UGMM-01
Calculus

Block-I Real Numbers and Functions

Unit-01 Limit and Continuity

Unit-02 Differentiation

Unit-03 Derivagives of Trigonometric Functions

Unit-04 Derivatives of Some Standard Functions exponential functions logarithmic functions, hyperbolic functions

Block-II Drawing Curves

Unit-05 Higher Order Derivatives 2^{nd} & 3^{rd} & 4^{th} Order derivatves, lebibniz theorem, Thylor's theorem and maclaurin's Series

Unit-06 The UPS and Downs- Maxima and Minima of the Functions, Mean Value Theorems, Roll's th & Lagrange's th, Sufficient Conditions for the Existence of extreme Points, Convexity and Concavity, Points of Inflations

Unit-07 Geometrical Properties of Curves- Tangent and Normals, Angle of Intersection, Asymtotes

Unit-08 Curve Tracing- Cartesian Eq", Polar Eq", and Cartesian Eq"

Block-III Integral Calculus

Unit-09 Definite Integral

Unit-10 Methods of Integration

Unit-11 Reduction Formulas

Unit-12 Integration of Rational and Irrational Function

Block-IV Application of Calculus

Unit-13 Application of Differential Calculus- Monotonic function, Approzimati Values, Inequalities

Unit-14 Area undir a Curve- Cartesian eq" Polar Eq" Area bounded by a closed curve, Trapezoidal rule, Simpson's rule

Unit-15 Application of Integral Calcules- Length of plane curve, Cartesian form, Parametric form, polar form, Volume of Solid of Revolution, area of Surface of Revolution

UGMM-02

Linear Algebra

Block-I	**Vector Space**
Unit-01	Sets, Functions and Fields
Unit-02	Two and Three Dimensional Spaces
Unit-03	Vector Space
Unit-04	Basis and Dimension
Block-II	**Linear Transformation and Matrices**
Unit-05	Linear Transformation-I- Range Space and the Kernel, Rank and Nullify Homomorphism Th
Unit-06	Linear Transformation-II- Vector Space of Matrices, Transpose, Conjugate, Conjugate, Transpose, Diagonal Matrix, Triangular Matrix, Multiplication Inverlible Matrix
Unit-07	Matrices-I- Vector Space of Matrices, Transpose, Conjugate, Conjugate Transpose, Diagonal Matrix, Triangular Matrix, Multiplication Inverlible Matrix
Unit-08	Matrices-II- Rank of Matrix, Elementary Operations, and its Applications
Block-III	**Eigen Values and Eigenvectors**
Unit-09	Determinants
Unit-10	Characteristics and Minimal Polynomials- Cayley Hamilton Theorem, Minimal polynomial
Block-IV	**Inner Production and Quadratic Forms**
Unit-11	Inner Production Spaces
Unit-12	Hermitian Unitary Operators
Unit-13	Real Quadratic Forms
Unit-14	Conies

UGMM-03

Mathematical Methods

Block-I	**Algebra and Geometry**
Unit-01	Sets and Functions
Unit-02	Graphs and Functions
Unit-03	Elementary Algebra
Unit-04	Coordinate Geometry
Unit-05	Vectors
Block-II	**Calculus**
Unit-06	Differential Calculus
Unit-07	Applications of Differential Calculus
Unit-08	The Integration
Unit-09	Integration of Elementary Functions
Unit-10	Differential Equations
Block-III	**Probability Distribution**
Unit-11	Statistics- Random Variables, Sampling, Frequency Distribution of data, Measure of Central Tendency, Mean, Median, Mode, Measures of Dispersion
Unit-12	Probability
Unit-13	Discrete Probability Distribution- Bionmial Distribution, Poisson Distribution
Unit-14	Continuous Probability Distribution- Uniform Distribution, Exponential Distribution, Normal Distribution
Block-V	**Statistical Inference**
Unit-15	Statistical data Sampling- Sample Selection, Sampling Distribution, Standard Error, Unbiased Estimator, Precession and Accuracy of the Sample Estimator, Types of Sample Design, Stratified Random Sampling, Cluster Sampling
Unit-16	Hypothesis Tests- Level of Significance, Degrees of Freedom, Chi-Square Test, t-test, ANOVA
Unit-17	Correlation and Regression

UGMM-04

Elementary Algebra

Block-I **Solutions of Polynomial Equations**

Unit-01 Sets

Unit-02 Complex Number- Geometrical Representations, Algebraic Operations, De-movivre's Theorem

Unit-03 Cubic and Biquadrate Equations

Block-II **Equations and Inequalities**

Unit-04 Systems of Linear Equations

Unit-05 Cramer's Rule

Unit-06 Inequalities

UGMM-05

Analytical Geometry

Block-I **Conies**

Unit-01 Preliminaries in Plane Geometry

Unit-02 Standard Conies- Parabola, Ellips, Hyperbola, Polar Equations of Conies

Unit-03 General Theory of Conies- 2^{nd} Degree Equation, Central and Non- Central Conies, Tracing a Conic, Tangents, Intersection of Conies

Block-II **Sphere, Cone and Cylinder**

Unit-04 Preliminaries in 3Dimensional Geometry- Points, Lines, Planes

Unit-05 The Sphere- Equations of Sphere, Tangent Lines and Plans, Lines Planes, Intersection of Spheres

Unit-06 Cones and Cylinder

Block-III **Conicoids**

Unit-07 General Theory of Conicoids

Unit-08 Central Conicoids

Unit-09 Paraboloids

UGMM-06

Abstract Algebra

Block-I **Elementary Group Theory**

Unit-01 Sets and Functions

Unit-02 Groups

Unit-03 Subgroups

Unit-04 Lagrange's Theorem

Block-II **Some More Group Theory**

Unit-05 Normal Subgroups

Unit-06 Group Homomorphisms

Unit-07 Permutation Groups

Unit-08 Finite Group

Block-III **Elementary ring Theory**

Unit-09 Rings

Unit-10 Sub Rings and Ideals

Unit-11 Ring Homorphisms

Block-IV **Integral Domains and Fields**

Unit-12 The Basics

Unit-13 Polynomial Rings

Unit-14 Special Integral Domains

Unit-15 Irreducibility and Field Extensions

UGMM-07

Advanced Calculus

Block-I	**R^{∞} and R^n**
Unit-01	Infinite Limits
Unit-02	L-Hospital's Rule
Unit-03	Functions of Several Variables
Block-II	**Partial Derivatives**
Unit-04	Limits and Centinuity
Unit-05	First Order Partical Desivatives and Differentiability
Unit-06	Higher Order Partial Derivatives
Unit-07	Chain Rule and Directional Derivatives
Block-III	**Applications of Partial Derivatives**
Unit-08	Taylor's Theorem
Unit-09	Jacobians
Unit-10	Implicit and Inverse Function Theorems
Block-IV	**Multiple Integrations**
Unit-11	Double Integration
Unit-12	Triple Integration
Unit-13	Applications of Integrals
Unit-14	Line Integrals in R^2

UGMM-08

Differential Equations

Block-I	**Ordinary Differential Equations of First Order**
Unit-01	The Nature of Differential Equations
Unit-02	Methods of Solving First Order and First Degree Equations
Unit-03	Linear Differential Equations
Unit-04	Differential Equations of First Order but not of First Degree
Block-II	**Second and Higher Order Ordinary**
Unit-05	Nigher Order Linear Differential Equations
Unit-06	Method of Unditerminded Coefficients
Unit-07	Method of Variation of Parameters
Unit-08	Method of Symbolic Operators
Unit-09	Second Order Linear Differential Equations
Block-III	**First Order Partial Differential Equations**
Unit-10	Curves and Surfaces
Unit-11	Simultaneous Differential Equations
Unit-12	Pfaffian Differential Equations
Unit-13	Linear Partial Differential Equations
Unit-14	Non-Linear Partial Differential Equations
Block-IV	**Second and Higher Order Partial Differential Equations**
Unit-15	Homogeneous Linear partial Differential Equations with Constant Coefficients
Unit-16	Non- Homogeneous Linear partial Differential Equations with Constant Coefficients
Unit-17	Partial Differential Equations of Second Order

UGMM-09

Real Analysis

Block-I	**Real numbers and Functions**
Unit-01	Sets and Numbers
Unit-02	Structure of Real Numbers
Unit-03	Topology of the Real Life
Unit-04	Real Functions
Block-II	**Sequences and Series**
Unit-05	Sequences- Bounded Morotonic, Canvergent, Cauchy
Unit-06	Positive Term Series
Unit-07	General Series- Conparison Tests, P-Test, d' Alembert's Ratio test, Raabe's Test, Gauss's Test, Leibnitz's Series, Absolute and Conditional Convergence
Block-III	**Limit and Continuity**
Unit-08	Limit of a Function
Unit-09	Continuity
Unit-10	Properties of Continuous Functions- Continuity on Bounded Closed Intervals, Point wise Continuity and Uniform Continuity
Block-IV	**Differentiability**
Unit-11	Derivatives
Unit-12	Mean Value Theorems- Roll's Theorem, Lagrange's Theorem, Cauchy's Mean Value theorem, Generalised mean Value Theorem Darboux Theorem
Unit-13	Higher Order Derivatives- Taylor's Theorem, Maclaurin's Expansion
Unit-14	Integrability
Unit-15	The Riemann Integration
Unit-16	Integrability and Differentiability
Unit-17	Sequences and Series of Functions- Convergence Point Convergence, Uniform

UGMM-10

Numerical Analysis

Block-I	**Solutions of Non-Linear Equations in one Variable**
Unit-01	Review of Calculus- Intermediate Value Theorem Roll's Theorem Lagrange's Mean Value Theorem, Taylor's Theorem, Round off Error Truncation Error
Unit-02	Iteration Methods for Finding Roots- Initial Approxmation to a Root, Bissction Method, Fixed Point Iteration Method
Unit-03	Chord Methods for Finding Roots- Regula Falsi Method, Newton Raphson Method, Convergence Criterion
Unit-04	Approximate Roots of Polynomial Equations- Birge Vieta Method Graeffe's Root Squaring Method
Block-II	**Solutions of Linear Algebraic Equations**
Unit-05	Direct Methods- Proliminaries Cramer's Rule, Gauss, Elimination Method, LU Decomposition Method
Unit-06	Inverse of Square :Matrix- Method of Adjoints, The Gaurs- Jordon Reduction Method, LU Decomposition Method
Unit-07	Iterative Method- General Iteratia Method, Jacobi Iteration Method, The Gauss-Seidel Iteration Method
Unit-08	Eigen Values and Eigen Vectors- The Eigen Value Problem, the Power Method, The Inverse power method
Block-IV	**Interpolation**
Unit-09	Lagrange's Form
Unit-10	Newton Form of the Interpolating Polynomial
Unit-11	Interpolation at Equally Spaced Points- Forward and Back ward Differences, Newton's Forward and Backward Difference Formula
Block-V	**Numerical Differentiation, Integration and Solutions of Differentiation Equations**
Unit-12	Numerical Differentiation
Unit-13	Numerical Integration
Unit-14	Numerical Solutions of Ordinary Differential Equations- Taylor Series Method, Euler's Method, Richardson's Extrapolation
Unit-15	Numerical Solutions of Numerical Equations Using runge- Kutta Methods- 2^{nd},3^{rd},and 4^{th} Order.

UGMM-11

Probability and Statistics

Block-I	**Descriptive Statistics**
Unit-01	Frequency Distribution of a Character
Unit-02	Measure of Central Tendency and Dispersion
Unit-03	Skewness and Kurtosis
Unit-04	Correlation and Regression
Block-02	**Probability on Discrete Sample Spaces**
Unit-05	Sample Space of a Random Experiment
Unit-06	Probability on a Discrete Sample
Unit-07	Discrete Random Variable and its Probability Distribution- Random Variable, Joint and Marginal Distribution and its independence, Mathematical Expectation, Moments and Moments Generating Functions, Covariance
Unit-08	Standard Probability Distribution-I- Bernaulli Distribution, Binomial Distribution, Hyper geometric Distribution
Unit-09	Standard Probability Distribution-II- Geometric Distribution, Negative Binomial Distribution, Poisson Distribution.
Block-III	**Distribution Theory**
Unit-10	Univariable Distributions- Distribution Functions, Density Functions, Expectation and Variance, Momeats and Moments Generating Functions.
Unit-11	Standard Continues Distributions- Normal Distribution, Exponential and Gamma Distribution, Beta Distribution.
Unit-12	Bivariate Distribution- Density Functions, Distribution Functions, Conditional Distribution, Independnee Expections, Correlation and Regression.
Unit-13	Functions Random Variables- Direct Approach Transformation Approach, Chi-Squala Distribution, Independnee Expectations, Correlation and Regression
Unit-14	Limit Theorms- Chebyshev's Inequality, Weak Law of Large Numbers, Poisson Approximation to Binomial, Central Limit Theorem.
Block-IV	**Elements of Statistical Inference**
Unit-15	General Introduction- Inductive Inference, Random Sampling, Sampling Distributions, Related to Normal Distribution, Point Extimation Testing of Hypothesis, Interval Estimation

Unit-16	Point Extimation- Properties of Estimators, Method of Moments, Method of Maximum Likelihood.
Unit-17	Testing of Hypotheses- Some Concepts, Meyman- Pearson Lemma, Likelihood-Ratio Tests
Unit-18	Common Tests and Confidence Intervals- Some Common Tests of Hypothesis for Normal Populations, Confidence Intervals, Chi- Square test for Goodness of Fit.

UGMM-12

Linear Programming

Block-I	**Basic Mathematics and Optimization**
Unit-01	Basic Algebra- Matrices and Determinants, Vector
Unit-02	Inequalties and Convex Sets
Unit-03	Optimization in two Variables
Unit-04	Optimization in More Than Two Variables
Block-II	**Simplex Method and Duality**
Unit-05	Standard Form and Solutions
Unit-06	Simplex Method
Unit-07	Primal and Dual
Unit-08	Duality Theorems
Block-III	**Special Linear Programming Problems**
Unit-09	Transportation Problem
Unit-10	Feasible Solution of the Transportation
Unit-11	The Assignment Problem
Block-IV	**Game Theory**
Unit-12	Games With Pure Strategies
Unit-13	Games With Mixed Strategies
Unit-14	Graphical Method and Dominance
Unit-15	Games and Linear Programming

UGMM-13

Discrete Mathematics

Block-I	**Elementary Logic**
Unit-01	Prepositional Calculus- Propositions, Logical Connectives, Logical Equivalence, Logical Quantifiers
Unit-02	Methods of Proof- Direct Proof, Indirect Proof, Counterexamples, Principle of Induction
Unit-03	Boolean Algebra and Circuits- Boolean Algebra, Boolean Expressions, Logic Circuits Boolean Functions
Block-II	**Basic Combinatorics**
Unit-04	Combinatories An Introduction- Multiplications and Addition Principles, Permutations, Combinations, Binomial Expansion, Multinomial Expansion
Unit-05	Partitions and Distributions
Unit-06	More About Counting- Pigeon Hole Principle, Inclusion Exclusion Principle, Application to Number Theory, Application to Onto Maps, Application to Probability, Applications to Derangements
Block-III	**Recurrences**
Unit-07	Recurrences Relations
Uit-08	Generating Functions- Exponential, Generating Functions, Linear Equations, Combinatorial Identities
Unit-09	Soloving Recurrences- Linear Homogeneous Recurrences, Linear Non Homogeneous Recurrences, Method of Inspection Method of Telescoping Sume, Method of Iteration, Method of Substitution
Block-V	**Graph Theory**
Unit-10	Basic Properties of Graphs
Unit-11	Special Graphs- Connected Graphs, Bipartite Graph, Trees
Unit-12	Eulerian and Hamiltonian Graphs- Eulerian Graphs Fleury's Algorithm, Hamiltonian Graphs, Travelling Salesperson Problem
Unit-13	Graph Colorings and Planar Graphs- Vertex Colorings, Planar Graphs, Map Coloring Problem, Edge Colorings.

UGMM-14

Mathematical Modeling

Block-I	**Introduction to Mathematical Modeling**
Unit-01	Mathematical Modeling- An Overview
Unit-02	Formulating A Model
Unit-03	Solving and Interpreting a Model
Block-II	**Mathematical Modeling in the Physical Environment**
Unit-05	Motion in a Straight Line- Free Fall of a Body, Upward Motion Under Gravity, Simple Harmonic Motion, Projectile Motion.
Unit-06	Planetary Motion- Netwon's Law of Gravitation, Particle projected from the Earth, Central Forces, Modeling planetary Motion, Kepler's Law Lead to Newton's Law of Gravitation, Limitations
Unit-07	Air Pollutions- Physical Process, Mathematical Model of Plane Rise, Gaussian Model of Dispersion
Block-III	**Mathematical Modeling in the Biological Environment**
U nit-08	Blood Flow and Oxygen Transfer
Unit-09	Single Species Population Models
Unit-10	Two Species Population Models
Unit-11	Epidemics
Block-IV	**Mathematical Modeling in Socio-Economic Environment**
Unit-12	Some Models in Economics- Utility and Demand Function, Production Function and Cost Function, Supply Function, Market Equilibrium, Monopoly, Puopoly and Oligopoly
Unit-13	Conflict and Cooperation- Some Games and its Applications, Two person and Zero-person Game, Co-operative and In-Co-Operative game Theory
Unit-14	Investments- Markowitz Model, Return Valuations, Risk Valuations, Diversitications, Portfolio Selection \
Unit-15	Probabilistic Models- Queneing Models, Queneing Theory Time Series Analysis, Forecesting Models.