. P. Maddileti, MGU
   Member on BOS in Mathematics, MGU

6) Mrs. Hymavathi. D, MGU
   Member and Convener on BOS in Mathematics, MGU.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY

M.Sc. Mathematics
Semester I

MM –101 **Paper-I**

Algebra

Unit I

Automaphisms- Conjugacy and G-sets- Normal series solvable groups- Nilpotent groups. (Pages 104 to 128 of [1])

Unit II

Structure theorems of groups: Direct product- Finitly generated abelian groups- Invariants of a finite abelian group- Sylow's theorems- Groups of orders p^2,pq . (Pages 138 to 155)

Unit III

Ideals and homomsphism- Sum and direct sum of ideals, Maximal and prime ideals- Nilpotent and nil ideals- Zorn's lemma (Pages 179 to 211).

Unit-IV

Unique factorization domains - Principal ideal domains- Euclidean domains- Polynomial rings over UFD- Rings of traction.(Pages 212 to 228)

Text Books:

[1] Basic Abstract Algebra by P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul.

Reference:

[1] Topics in Algebra by I.N. Herstein.

02/09

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DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY

M.Sc. Mathematics
Semester I

MM – 102 **Paper-II**

Real Analysis

Unit I

Metric spaces- Compact sets- Perfect sets- Connected sets

Unit II

Limits of functions- Continuous functions- Continuity and compactness Continuity and connectedness- Discontinuities – Monotone functions.

Unit III

Rieman- Steiltjes integral- Definition and Existence of the Integral- Properties of the integral- Integration of vector valued functions- Rectifiable waves.

Unit-IV

Sequences and series of functions: Uniform convergence- Uniform convergence and continuity- Uniform convergence and integration- Uniform convergence and differentiation- Approximation of a continuous function by a sequence of polynomials.

Text Books:

[1] Principles of Mathematical Analysis (3rd Edition) (Chapters 2, 4, 6)

by W. Tuddin Mc Graw-Hill Internation Edition

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DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY

M.Sc. Mathematics
Semester I

MM –103 Paper-III

Discrete Mathematics

UNIT- I

LATTICES: Partial Ordering – Lattices as Posets – some properties of Lattices – Lattices as Algebraic Systems – Sublattices, Direct products and Homomorphisms – some special Lattices – Complete, complemented and distributive lattices.(Pages 183-192, 378-397 of [1])

UNIT- II

BOOLEAN ALGEBRA: Boolean Algebras as Lattices – Bolean Identities – the switching Algebra – sub algebra, Direct product and homomorphism – Join irreducible elements – Atoms (minterms) – Boolean forms and their equivalence – minterm Boolean forms – Sum of products canonical forms – values of Boolean expressions and Boolean functions – Minimization of Boolean functions – the Karnaugh map method.(Pages 397 – 436 of [1])

UNIT- III

GRAPHS AND PLANAR GRAPHS : Directed and undirected graphs – Isomorphism of graphs – subgraph – complete graph – multigraphs and weighted graphs – paths – simple and elementary paths – circuits – connectedness – shortest paths in weighted graphs – Eulerian paths and circuits – Incoming degree and outgoing degree of a vertex - Hamiltonian paths and circuits – Planar graphs – Euler's formula for planar graphs.(Pages 137-159, 168-186 of [2])

UNIT- IV

TREES AND CUT-SETS: Properties of trees – Equivalent definitions of trees - Rooted trees – Binary trees – path lengths in rooted trees – Prefix codes – Binary search trees – Spanning trees and Cut-sets – Minimum spanning trees(Pages 187-213 of [2])

Text Books:-

[1] J P Tremblay and R. Manohar: Discrete Mathematical Structures with applications to Computer Science, McGraw Hill Book Company
[2] C L Liu : Elements of Discrete Mathematics, Tata McGraw Hill Publishing Company Ltd. New Delhi. (Second Edition).

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DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY <BCS

M.Sc. Mathematics
Semester I

Paper-IV

MM 104

Elementary Number Theory

UNIT-I

The Fundamental Theorem of arithmetic: Divisibility, GCD, Prime Numbers, Fundamental theorem of Arithemtic, the series of reciprocal of the Primes, The Euclidean Algorithm.

UNIT-II

Arithmetic function and Dirichlet Multiplication, The functions $\phi(n)$, $\mu(n)$ and a relation connecting them, Product formulae for $\phi(n)$, Dirichlet Product, Dirichlet inverse and Mobius inversion formula and Mangoldt function $\Lambda(n)$, multiplication function, multiplication function and Dirichlet multiplication, Inverse of a completely multiplication function, Liouville's function $\lambda(n)$, the divisor function is $\sigma_\alpha(n)$

UNIT-III

Congruences, Properties of congruences, Residue Classes and complete residue system, linear congruences conversion, reduced residue system and Euler Fermat theorem, polynomial congruence modulo P, Lagrange's theorem, Application of Lagrange's theorem, Chinese remainder theorem and its application, polynomial congruences with prime power moduli

UNIT-IV

Quadratic residue and quadratic reciprocity law, Quadratic residues, Legendre's symbol and its properties, evaluation of (-1/p) and (2/p), Gauss Lemma, the quadratic reciprocity law and its applications.

Text Book:- Introduction to analytic Number Theory by Tom N. Apostol.
Chapters 1,2,5,9

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DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY

M.Sc. (Mathematics)
Semester I

MM – 105 **Paper- V**

Mathematical Methods

Unit I Existence and Uniqueness of solution of $\frac{dy}{dx} = f(x,y)$. The method of successive approximation- Picard's theorem- Sturm-Liouville's boundary value problem.Partial Differential Equations: Origins of first-order PDES-Linear equation of first-order-Lagrange's method of solving PDE of Pp+Qq = R – Non-Linear PDE of order one-Charpit method- Linear PDEs with constant coefficients.

Unit II Partial Differential Equations of order two with variable coefficients-Canonical form Classification of second order PDE- separation of variable method solving the one-dimensional Heat equation and Wave equation- Laplace equation.

Unit III

Power Series solution of O.D.E. – Ordinary and Singular points- Series solution about an ordinary point -Series solution about Singular point-Frobenius Method.Lagendre Polynomials: Lengendre's equation and its solution- Lengendre Polynomial and its properties- Generating function-Orthogonal properties- Recurrance relations-Laplace's definite integrals for $P_n(x)$- Rodrigue's formula.

Unit-IV

Bessels Functions: Bessel's equation and its solution- Bessel function of the first kind and its properties- Recurrence Relations- Generating function- Orthogonality properties.Hermite Polynomials: Hermite's equation and its solution- Hermite polynomial and its properties- Generating function- Alternative expressions (Rodrigue's formula)- Orthogonality properties- Recurrence Relations.

Text Books:

[1] "Elements of Partial Differential Equations", By Ian Sneddon, Mc.Graw-Hill International Edition.

[2] "Text book of Ordinary Differential Equation", By S.G.Deo, V. Lakshmi Kantham, V. Raghavendra, Tata Mc.Graw Hill Pub. Company Ltd.

[3] "Ordinary and Partial Differential Equations", By M.D. Raisingania,

S. Chand Company Ltd., New Delhi.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. (Mathematics)
Semester II

MM –201 **Paper-I**

Advanced Algebra

Unit I

Algebraic extensions of fields: Irreducible polynomials and Eisenstein criterion- Adjunction of roots- Algebraic extensions-Algebraically closed fields (Pages 281 to 299)

Unit II

Normal and separable extensions: Splitting fields- Normal extensions- Multiple roots- Finite fields- Separable extensions (Pages 300 to 321)

Unit III

Galois theory: Automorphism groups and fixed fields- Fundamental theorem of Galois theory- Fundamental theorem of Algebra (Pages 322 to 339)

Unit-IV

Applications of Galoes theory to classical problems: Roots of unity and cyclotomic polynomials- Cyclic extensions- Polynomials solvable by radicals- Ruler and Compass constructions. (Pages 340-364)

Text Books:

[1] Basic Abstract Algebra- S.K. Jain, P.B. Bhattacharya, S.R. Nagpaul.

Reference Book:

1.Topics in Algrbra By I. N. Herstein

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY

M.Sc. Mathematics
Semester II

MM –202 **Paper-II**

Advanced Real Analysis

Unit I

Algebra of sets- Borel sets- Outer measure- Measurable sets and Lebesgue measure- A non-measurable set- Measurable functions- Little wood's three principles.

Unit II

The Rieman integral- The Lebesgue integral of a bounded function over a set of finite measure- The integral of a non-negative function- The general Lebesgue integral.

Unit III

Convergence in measure- Differentiation of a monotone functions- Functions of bounded variation.

Unit-IV

Differentiation of an integral- Absolute continuity- The L^p-spaces- The Minkowski and Holder's inequalities- Convergence and completeness.

Text Books:

[1] Real Analysis (3rd Edition) (Chapters 3, 4, 5) by H. L. Royden

Pearson Education (Low Price Edition)

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DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY

M.Sc. Mathematics
Semester II

Paper-III

MM – 203

Functional Analysis

UNIT-I

Normed Space, Banach Space, further properties of normed spaces, Finite dimensional normed spaces and subspaces, compactness and finite dimension linear operators, Bounded and continuous linear operators, linear functionals, linear operators and functionals on finite dimensional spaces, normed spaces of operators, Dual spaces.

(See Sections 2.2 to 2.10)

UNIT-II Inner product space, Hilbert space, further properties of inner product spaces, orthogonal complements and direct sums, orthonormal sets and sequences, series related to orthonormal sequences and sets. (Sections 3.1 to 3.5)

UNIT-III Total Orthonormal sets and sequences, Representation of functionals on Hilbert Spaces, Hilbert-adjoint operator, self-adjoint, unitary and normal operators. (See Sections 3.6, 3.8, 3.9 and 3.10)

UNIT-IV

Hahn-Banach theorems for Complex vector spaces and normed spaces, adjoint operator, Reflexive spaces, uniform boundedness theorem, convergence of sequences of operators and Functionals. Open mapping theorem, closed graph theorem.

(See Sections 4.3, 4.5, 4.6, 4.7, 4.12 and 4.13).

Text Book:-Introductory Functional Analysis by E.Kreyszig, John-wiley and Sons, New York,

References Books:-

1).B.V.Limaye, "Functional Analysis", 2nd Edition

2).Brown and Page, "Elements of Functional Analysis"

3).P.K.Jain, O.P.Ahuja and Khalil Ahmed, "Functional Analysis".

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester II

Paper-IV

MM – 204

Theory of Ordinary Differential Equations

UNIT-I

Linear differential equations of higher order: Introduction-Higher order equations A Modelling problem -Linear Independence- Equations with constant coefficients- Equations with variable coefficients- Wronskian- Variation of parameters- Some standard methods.

UNIT-II Existence and Uniqueness of solutions: Introduction – preliminaries – successive approximations – Picard's theorem – continuation and dependence on initial conditions – existence of solutions on the large – existence and uniqueness of solutions of systems – fixed point method

UNIT-III Analysis and methods of non-linear differential equations:-Introduction – Existence theorem- Extremal solutions – Upper and Lower solutions- Monotone iterative method, method of quasi linearization- Bihari's inequality.

Unit – IV Oscillation theory for linear Differential equation of Second Order :- The adjoint equation- self adjoint differential equation of second order- Abel's formula - the number of zeros in a finite interval – the Strum separation theorem- the strum comparison theorem- the sturm picone theorem- the Bocher Osgood theorem- Aspecial pair of solution – Osillation on half axis.

Text Book :

1) Ordinary Differential Equations and Stability theory by S.G. Deo, V. Lakshmikantham, V. Raghavendra

Reference Books:

1. An Introduction to Ordinary Differential Equations by E.A.Coddington
2. Ordinary Differential Equations and stability theory by David Sanchez
3. An Introduction to the Theory of Ordinary Differential Equations by Walter Leighton

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DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester-II

Paper- V

MM – 205

Topology

Unit I

Topological spaces: Definition and some examples- Elementary concepts Open bases and open subbases – weak topologies.

Unit II

Compactness : Compact spaces – products of spaces- Tychonoff's theorem and locally compact spaces – Compactness for metric spaces – Ascoli's theorem.

Unit III

Separation : T1 –spaces and Hausdorff spaces – completely regular spaces and normal spaces – Uryson's lemma and the Tietze extension theorem- the Urysohn imbedding theorem.

Unit IV

Connectedness: Connected spaces – The components of a spaces – Totally disconnected spaces – Locally connected spaces.

Text Book:

[1] G. F. Simmons, Topology and Modern Analysis, (Chapters 3,4,5,6)McGraw Hill.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY

M.Sc. Mathematics
Semester III

MM –301 **Paper-I**

Complex Analysis

Unit I

Regions in the complex plane- Functions of a complex variable- Mappings by exponential functions- Limits- Continuity- Derivatives- Cauchy-Riemans equations- Sufficient conditions for differentiation- Polar coordinates.

Unit II

Analytic functions- Uniquely determined analytic functions- Reflection principle- The exponential function- The logarithmic function- Complex exponents- Trigonometric functions- Hyperbolic functions- Inverse trigonometric- Hyperbolic functions.

Unit III

Derivatives of functions w(t)- Definite integrals of functions w(t)- Contours- Contour integrals- Upper bounds for moduli of contour integrals- Anti derivatives.

Unit-IV

Cauchy-Goursat theorem and its proof- Simply and multiply connected domains- Cauchy's integral formula- Derivatives of analytic functions- Liouville's theorem and fundamental theorem of algebra- Maximum modulus principle.

Text Books:

[1] Complex Variable and Application (8th Edition) By James Ward Brown,

Ruel V-Churchill

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester-III

MM – 302 **Paper-II**

Elementary Operator Theory

Unit I

Spectral theory in finite dimensional normed spaces - Basic concepts of spectrum - Resolvent sets - Spectral properties of bounded linear operators - Further properties of resolvent and spectrum. (Sections 7.1, 7.2,7.3 and 7.4 of [1])

Unit II

Compact linear operators on normed spaces - Properties of compact linear operators - Spectral properties of compact linear operators on normed spaces - Operator equations involving compact linear operators. (Sections 8.1, 8.2, 8.3 and 8.5 of [1])

Unit III

Spectral properties of bounded self adjoint linear operators - Further spectral properties of bounded linear operators - Positive operators - Square root of a positive operator. (Sections 9.1, 9.2, 9.3 and 9.4 of [1])

Unit IV

Projection operators - Properties of projection operators - Spectral family - Spectral family of a bounded self adjoint linear operator.

(Sections 9.5, 9.6, 9.7 and 9.8 of [1])

Text Book :

[1] E. Kreyszig : Introductory Functional Analysis, John Wiley and Sons, New York, 1978.

Reference Books:

[1] Brown and Page: Elements of Functional Analysis, D.V.N. Comp.

[2] B.V. Limaye : Functional Analysis, Wiley Eastern Limited, (2nd Edition)

[3] P.R. Halmos : A Hilbert Space Problem Book, D. Van Nostrand Company, Inc. 1967.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester-III

MM – 303 A

Paper- III(A)

Mechanics

Unit I

Dynamics of systems of Particles:- Introduction - Centre of Mass and Linear Momentum of a system- Angular momentum and Kinetic Energy of a system, Mechanics of Rigid bodies- Planar motion:- Centre of mass of Rigid body-some theorem of Static equilibrium of a Rigid body- Equilibrium in a uniform gravitational field- Rotation of a Rigid body about a fixed axis.

Unit II

Moment of Inertia:- calculation of moment of Inertia Perpendicular and Parallel axis theorem- Physical pendulum-A general theorem concerning Angular momentum-Laminar Motion of a Rigid body-Body rolling down an inclined plane (with and without slipping).

Unit III

Motion of Rigid bodies in three dimension-Angular momentum of Rigid body products of Inertia, Principles axes-Determination of principles axes- Rotational Kinetic Energy of Rigid body-Momentum of Inertia of a Rigid body about an arbitrary axis- The momental ellipsoid - Euler's equation of motion of a Rigid body.

Unit IV

Lagrange Mechanics:-Generalized Coordinates-Generalized forces-Lagrange's Equations and their applications-Generalized momentum-Ignorable coordinates-Hamilton's variational principle-Hamilton function-Hamilton's Equations- Problems-Theorems.

Text Book:

[1] G.R. Fowles, Analytical Mechanics, CBS Publishing, 1986

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester III

MM – 303B **Paper III(B)**

Operations Research

Unit I

Formulation of Linear Programming problems, Graphical solution of Linear Programming problem, General formulation of Linear Programming problems, Standard and Matrix forms of Linear Programming problems, Simplex Method, Two-phase method, Big-M method, Method to resolve degeneracy in Linear Programming problem, Alternative optimal solutions. Solution of simultaneous equations by simplex Method, Inverse of a Matrix by simplex Method, Concept of Duality in Linear Programming, Comparison of solutions of the Dual and its primal.

Unit II

Mathematical formulation of Assignment problem, Reduction theorem, Hungarian Assignment Method, Travelling salesman problem, Formulation of Travelling Salesman problem as an Assignment problem, Solution procedure.

Mathematical formulation of Transportation problem, Tabular representation, Methods to find initial basic feasible solution, North West corner rule, Lowest cost entry method, Vogel's approximation methods, Optimality test, Method of finding optimal solution, Degeneracy in transportation problem, Method to resolve degeneracy, Unbalanced transportation problem.

Unit III

Concept of Dynamic programming, Bellman's principle of optimality, characteristics of Dynamic programming problem, Backward and Forward recursive approach, Minimum path problem, Single Additive constraint and Multiplicatively separable return, Single Additive constraint and Additively separable return, Single Multiplicatively constraint and Additively separable return.

Unit-IV

Historical development of CPM/PERT Techniques - Basic steps – Network diagram representation - Rules for drawing networks - Forward pass and Backward pass computations - Determination of floats - Determination of critical path - Project evaluation and review techniques updating.

Text Books:

[1] S. D. Sharma, Operations Research.
[2] Kanti Swarup, P. K. Gupta and Manmohan, Operations Research.
[3] H. A. Taha, Operations Research – An Introduction.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester III

MM – 303 C

Paper III(C)

Dynamical Systems

Unit I

Linear System: Uncoupled linear system- Diagonalization- Exponentials of Operators- the fundamental theorem for linear system- linear system in R^2 - Complex Eigen values- Multiple Eigen values.

Unit II

Jordan forms- stability theory- Non homogonous linear systems- Non linear system: local theory: Some preliminary concepts and definitions- The fundamental existence uniqueness theorem- Dependence on initial condition and parameters-The maximal interval of existence.

Unit III

The flow defined by a differential equation- linearization- the stable manifold theorem- the Hartman- Grobman theorem- Stability and Liapunov functions-saddles- nodes-Foci and centres.

Unit IV

Equation with Deviating arguments: Introduction- Equation with constant delay- equation with piecewise constant delay-A few other types of delay equations.

Text Books:

[1] Differential Equations and Dynamical System; by Lawrence perko, third Edition, Springer
[2] Text Book of Ordinary Differential Equations by S.G.Deo, V. Lakshmikantham and V. Raghavendra,

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester-III

MM – 304A **Paper-IV(A)**

Analytic Number Theory

Unit I

Averages of arithmetical function: The big oh notation- Asymptotic equality of functions- Euler summation formula- Some asymptotic formulas- The average order of d(n)- The average order of the divisor functions $\sigma_\alpha(n)$- The average order of $\varnothing(n)$- An application to the distribution of lattice points visible trona the origin- The average order of $\mu(n)$ and $\Lambda(n)$- The partial sums of dirichlet product- Applications to $\mu(n)$ and $\Lambda(n)$- Another identity for the partial sums of a dirichlet product. (Sections3.1 to 3.12)

Unit II

Some elementary theorems on the distribution of prime numbers- Introduction chebyshev's functions- $\psi(x)$ and $\theta(x)$- Relation connecting $\theta(n)$and $\pi(n)$- Some equivalent forms of the prime number theorem- Inequalities for $\pi(n)$ and p_n. (Sections4.1 to 4.5)

Unit III

Shapiro's Tauberian theorem- Applications of shapiro's theorem An asymptotic formula for the partial sums $\sum_{p \le x} 1/p$ - The partial sums of the mobins function- Selberg Asymptotic formula. (Sections4.6 to 4.11 except 4.10)

Unit-IV

Finite Abelian groups and their character: Construction of sub groups- Characters of finite abelian group- The character group- The orthogonality relations for characters Dirichlet characters- Sums involving dirichelt characters the non vanishing of $L(1, \chi)$ for real non principal χ . (Sections 6.4 to 6.10)

Text Books:

[1] Tom M. Apostol- Introduction to Analytic Number Theory.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester III

MM 304 B

Paper- IV(E)

Integral Equations

Unit I

Basic concepts - Relationship between Linear differential equations and Volterra Integral equations - Resolvent Kernel of Volterra Integral equation. Differentiation of some resolvent kernels - Solution of Integral equation by resolvent kernel - The method of successive approximations - Convolution type equations.

Unit II

Solution of Integro-differential equations with the aid of the Laplace Transformation – VIE with limits (x,a), Volterra integral equation of the first kind -VIE of the first kind of the convolution type - Euler integrals - Beta and Gamma functions and their elementary properties - Relationship between Beta and Gamma functions - Abel's problem - Abel's integral equation and its generalizations. VIE of the first kind of the convolution type.

Unit III

Fredholm integral equations of the second kind - Fundamentals - Method of Fredholm Determinants-Iterated kernels constructing the resolvent kernel with the aid of iterated kernels - Integral equations with degenerated kernels - Hammerstein type equation - Characteristic numbers and Eigen functions and its properties. Solution of homogeneous equations with degenerated kernel. Non homogeneous symmetric equations.

Unit IV

Applications of integral equations to problems- Longitudinal vibrations of a rod, Deformation of a rod, Deformation of periodic solutions. - Green's function - Construction of Green's function for ordinary differential equations - Special case of Green's function - Using Green's function in the solution of boundary value problem – Boundary value problems containing a parameter-Reducing to integral equation- singular integral equations.

Text Book:

[1] M. Krasnov, A. Kiselev, G. Makarenko, Problems and Exercises in Integral Equations (1971)
[2] S. Swarup, Integral Equations (2008)

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester III

MM – 304 C Paper IV(C)

Graph Theory

Unit I

Graphs, introduction- Finite and infinite graphs, Incidence and degree, Null graph, isolated and pendent vertices. Paths and circuits- Isomorphism, Subgraphs- Walks, paths and circuits- Connected and disconnected graphs, components- Euler graphs- Operations on graphs- Hamiltonian paths and circuits-Travelling salesman problem.

Unit II

Trees- Their properties- pendent Vertex in a tree- Distance and centers in a tree- Rooted and binary Trees- Counting trees- Spanning trees. Fundamental circuits- Finding all spanning trees of a graph- spanning trees in a weighted graph. Cut sets- properties- All cut sets in a graph- Fundamental Circuits and cutsets.

Unit III

Planar and Dual graphs- Combinatorial Vs Geometric graphs- Planar graphs- Kuratowski two graphs- Different representations of a planar graph- Detection of planarity- Geometric and combinatorial duals Criteria of planarity- Thickness and crossings.Vector spaces of a graphs- Vector space Associated with a graph- Basis vector of a graph- circuit and cut set subspaces- Intersection and join of W and W_s.

Unit IV

Matrix representation of graphs- Incidence matrices, sub matrix of A(G)- circuit matrix- Fundamental circuit matrix and rank of B- An application of switching network- cut set matrix- Relations among A_f, B_f and C_f- pathmatrix and Adgacency matrix- Para coloring, covering and partitioning- Chromatic number, Chromatic Partitioncing-Chromatic polynomial- matchings- covering and the four colour problem (and its present status.)

Text Book:

[1] NarsingDeo, Graph Theory with application to Engineering and computer science, Prentice Hall of India.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester III

Paper V(A)

MM – 305 A

Algebraic Number Theory

Unit I

The Gaussian integers – Introduction – The Fundamental theorem of arithmetic in the Gaussian integers - The two square problems.

Unit II

Arithmetic in quadratic fields – Introduction - Quadratic fields - The integers of a quadratic field - Binary quadratic forms - Modules

Unit III

The coefficient ring of a module - The Unit theorem - Factorization theory in quadratic field - The failure of unique factorization.

Unit IV

Generalized congruences and norm of a module - Product and Sum of modules - The Fundamental factorization theorem.

Text Book:

[1] William W. Adam, Lory Joel Goldstein, Introduction to Number Theory. (Sections: 7.1 to 7.3, 8.1 to 8.7, 9.1 to 9.4)

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. (Mathematics)
Semester III

MM – 305B *Paper V(B)*

Numerical Techniques

Unit I

Transcendental and polynomial equations: Introduction, Bisection method, Iteration methods based on first degree equation; Secant method, Regulafalsi method, Newton-Raphson method, Iteration method based on second degree equation; Mullers method, Chebyshev method, Multipoint iterative method, Rate of convergence of secant method, Newton Raphson method,(Algorithms of above methods)

Unit II

System of linear algebraic equation: Direct methods, Guass elimination method, Triangularization method, Cholesky method, Partition method, Iteration method: Gauss seidel Iterative method, SOR method.

Unit III

Interpolation and Approximation: Introduction,Lagrange and Newton's divided difference interpolation,Finite difference operators, stirling and Bessel interpolation, Hermite interpolation,piecewise and Spline Interpolation,least square approximation.(Algorithms on Lagrange and Newton divided difference Interpolation).

Unit IV

Numerical Differentiation: methods based on Interpolation, methods based on Finite difference operators Numerical Integration: methods based on Interpolation, Newton's cotes methods, methods based on Undertermined coefficients, Guass legendre Integration method, Numerical methods ODE: Singlestep methods: Eulers method, Taylor series method, Rungekutte second and forth order methods, Multistep methods: Adam Bash forth method, Adam Moulton methods, Milne-Simpson method. (Algorithms on Trapezoidal, Simpson, Eulers & Runggekutte. methods only)

Text Book:

[1] Numerical Methods for Scientific and Engineering computation by M.K. Jain, S.R.K. Iyengar, R.K. Jain, New Age Int. Ltd., New Delhi.

[2] Computer Oriented Numerical Methods by V. Rajaraman.

Reference:

[1] Introduction to Numerical Analysis, by S.S. SastryPrentice Hall Flied.

DEPARTMENT OF MATHEMATICS

MAHATMA GANDHI UNIVERSITY

M.Sc. Mathematics

Semester III

AM – 305 C Paper V(C)

Differential Geometry

Unit I

Curves with Torsion - Tangent, Principal normal curvature – Binormal, torsion - Serret - Frenet formulae - Examples thereon - Lines of centre of curvature - spherical curvature - Locus of centre of spherical curvature - Curve determined by its intrinsic equation - Helices Involutes - Evolutes and Betrand curves - Examples thereon.

Unit II

Envelops - Developable surfaces - Surfaces - Tangent plane - Normal - Envelop characteristics - Edge of regression - Developable surfaces - osculating developable - polar developable - Rectifying developable Envelopes - characterstic points - Examples thereon.

Unit III

Curvilinear coordinates on a surface - First order magnitudes - Directions on a surface - The normal - Second order magnitudes - Derivatives of n - curvature of normal section - Meunier's theorem - Examples thereon.

Unit IV

Curves on a surface - Principal directions and curvatures - First and Second curvatures Joachimsthal's theorem - Euler's theorem - The surface $z=f(x,y)$ - Surface of revolution - Examples thereon.

(Art. 1-8, 10-31, 33, 34 Pages 10-28, 30-79 of [1])

Text Book:

[1] C.E .Weatherburn, Differential Geometry of Three Dimensions, (E.L.B.S.Edition,1964)

Reference Book:

[2] T.J.Willmore, An Introduction to Differential Geometry (Oxford University Press), 11th Edition, New Delhi,1993.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester IV

MM – 401 *Paper- I*

Advanced Complex Analysis

Unit I

Convergence of sequences and of series- Taylors series- Laurent's series-Absolute and uniform convergence of power series- Continuity of sums of power series- Uniqueness of series representation.

Unit II

Residues- Cauchy's residue theorem- Using a single residues the three types of isolated singular points- Residues at poles- Zeroes of analytic functions-Zeroes and poles- Behaviour of f near isolated singular points.

Unit III

Evaluation of improper integrals- Improper integrals from Fourier analysis-Jordan's lemma- Indented paths- Definite integrals involving sines and cosines- Argument principle- Rouche's theorem.

Unit-IV

Linear transformations- The transformation $w = 1$ mappings by $w = 1$, z z

Linear fractional transformations- An implicit form- Mapping of the upper half plane- The transformation $w = \sin z$, Mapping by z ².

Text Books:

[1] Complex Variable and Application (8th Edition) by James Ward Brown, RuelV.churchill m McGraw Hall Int. Edition.

Reference:

[1] Complex analysis by Serge Lang Springer- Varlag

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester IV

MM – 402 , Paper- II

General Measure Theory

Unit I

Measure spaces- Measurable functions- Integration- General Convergence theorem.

Unit II

Signed measures- The Radon- Nikodym theorem.

Unit III

Outer measure and measurability- The Extension theorem- The Product measure.

Unit-IV

Inner measure- Extension by sets of measure zero- Caratheodory outer measure

Text Books:

[1] Real Analysis (Chapters 11, 12) byH.L. Royden Pearson Ediation

DEPARTMENT OF MATHEMATICS,
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester IV

MM – 403A Paper- III(A)

Fluid Mechanics

Unit I

General orthogonal curvilinear coordinates - Kinematics - Lagrangian and Eulerian methods - Equation of continuity - Boundary surface - Stream lines, Path lines and Streak lines - Velocity potential - Irrotational and rotational motions - Vortex lines

Unit II

Equation of motion - Lagrange's and Euler's equation of motion - Bernoulli's theorem - Stream functions - Irrotational motion in two-dimensions - Complex 'velocity potential sources – Sinks, doublets and their images - Milne-Thompson Circle theorem

Unit III

Two dimensional irrotationalmotion produced by motion of Circular, Co-axial and elliptic cylinders in an infinite mass of liquid - Theorem of Blasius motion of a sphere through a liquid at rest at infinity - Liquid streaming past a fixed sphere.

Unit IV

Stress components in a real fluid - Relation between rectangular components of stress - Connection between stresses and gradient of velocity - Navier-Stoke's equations of motion - Plane Poiseulle and couette flows between two parallel plates.

Text Books:

[1] W.H. Besaint and A.S.Ramsay, A Treatise on Hydromechanics, Part-II. CBS Publishers, Delhi, 1988.
[2] F.Chorlton, Text book of Fluid Dynamics, CBS Publishers, Delhi, 1985.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester IV

MM – 403 B Paper III(B)

Banach Algebra

Unit I

Definition of Banach Algebra and examples- Invertib1lity in a Banach Algebra with unity- singular and non-singular elements- Resolvent and spectrum of an element- the spectral radius- Gelfand formula.(Sections 49, 50, 51 and 55 of Ch.6)

Unit II

Multiplicative linear functionals and the maxima1 ideal space- the Gelfand Transforms (i.e.:section:Gelfand representation theorem)- the spectral mapping theorem- isometric Gelfand Transform- Topological divisors of zero-boundary
of the spectrum- spectrum in L (E).(Sections: 52, 53, 56 and 57 of Ch. 6)

Unit III

Definition and examples of C-algebra - Self adjoint, unitary, normal, positive elements in C – homomorphisms - representation of commutative algebras, states onC-algebras.(Sections: 58, 59, 60 and 61 of Ch. 7)

Unit IV

GelfandNewmark representation theorem - the spectral theorem - the continuous functional calculus - spectral sets. (Sections: 62 of Ch. 7 and 65, 66 of Ch. 8)

Text Book:

[1] S.K.Berberian, Lectures in Functional Analysis and Operator Theory, Springer International student Ed.

Reference Books:

[2] Keue Zhu, An Introduction to Operator Algebras, CRC Press, 1963
[3] T.W.Palmea, Banach Algebra, Vol- I, Cambridge University Press, 1994.

(2C)

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester IV

MM – 403 C

Paper III(c)

Prime Number Theory

Unit I

Dirichlet theorem as primes in an arithmetic progression - primes of the form 4n-1, 4n+1 - Dirichlet of primes in arithmetic progression - Dirichlet series and Euler products - the half plane of convergence of a Dirichlet series - function defined by a Dirichlet series - Multiplication of Dirichlet series - Euler products - the half plane of convergence of a Dirichlet series.

Unit II

Analytic properties of Dirichlet series - Dirichlet series with non negative coefficients - Dirichlet series expressed as exponentials of Dirichlet series - Mean value simule for Dirichlet series - on integral principle for the coefficients of a Dirichlet series and for the partial sum of a Dirichlet series.

Unit III

The function (s) and L(s,) - integral representation for the Hurwitz function - a contour integral representation for the Hurwitz zeta function - Analytic continuation of the Hurwitz zeta function - analytic continuation of (s) and L(s,) - Hurwitz formulae for (s, a) for functional equation for the Riemann Zeta function and Hurwitz zeta function.

Unit IV

Analytic proof of the prime number theorem - plan of the proof - two lemmas proving $[\ _1(x)]/x^2$ implies prime number theorem - a contour integral representation for $[\ _1(x)]/x^2$ - upper bounds for | (s)| and | (s)| near the line =1 - the non vanishing of (s) on the line =1 - inequalities for |1/ (s)| and $\left|\frac{(s)}{(s)}\right|$ - completion of the proof of prime number theorem.

Scope as in Chapters: 7, 11, 12, 13 of [1]

Text Book:

[1] Tom. M. Apostol, Introduction to Analytic Number Theory, Springer International Student Edition.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester IV

Paper 404A

Paper IV(A)

Finite Difference Methods

Unit I

Partial differential Equations – Introduction - Difference method - Routh Hurwitz criterion - Domain of Dependence of Hyperbolic Equations. (1.1 to 1.4)

Unit II

Difference methods for parabolic partial differential equations - Introduction – One space dimension - two space dimensions - Spherical and cylindrical coordinate System.(2.1 to 2.3, 2.5)

Unit III

Difference methods for Hyperbolic partial differential equations - Introduction - one space dimensions - two space dimensions - First order equations.(3.1 to 3.4)

Unit IV

Numerical methods for elliptic partial differential equations – Introduction - Difference methods for linear boundary value problems - General second order linear equation - Equation in polar coordinates.(4.1 to 4.4)

Text Book:

[1] M. K. Jain, S. R. K. Iyengar, R. K. Jain, Computational Methods for Partial Differential Equations, Wiley Eastern Limited, New Age International Limited, New Delhi.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester IV

MM – 404B **Paper IV(B)**

Application of Functional Analysis

Unit I

Concepts of Metric spaces and vector spaces (Questions should not be framed from this part) - Concepts of Normed and Banach spaces - Inner product and Hilbert spaces - Uniform boundedness theorem - Space of polynomials - Fourier series - Strong and weak convergence - Examples – Convergence of sequences of operators and functionals - Applications to summability of sequences. (See 2.2, 3.1, 4.7, 4.8, 4.9, 4.10 of [1])

Unit II

Banach fixed point theorem - Application of Banach theorem to linear equations - Application of Banach theorem to differential equations - Application of Banach theorem to Integral equations. (See 5.1, 5.2, 5.3 and 5.4 of [1])

Unit III

Approximations in Normed spaces – Examples - Uniqueness - Strict convexity - Uniform Approximation. (See 6.1, 6.2, 6.3 of [1])

Unit IV

Legendre, Hermite and Lagurre's polynomials - Chebyshev polynomials - Approximation in Hilbert space - Splines. (See 3.7, 6.4, 6.5 and 6.6 of [1])

Text Book:

[1] Krayszig, Introductory Functional Analysis with Applications, John Wiley and Sons - 1989.

Reference Book:

[2] Brown and Page, Introductory Functional Analysis.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester IV

MM – 404C **Paper IV(C)**

Commutative Rings

Unit I

Rings and Ideals- Ring and Homomorphisms- Ideals- Quotient Rings – Zero divisors- Nilpotent element – Units- Prime Ideakls – and Maximal Ideals- Nil rasical and Jacobson rasical- Operation on Ideals- Extension and Contraction (page 1 to 10)

Unit II

Modules: Moduls and Homomorphisms –submodules and quotient modules – Operations on sub modules – Direct sum and Products- Finitely generated modules- exact sequences- Tensor products of modules- Exactness properties of tensor products (Page 17-29)

Unit III

Rings of modules of fractions- local Properties extended and contracted ideals of fractions (pages36-43) primary Decompositions(pages 50-54).

Unit IV

Chain conditions (pages 74 to 77) – Notherian rings (pages 80- 83)- Artinian rings(pages 89-91).

Text Books:

1. M.F. Atiyah (FRS). I.G Mcdonald , Introduction to commutative Algebra Addison Wesley Publication company.

Reference Book:

1. S. Gopala Krishnan, Commutative Algebra, Published by Oxonian Press Pvt. Ltd. N- 56 connaught Circus, New Delhi-110001.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester IV

MM – 405A

Paper V(A)

Calculus of Variations

Unit I

Definitions of Functionals - Strong and Weak Variations - Derivations of Euler's' equation - Other forms of Euler's equation - Special cases – Examples - Fundamental Lemma of Calculus of Variation

Unit II

The problem of minimum surface of revolution - Minimum Energy Problem Brachistochrone Problem - Variational notation - Variational problems involving Several functions.

Unit III

Isoperimetric problem - Examples - Eulers's equations in two dependent variables variational problems in parametric form - Functional dependent on higher order derivatives.Euler Poisson equation.

Unit IV

Application of Calculus of Variation - Hamilton's principle - Lagrange's Equation, Hamilton's equations.Variational problems with movable boundaries- Simplest problem with movable boundaries- Examples there on-Problems with movable boundaries for functionals of the form

$\int_{x_0}^{x_1} F(x,y,z,y^1,z^1)dx$ and $\int_{x_0}^{x_1} F(x,y,y^1,y^{11})dx$ – examples thereon.

Text Book:

[1] L. Elsgolts, Differential Equation and Calculus of Variations.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester IV

CBMM-405 B Paper V(B)

Elements of Information Technology

Unit – I:

Digital Age: Digital basis of Computers, Data/Information, Hardware Input,Output, Memory, Communication Hardware, Software, Application Software, System Software, Communications, and Five kinds of Computers, Development in communication Technology, Connectivity and Interactivity, Five Generations of Programming Languages, Programming Languages uses today, Object Oriented & Visual Programming.

Operating Systems: Booting, Managing Storage, Resources, Files tasks,Common Operating Systems: Windows 95/98, DOS, and Windows - NT

Unit – II:

Processors: The CPU and Main Memory, Data Representation, MicroComputer System Unit, Input & Output devices, Keyboard, Pointing devices, Source data entry devices, Soft copy output, Hardcopy output, more output devices, Diskettes, Hard – disks, Optical disks, Flash memory, Magnetic tape, Compression and Decompression.

Unit-III:

Telecommunications: Data, Video, Audio Communication, the Internet, theWorld Wide Web, new Internet technologies, Communication Channels, Networks, conduits of communication, Communication networks, Local networks, factors affecting communication among devices.

Unit-IV:

Files & Databases: Data storage hierarchy, File management, FilesManagement Systems, Database Management Systems, type of database organization, and features of a DBMS.

Application Software: Common features of software, Word processing,Spread sheet, software for Cyber space, Internet programming, HTML, XML, & Active X.

Suggested Reading:

2. Williams B.K. Sawyer et.al., "*Using Information Technology*", Sixth Edition, Tata McGraw Hill, 2006.

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY
M.Sc. Mathematics
Semester IV

MM – 405 CT Paper V(C)

OOPS through C++

Unit I

Object - oriented programming - Procedural oriented programming - OOP Terminology - Data Abstraction - Data Encapsulation - Objects, classes - Defining member functions - constructors -dynamic initialization of the objects - polymorphism - Function overloading, operator overloading

Unit II

Introduction to computer programming - Programming Fundamentals - Higher Level Language, Operating Systems, Compiling Programs, writing a program in C++ by usage of variables, Data types, Constants, Arithmetic Expression

Unit III

Programming using Control Structures - looping - for statement-while statement do statement - decision making - if statement - switch statement - conditional expression operator - Arrays-Initializing arrays, character arrays-Multi dimensional arrays

Unit IV

Inheritance: Defining derived classes-single , and multiple inheritance, virtual base classes, abstract classes, runtime polymorphism and its implementation, virtual functions, dynamic binding. I/O - Console I/O operator in C++, Streams-stream classes - unformatted I/O operations. Exception handling - Templates-Functional Templates.

Text Book:

[1] E.Balaguruswamy : Introduction to C++ , Tata McGraw Hill

Reference Book:

[2] Venugopal, Ravishankar and Rajkumar : Mastering C++, Tata McGraw Hill

DEPARTMENT OF MATHEMATICS
MAHATMA GANDHI UNIVERSITY

M.Sc. (Mathematics)
Semester IV

MM – 405 CP **Paper V(CP)**

Practicals: Object Oriented Programming through C++

1. Write a programme to find the GCD of two given integers.
2. Write a programme to generate the first fifty numbers of Fibonacci Sequence.
3. Write a programme for finding the sum of two matrices A_{mxn} and B_{mxn}.
4. Write a function sub-programme to find the transpose of a given matrix A_{mxn} and call it in main programme.
5. Write a programme for finding the product of two matrices A_{mxn} and B_{mxn}.
6. Write a programme for finding the root of an equation using Regular-Falsi method.
7. Write a programme for finding the root of an equation using Newton-Raphson method.
8. Write a programme for implementing Gauss-Elimination method.
9. Write a programme to implement Trapezoidal Rule.
10. Write a programme to implement Simphsons 1/3 Rule.
11. Write a programme to implement modified Euler's method.
12. Write a programme to implement Runge-Kutta method.