B.Sc., MATHEMATICS

Sem	Subject Code	Part	Course	Subject Title	Hrs / Week	Credit	Marks		
							Int.	Ext	Tot
I	11U1LT1/LA1/LH1/LU1/LF1	I	Language – I		6	3	25	75	100
	11U1LE1	II	English – I		6	3	25	75	100
	11UPH1301	III	Allied Course – I a	Allied Physics - I	5	3	25	75	100
	11UPH1301P	III	Allied Course – I b	Allied Physics Practical - I	3	2	20	30	50
	11UMA1401	III	Core Course – I	Calculus	6	4	25	75	100
	11UMA1402	III	Core Course - II	Theory of Equations and Fourier Series	2	2	25	75	100
	11U19	IV	Environmental Studies	Environmental Studies	2	2	25	75	100
	TOTAL				30	19	170	480	650
II	11U2LT2/LA2/LH2/LU2/LF2	I	Language – II		6	3	25	75	100
	11U2LE2	II	English – II		6	3	25	75	100
	11UPH2302	III	Allied Course – II a	Allied Physics – II	4	3	25	75	100
	11UPH2302P	III	Allied Course – II b	Allied Physics Practical - II	3	2	20	30	50
	11UMA2403	III	Core Course – III a	Programming in C	6	5	15	45	60
	11UMA2403P	III	Core Course – III b	C Programming Lab	3	2	10	30	40
	11UMA2601	IV	Non Major Elective - I	Mathematics For Competitive Examinations - I	2	2	25	75	100
	TOTAL				30	20	145	405	550
III	11U3LT3/LA3/LH3/LU3/LF3	I	Language – III		6	3	25	75	100
	11U3LE3	II	English – III		6	3	25	75	100
	11UMA3304:1	III	Allied Course - IV	Mathematical Statistics - I	5	3	25	75	100
	11UMA3404	III	Core Course - IV	Differential Equations and Applications	5	3	25	75	100
	11UMA3405	III	Core Course - V	Vector Calculus and Two Dimensional Geometry	4	3	25	75	100
	11U310	IV	Value Education	Value Education	2	2	25	75	100
	11UMA3602	IV	Non Major Elective - II	Mathematics For Competitive Examinations - II	2	2	25	75	100
	TOTAL				30	19	175	525	700
IV	11U4LT4/LA4/LH4/LU4/LF4	I	Language – IV		6	3	25	75	100
	11U4LE4	II	English – IV		6	3	25	75	100
	11UMA4305:1	III	Allied Course - V	Mathematical Statistics – II	5	3	25	75	100
	11UMA4306:1	III	Allied Course –VI a	Mathematical Statistics - III	3	2	15	45	60
	11UMA4306:1P	III	Allied Course –VI b	Statistics Lab	2	2	10	30	40
	11UMA4406	III	Core Course - VI	Sequences and Series	4	4	25	75	100
	11UMA4701	IV	Skill Based Elective - I	Soft Skills	4	4	25	75	100
	11 U411	V	Extension	NSS, NCC, etc…	-	1	-	-	-
	TOTAL				30	22	150	450	600
V	11UMA5407	III	Core Course - VII	Mechanics	6	6	25	75	100
	11UMA5408	III	Core Course - VIII	Modern Algebra	5	5	25	75	100
	11UMA5409	III	Core Course - IX	Real Analysis	5	5	25	75	100
	11UMA5410	III	Core Course - X	Laplace and Fourier Transforms	5	5	25	75	100
	11UMA5501	III	Major Based Elective- I	Graph Theory	5	5	25	75	100
	11UMA5702	IV	Skill Based Elective - II	Three Dimensional Geometry and Trigonometry	4	4	25	75	100

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					30	30	150	450	600
			TOTAL		30	30	150	450	600
VI	11UMA6411	III	Core Course - XI	Number Theory	5	5	25	75	100
	11UMA6412	III	Core Course - XII	Complex Analysis	5	5	25	75	100
	11UMA6413	III	Core Course - XIII a	Numerical Methods	4	4	15	45	60
	11UMA6413P	III	Core Course - XIII b	MATLAB	2	2	10	30	40
	11UMA6502	III	Major Based Elective - II	Operations Research	5	5	25	75	100
	11UMA6503	III	Major Based Elective - III	Linear Algebra	4	4	25	75	100
	11UMA6703	IV	Skill Based Elective - III	Discrete Mathematics	4	4	25	75	100
	11U612	V	Gender Studies	Gender Studies	1	1	25	75	100
			TOTAL		30	30	175	525	700
			GRAND TOTAL		180	140	950	2850	3800

CORE COURSE – I
CALCULUS

Sub Code:	11UMA1401	**Max Marks:**	100
Hours/Week:	6	**Internal Marks:**	25
Credit:	4	**External Marks:**	75

UNIT I

Successive Differentiation: nth derivatives of standard result - Trigonometrical transformation of functions – Applicable to some suitable problems

UNIT II

Homogeneous functions – Partial derivatives of a function of two functions – Maxima and minima of function of two variables - Lagrange's method of undetermined Multipliers.

UNIT III

Curvature: Circle, Radius and Center of Curvature- Cartesian Formula for the Radius of Curvature – Coordinates of the Centre of Curvature – Evolute and Involute - Radius of Curvature when the curve is given in Polar coordinates.

UNIT IV

Multiple Integrals - Definition – Evaluation – Illustrative Examples – Double Integrals in Cartesian coordinates and polar coordinates – change the order of Integration – Triple Integral - Some more worked examples.

UNIT V

Gamma functions – Beta functions – Relation between Beta and Gamma functions – Properties and examples – Integrals using Gamma and Beta functions – Applications of Gamma functions to multiple Integrals.

Text Books:
T.B-1   T.K. Manickavasagam Pillai and others, Calculus Volume – I, S.Viswanathan Publishers, Pvt. Ltd, 2004.
T.B-2   T. K. Manicavachagom and others, Calculus Volume – II, S.Viswanathan Publishers, Pvt. Ltd, 2004.

UNIT I	Chapter III		**T.B-1**
UNIT II	Chapter VIII	Sec 1.6, 1.7 Sec 4, 5	**T.B-1**
UNIT III	Chapter X	Sec 2.1- 2.6	**T.B-1**
UNIT IV	Chapter 5	Sec.2 – 4	**T.B-2**
UNIT V	Chapter 7	Sec.2 – 6	**T.B-2**

Reference Books:

1. S.Arumugam and Isaac, Calculus, Volume1, New Gamma Publishing House,1991.
2. Shanti Narayan, Differential and Integral Calculus.

CORE COURSE – II
THEORY OF EQUATIONS AND FOURIER SERIES

Sub Code:	11UMA1402	**Max Marks:**	100
Hours/Week:	2	**Internal Marks:**	25
Credit:	2	**External Marks:**	75

UNIT I
Relation between the roots and coefficients of equations.

UNIT II
Symmetric functions of the roots.

UNIT III
Transformation of equation – Roots with sign changed, Roots Multiplied by a given number – Diminishing, Increasing the roots of a given equation by a given quantity.

UNIT IV
Fourier series: Definition of Fourier series – Finding Fourier series expansion of a periodic function with period 2π.

UNIT V
Odd and Even functions – Development in cosine series and sine series.

Text Books:

T.B-1: T.K.Manicavachagam Pillai, T.Natarajan, & K.S. Ganapathy, Algebra, Volume-I, S.Viswanathan Publishers, Pvt. Ltd, 2004.

T.B- 2: T.K.Manicavachagam pillai and others, Calculus, Volume –III, S.Viswanathan Publishers, Pvt. Ltd, 2004.

UNIT	I	Chapter 6 Section 11	**T.B-1**
UNIT	II	Chapter 6 Section 12	**T.B-1**
UNIT	III	Chapter 6 Sections 15.1, 15.2, 17	**T.B-1**
UNIT	IV	Chapter 6 sections 1, 2	**T.B-2**
UNIT	V	Chapter 6 section 3,4,5	**T.B-2**

Reference Books:

1. M.L.Kanna, Theory of Equations , Jai Prakasnath & Co.

2. Arumugam , Isaac, Algebra(Theory of Equations, Inequalities and Theory of numbers), New Gamma Publishing House,2006.

CORE COURSE –III a
PROGRAMMING IN C

Sub Code:	11UMA2403	**Max Marks:**	60
Hours/Week:	6	**Internal Marks:**	15
Credit:	5	**External Marks:**	45

UNIT I
Constants, Variables and Data Types – Character set – C tokens – Keywords and identifiers – Constants – Variables – Data types – Declaration of variables and storage class – Assigning values to variables – Defining symbolic Constants – Operators and Expression – Arithmetic of operators – Relational operators – Logical operators – Assignment operators – Increment and decrement operators – Conditional operator – Bitwise operators – Special operators – Arithmetic expressions – Evaluation of expressions – Precedence of arithmetic operators – Mathematical Functions – Managing Input and Output Operators – Reading character – Writing a character – Formatted input – Formatted output.

UNIT II
Decision Making and Branching – Decision making with IF statement – Simple IF statement – The IF ELSE statement – Nesting IF…ELSE statements – The ELSE IF ladder – The switch statement – The ?: operator – The GOTO statement - Decision Making and Looping – The WHILE, DO, FOR statement – Jumps in loops.

UNIT III
Handling of Character String – Declaring and initializing string variables – Reading strings from terminal – Wring strings to screen – Arithmetic operations on characters – Putting strings together – Comparisons of two strings – String – Handling functions – Table of strings – **Arrays** – One-dimensional, Two-dimensional arrays and Multi-dimensional arrays – **Pointers** – Understanding pointers – Accessing the address of a variable – Declaring and initializing pointers – Accessing a variable a variable through its pointer – Pointer expressions – Pointer increments and scale factor – Pointers and arrays – Pointers and character strings.

UNIT IV
User-Defined Functions – Need for user-defined functions – A multi-function program – The form of C functions – Return values and their types – Calling a function – Category of functions – No arguments and no return values – Arguments with return values – Handling of non-integer functions – Nesting of functions – Recursion.

UNIT V
File Management in C – Defining and opening a file – closing file – Input/Output operations on files – Error handling during I/O operations – Random access to files.

Text Book:
E.Balgurusamy, Programming in ANSI C (Third Edition), TMH.
UNIT I   Chapter 2: 2.2 to 2.11; Chapter 3: 3.2 to 3.16; Chapter 4: 4.2 to 4.5
UNIT II   Chapter 5: 5.2 to 5.9; Chapter 6: 6.2 to 6.5
UNIT III Chapter 8: 8.2 to 8.9; Chapter 7: 7.2 to 7.7; Chapter 11: 11.2 to 11.11
UNIT IV   Chapter 9: 9.2 to 9.16
UNIT V   Chapter 12: 12.2 to 12.6

Reference Book:
Yashvant Kanetkar Let us C, Seventh Edition, BPB Publications.

CORE COURSE –III b
C PROGRAMMING LAB

Sub Code: 11UMA2403 P   **Max Marks:** 40
Hours/Week: 3   **Internal Marks:** 10
Credit: 2   **External Marks:** 30

List of Practicals:

1. Solving a Quadratic equation.

2. Sum of Sine, Cosine, e^x series.

3. Ascending, Descending, Largest and Smallest of given numbers.

4. Sorting names in Alphabetical Order.

5. Finding Factorial, generating Fibonacci numbers using Recursive Functions.

6. Mean, Variance and Standard Deviation

7. Creation and Processing of sequential files for Payroll and Mark List Preparation.

NON MAJOR ELECTIVE-I
MATHEMATICS FOR COMPETITIVE EXAMINATIONS – I

Sub Code:	11UMA2601	Max Marks:	100
Hours/Week:	2	Internal Marks:	25
Credit:	2	External Marks:	75

UNIT I
Numbers: Problems on Addition, Subtraction, Multiplication and Division (Shortcut Methods) – Various tests for Divisibility – Prime and Composite numbers – Various types of numbers.

UNIT II
HCF and LCM of numbers - Decimal fractions: Addition, Subtraction, Multiplication and Division of Decimal fractions - H.C.F and L.C.M of Decimals – Rule for converting Pure and Mixed Recurring Decimals into a Vulgar Fractions.

UNIT III
Simplification - Square Root- Square Root by means of Factors – General Method – Square Root of Decimal Fractions - Square Root of Vulgar Fractions - Cube Root.

UNIT IV
Percentage: Shortcut Method – Problems based on Population, Average, Ratio and Proportion.

UNIT V
Partnership, Chain rule - Direct proportion – Indirect Proportion.

Text Book:
Scope and treatment as in "Quantitative Aptitude" by R.S.Aggarwal, S.Chand & Company Ltd.2007.

Reference books:
1. R.S. Aggarwal, Arithmetic (Subjective And Objective) For Competitive Examinations, S.Chand &
   Company Ltd, 2004.
2. O.P. Agarwal, Exhaustive Arithmetic, Avadh Prakashan.
3. R.S. Aggarwal, Objective Arithmetic, S.Chand & Company Ltd, 2004.

Note:
75 Multiple choice questions only. 15 Questions from each unit.

ALLIED COURSE - IV
MATHEMATICAL STATISTICS – I

Sub Code:	11UMA3304:1	**Max Marks:**	100
Hours/Week:	5	**Internal Marks:**	25
Credit:	3	**External Marks:**	75

UNIT I
Measures of central tendencies- Arithmetic Mean, Properties of Arithmetic Mean, Weighted mean, Median, Mode, Geometric mean and Harmonic mean Graphical Location of the Partition values. Merits and Demerits of Mean, Median and Mode.

UNIT II
Measures of Dispersion, Skewness and Kurtosis – Dispersion, , characteristics for ideal measure of dispersion, Measures of Dispersion ,Range, Q.D, M.D and S.D, coefficient of dispersion, coefficient of variation, Moments, Pearson's β and γ Co-efficients, Skewness and Kurtosis - simple problems.

UNIT III
Theory of probability- Classical probability; empirical probability; Axiomatic approach towards probability; Addition and Multiplication theorem; Conditional probability; Baye's theorem; simple problem.

UNIT IV
Random variable; Distribution function; Properties; Probability mass function; Probability density function; Joint probability mass function; Joint probability density function; Marginal and Conditional distribution – Simple problems.

UNIT V
Mathematical Expectation; Addition theorem of Expectation; Multiplication theorem of Expectation; Moment Generating Function; Cumulant Generating Function and cumulants, Additive Property of Cumulants – Simple problems.

Text Book:
S.C.Gupta & V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand publication, Third edition, Reprint 2006.

UNIT I	Sec. 2.3 - 2.9.1 & 2.11.1
UNIT II	Sec. 3.1 – 3.7, 3.7.3, 3.8, 3.8.1, 3.9, 3.10 - 3.12
UNIT III	Sec. 4.1, 4.3.1, 4.3.2, 4.5, 4.6.2 – 4.9
UNIT IV	Sec. 5.1 – 5.4.1, 5.5.1 – 5.5.5
UNIT V	Sec. 6.1- 6.4, 6.10, 6.11 & 6.17

Reference Books:
1. Murray R. Speigel, John Jschiller, R. Alu Srinivasan Probability and Statistics, Third Edition, Shaum's Outline Series,2010.
2. B.R.Bhat, Modern Probability Theory Revised Third Edition, New Age International, 2005.

CORE COURSE - IV
DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS

Sub Code:	11UMA3404	**Max Marks:**	100
Hours/Week:	5	**Internal Marks:**	25
Credit:	3	**External Marks:**	75

UNIT I
Equations of the first order but of higher degree: Equations solvable for dy/dx - Equations solvable for y - Equations solvable for x – Clairaut's form – Equations that do not contain x explicitly - Equations that do not contain y explicitly - Equations homogeneous in x and y – Exact Differential Equations – Practical Rule – Rules for finding Integrating factors.

UNIT II
Applications of first order equations: Growth, Decay and chemical reactions, Flow of water from an orifice, Falling bodies and other rate problems.

UNIT III
Linear Equations with constant coefficients: Complementary function of a linear equation with constant coefficients – General methods of finding Particular Integrals – Linear Equations with variable coefficients – Equations reducible to the linear equations.

UNIT IV
Partial Differential Equations of the first order: Classification of integrals, Derivation of PDE by elimination of constants and functions, Lagrange's method of solving the linear equation, Special methods, Standard forms I,II,III and IV(Clairaut's form)

UNIT V
Partial Differential Equations of higher orders: A simple case of the linear PDE with constant coefficients, The general Homogeneous linear equation, The Homogeneous equations with constant coefficients, Solution of the Homogeneous equation f(D,D')=0 Second method, case of the auxiliary equation having Repeated roots, The Particular integral.

Text Books:
T.B-1 S. Narayanan and T. K. Manicavachagom Pillay, Differential Equation and its Application, S. Viswanathan Publishers Pvt Ltd, Ninth edition,1996.
T.B-2 Dr. M. K. Venkataraman,Engineering Mathematics Volume III B, National Publishing Company, 13th Edition, 1998.

UNIT I	Chapter IV Sec. 1 – 4, Chapter II – Sec. 6.1 – 6.4	**T.B- 1**
UNIT II	Chapter III Sec. 1 – 3.	**T.B- 1**
UNIT III	Chapter V Sec. 1 – 6.	**T.B- 1**
UNIT IV	Chapter XII Full	**T.B- 1**
UNIT V	Chapter II Sec 13-19	**T.B- 2**

Reference Book:
1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co.
2. M.L. Khanna, Differential Equations, Jaiprakashnath and Co.,2004.

CORE COURSE - V
VECTOR ANALYSIS AND 2D

Sub Code:	11UMA3405	**Max Marks:**	100
Hours/Week:	4	**Internal Marks:**	25
Credit:	3	**External Marks:**	75

UNIT I
Vector differentiation – The vector differential operator – Gradient- Direction and magnitude of gradient- Divergence and curl- formula involving operator ∇, operators involving ∇ twice.

UNIT II
Vector integration: Line integral – surface integral – volume integral – problems on these.

UNIT III
Gauss divergence theorem – Stoke's theorem, Green's theorem – simple verification of theorems and problems.

UNIT IV
Polar Coordinates- distance between the points – Transformations of polar coordinates into Cartesian coordinates – Area of a triangle – Equation of a straight line – Circle

UNIT V
Polar equation of a conic - Equation of the chord of the conic – Asymptotes of a conic – Properties of general conic – Equations of the polar of any point with respect to the conic – Equation of the pair of the tangent drawn from the point to the conic.

Text Books:
T.B-1 Narayanan.S and Manicavachagom Pillai. T.K., Vector Algebra and Analysis, S.Viswanathan Pvt.Ltd. 1995.
T.B-2 Manicavachagom Pillai and Natarajan A text book of analytical geometry Part I ,Two dimensions, S.Viswanathan Pvt.Ltd. 1999.

UNIT I	Chapter 4	Sec.6 to 12	**T.B-1**
UNIT II	Chapter 6	Sec.2 to 5	**T.B-1**
UNIT III	Chapter 6	Sec.6 to 10	**T.B-1**
UNIT IV	Chapter 9	Sec 1 to 8	**T.B-2**
UNIT V	Chapter 9	Sec 9 to 15	**T.B-2**

Reference Book:
        M.L. Khanna, Vector Calculus, Jai Prakash Nath and Co., Eighth Edition, 1986.

NON MAJOR ELECTIVE - II
MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II

Sub Code:	11UMA3602	**Max Marks:**	100
Hours/Week:	2	**Internal Marks:**	25
Credit:	2	**External Marks:**	75

UNIT I
Time and work, Pipes and Cisterns.

UNIT II
Time and Distance, Trains, Boats and Streams

UNIT III
Profit and Loss, Mixture.

UNIT IV
Simple interest and Compound interest, Calendar.

UNIT V
Volume and Area of Solid figures

Text Book:
Scope and treatment as in "Quantitative Aptitude" by R.S.Aggarwal, S.Chand & Company
Ltd.2007.

Reference books:
1. R.S. Aggarwal, Arithmetic (Subjective And Objective) For Competitive Examinations, S.Chand &
   Company Ltd, 2004.
2. O.P. Agarwal, Exhaustive Arithmetic, Avadh Prakashan.
3. R.S. Aggarwal, Objective Arithmetic, S.Chand & Company Ltd, 2004.

Note:
75 Multiple choice questions only. 15 Questions from each unit.

ALLIED COURSE - V
MATHEMATICAL STATISTICS – II

Sub Code:	11UMA4305:1	**Max Marks:**	100
Hours/Week:	5	**Internal Marks:**	25
Credit:	3	**External Marks:**	75

UNIT I

Theoretical discrete distribution – Binomial distribution: Moments, Recurrence relation Moment generating Function Characteristic Function and Cumulants.   Poisson distribution: Moments, Recurrence relation, Moment generating Function, Characteristic Function and Cumulants - Simple Problems.

UNIT II

Theoretical continuous distribution - Rectangular (or) Uniform distribution, Normal distribution, Moment generating Function, Cumulant generating Function, Moments; Area Property, Fitting of Normal Distribution - Simple Problems.

UNIT III

Theoretical continuous distributions – Gamma Distribution, Moment generating Function, Cumulant generating Function, Additive property, Beta Distribution of first kind, Exponential Distribution - Simple Problems.

UNIT IV

Curve Fitting and Principles of Least squares – Curve Fitting, Fitting of straight line, Fitting of second degree parabola, Fitting of polynomial of kth degree, Change of origin, Most plausible solution of a system of linear equations - Simple Problems.

UNIT V

Bivariate distribution, Correlation, Scatter diagram, Pearson's Coefficient of Correlation, Properties, Rank correlation, Regression - Lines of Regression, Regression Coefficient and its properties- Simple Problems.

Text Book:

S.C.Gupta and V. K. Kapoor, Elements of Mathematical Statistics, Sultan Chand Publication,Third edition, Reprint 2006.

Unit I	Chapter 7: 7.1 to 7.5
Unit II	Chapter 8: 8.1, 8.2 and 8.6
Unit III	Chapter 13: 13.1 to 13.6; Chapter 14: 14.1 to 14.5.4
Unit IV	Chapter 12
Unit V	Chapter 13, 13.7; Chapter14: 14.5.4 to14.5.10

Reference Books:

1. Murray R. Spiegal , John Jschiller, R. Alu Srinivasan Probability and Statistics, Third
    Edition, Shaum's Outline Series,2010.

2. B.R.Bhat, Modern Probability Theory Revised Third Edition, New Age International, 2005.

ALLIED COURSE – VI a
MATHEMATICAL STATISTICS – III

Sub Code:	11UMA4306:1		Max Marks:	60
Hours/Week:	3		Internal Marks:	15
Credit:	2		External Marks:	45

UNIT I :
Sampling Introduction; Types of sampling parameter and statistic; Sampling distribution Standard Error; Tests of significance; Null Hypothesis.

UNIT II :
Test for single proportion; Test for difference of proportions; Test of significance of single mean; Test of significance of Difference of means.

UNIT III :
Chi-Square variate Definition; Application of χ^2- dist; χ^2-test for pop. variance; and independence of attributes.

UNIT IV:
Students t definition; Application of t-distribution test for single mean; Difference of means; test for corr. Coefficient;

UNIT V:
F-Statistic def; Application of F-distribution; F-test for equality of pop. Variance.

Text Books
S.C.Gupta and V. K. Kapoor, Elements of Mathematical Statistics, Sultan Chand Publication,Third edition, Reprint 2006.

UNIT I	12.1 to 12.5
UNIT II	12.9.1,12.9.2,12.13 and 12.14
UNIT III	13.1,13.5.1 to 12.5.3
UNIT IV	14.2,14.2.5 to 14.2.8
UNIT V	14.3,14.3.1,14.3.2

Reference Book:
1. Murray R. Spiegal , John Jschiller, R. Alu Srinivasan Probability and Statistics, Third
   Edition, Shaum's Outline Series,2010.
2. B.R.Bhat, Modern Probability Theory Revised Third Edition, New Age International, 2005.

ALLIED COURSE – VI b
SPSS LAB

Sub Code:	11UMA4306:1 P		**Max Marks:**	40
Hours/Week:	2		**Internal Marks:**	10
Credit:	2		**External Marks:**	30

List of Practicals

1. Calculation of Means, Standard deviations, Variances, correlation and regression.

2. Application of t-test for one sample problem.

3. Application of t-test for two sample problems.

4. Application of t-test for testing the significance of Correlation Coefficient.

5. One-tailed and Two-tailed tests.

CORE COURSE – VI
SEQUENCES AND SERIES

Sub Code: **11UMA4406**   **Max Marks:**   **100**
Hours/Week: **4**   **Internal Marks:**   **25**
Credit: **4**   **External Marks:**   **75**

UNIT I
Sequences - bounded sequences - monotonic sequences - convergent sequences - divergent and oscillating sequences - algebra of limits.

UNIT II
Behavior of monotonic sequences - Some theorems on limits – Subsequences.

UNIT III
Limit points – Cauchy sequences – the upper and lower limit of a sequence.
Infinite series – comparison Test.

UNIT IV
Kummer's test – D'Alembert's ratio test – Raabe's test – De Morgan and Bertrand's test – Gauss' test.

UNIT V
 Cauchy's root test - Cauchy's condensation test – Cauchy's integral test - Alternating series – Leibnitz's test - Absolute convergence.

Text Book:
Arumugam and Isaac, Sequences and series, New Gamma Publishing House,1991.

UNIT I	Chapter III Sections 3.1 – 3.6
UNIT II	Chapter III Sections 3.7 – 3.9
UNIT III	Chapter III Sections 3.10 - 3.12 , Chapter IV Sections 4.1, 4.2
UNIT IV	Chapter IV Sections 4.3
UNIT V	Chapter IV Sections 4.4,4.5, Chapter V Sections 5.1,5.2

Reference Books:
1. Richard R. Goldberg,Methods of Real Analysis,Oxford and IBH Publishing Co & Pvt Ltd, 1970.
2.   M.K.Singal & Asha Rani Singal, A first course in Real Analysis, R. Chand & Co.,1999

CORE COURSE - VII
MECHANICS

Sub Code: 11UMA5407   **Max Marks:**   100
Hours/Week: 6   **Internal Marks:**   25
Credit: 6   **External Marks:**   75

UNIT I
Kinematics: Basic units – Velocity – Acceleration – Coplanar motion. Force: Newton's laws of motion – Resultant of two forces on a particle.

UNIT II
Equilibrium of a particle: Equilibrium of a particle – Forces on a rigid body: Moment of a force – Parallel forces – Couples – Resultant of several coplanar forces- Equilibrium of a rigid body under three coplanar forces.

UNIT III
Hanging strings: Equilibrium of a uniform homogeneous string – Suspension bridge.

UNIT IV
Projectiles: Forces on a projectile – Projectile projected on an inclined plane.

UNIT V
Impact: Impulsive force – Impact of sphere – Impact of two smooth spheres – Impact of a smooth sphere on a plane – Oblique impact of two smooth spheres.

Text Book:
P.Duraipandian, Laxmi Duraipandian and Muthamizh Jeyapragasam, Mechanics, S Chand and Company Ltd, Reprint 2010.
Unit I   Chapter 1: Full & Chapter 2: Full
Unit II   Chapter 3: Sec 3.1 & Chapter 4: Sec 4.1,4.4,4.6,4.7,4.9
Unit III   Chapter 9: Full
Unit IV   Chapter 13: Full (except 13.3)
Unit V   Chapter 14: Full

Reference Books:
1. M.K.Venkataraman, Statics, Agasthiyar Publications, 2002.
2. M.K.Venkataraman, Dynamics, Agasthiyar Publications, 2002.
3. S.L. Lony, Elements of Statics and Dynamics, Part-I, A.I.T. Publishers, 1991.

CORE COURSE – VIII
MODERN ALBEBRA

Sub Code: 11UMA5408   **Max Marks:** 100
Hours/Week: 5   **Internal Marks:** 25
Credit: 5   **External Marks:** 75

UNIT I
Groups: Definition of a group – Simple properties of groups – Equivalent definitions of a group – subgroups - cyclic groups - cosets and Lagrange's theorem - Normal subgroups and quotient groups

UNIT II
Rings: Definition of a ring and some examples-some properties of rings-some special classes of rings - sub rings and subfields - ideals and quotient rings - Characteristic of an Integral domain

Unit III
Homomorphisms: Homomorphism on groups - Isomorphism theorems on groups – Automorphisms on groups – Homomorphism on rings

UNIT IV
Euclidean Rings: Definition and some properties of Euclidean Rings- Unique factorization theorem – Gaussian Integers.

UNIT V
Polynomial Rings: Polynomials over fields – Polynomials over the rational field – Polynomials over Commutative rings

Text Book:
Dr. M.L. Santiago, Modern Algebra, Arul Publications, 1988.
UNIT I   Chapter 2 Sec 2.1 – 2.7
UNIT II   Chapter 3 Sec 3.1 – 3.5, 3.9
UNIT III   Chapter 2 Sec 2.8 – 2.11, Chapter 3 – Sec 3.6
UNIT IV   Chapter 4 Full
UNIT V   Chapter 5 Full

Reference books:
1. S.Arumugam and A.Thangapandi Isaac, Modern Algebra, New Gamma Publishing House,1997.
2. K.S. Narayanan and T. K. Manicavachagom Pillay, Modern Algebra, Volume I, S. Viswanathan Publishers, Pvt. Ltd., 1983.

CORE COURSE – IX
REAL ANALYSIS

Sub Code:	11UMA5409	**Max Marks:**	100
Hours/Week:	5	**Internal Marks:**	25
Credit:	5	**External Marks:**	75

UNIT I

Metric Spaces – Definition – Bounded sets – Open Ball – Open sets – Subspaces – Interior of a set – Closed sets – Closure.

UNIT II

Limit point of a set - Dense sets - Complete Metric Space – Baire's Category theorem.

UNIT III

Continuity – Homeomorphism – Uniform Continuity – Discontinuous Functions on Reals.

UNIT IV

Connectedness – Definition – Connected Subsets of R – Connectedness and Continuity.

UNIT V

Compact Spaces – Compact Subsets of R – Equivalent Characterisation for compactness – compactness and continuity.

Text Book:

Arumugam and Isaac, Modern Analysis, New Gamma Publishing House,2007.

UNIT I	Chapter-2 Sec 2.1 to 2.8
UNIT II	Chapter-2 Sec 2.9,2.10, Chapter-3 Sec 3.1,3.2
UNIT III	Chapter-4
UNIT IV	Chapter-5
UNIT V	Chapter-6

Reference Books:

1.   Richard R. Goldberg, Methods of Real Analysis, Oxford and IBH Publishing Co & Pvt Ltd, 1970.
2.   Shanthi Narayan, A Course of Mathematical Analysis, S. Chand & Co., 1995

CORE COURSE – X
LAPLACE AND FOURIER TRANSFORMS

Sub Code:	11UMA5410	**Max Marks:**	100
Hours/Week:	5	**Internal Marks:**	25
Credit:	5	**External Marks:**	75

UNIT I

Laplace Transforms – Sufficient conditions for the existence of the Laplace transforms – Properties of Laplace transforms – Laplace transforms of Periodic functions – Some general theorems – Evaluation of integrals. The inverse Laplace transforms.

UNIT II

Application of Laplace transforms – Solution of ODE with constant coefficients – Solution of ODE with variable coefficients – Solution of simultaneous ODE.

UNIT III

Dirichlet's Conditions – Fourier Transforms – Inversion Theorem for complex Fourier Transforms – Sine and Cosine transforms – Linearity Property of Fourier Transforms – Change of scale property – Shifting property – Modulation Theorem.

UNIT IV

Multiple Fourier transforms – convolution – convolution for Fourier transforms – Parseval's identity – relationship between Fourier and Laplace transforms – Fourier transforms of the derivatives of a function.

UNIT V

Finite Fourier sine transforms – Inversion formula for sine transform – Finite Fourier cosine transform – Inversion formula for cosine transform.

Text Books:

T.B-1 S. Narayanan and T. K. Manicavachagom Pillay, Differential Equation and its Application, S. Viswanathan Publishers Pvt Ltd, Ninth edition,1996.
T.B-2 A.R. Vasistha and R.K. Gupta, Integral Transforms

UNIT- I	Chapter IX – Sec 1 to 7	**T.B-.1**
UNIT- II	Chapter III – Sec 3.1 to 3.3	**T.B-.2**
UNIT-III	Chapter VI – Section 6.1 to 6.13	**T.B-.2**
UNIT-IV	Chapter VI – Section 6.16 to 6.21	**T.B-.2**
UNIT- V	Chapter VII – Section 7.1 to 7.4	**T.B-.2**

Reference Books:

1. A.H. Siddiqi and P.H Manchanda, A First course in Differential Equations with applications.
2. Francis B. Hildebrand, Methods of Applied Mathematics, Second edition.

MAJOR BASED ELECTIVE - I
GRAPH THEORY

Sub Code:	11UMA5501	Max Marks:	100
Hours/Week:	5	Internal Marks:	25
Credit:	5	External Marks:	75

UNIT I
Introduction: Graph – Finite and Infinite graphs – Incidence and Degree – Isolated vertex, pendant vertex and Null graphs. Paths and Circuits: Isomorphism – sub-graphs – walks, paths and circuits – Connected and disconnected graphs- Euler Graphs.

UNIT II
Operations on Graphs – More on Euler Graphs – Hamiltonian Paths and circuits. Trees and fundamental circuits: Trees – Some Properties of Trees – Pendant vertices in a Tree – Distance and centers in a Tree.

UNIT III
Spanning Trees – Fundamental circuits – Spanning trees in a weighted graph - Cut sets and cut vertices: Cut sets – Properties of a cut set – all cut sets in a graph.

UNIT IV
Fundamental circuits and cut sets – Connectivity and Separability. Planar and dual graphs: Planar graphs – Kuratowski's two graphs – Representation of a planar graph.

UNIT V
Matrix Representation of graphs: Incidence Matrix – Circuit matrix – Fundamental circuit matrix and Rank of circuit matrix – Cut set matrix – Relationship among A_f, B_f and C_f – Path matrix.

Text Book:
Narsingh Deo, Graph theory with application to Engineering and Computer Science, PHI, 2005.

UNIT I	Chapter 1 Sections 1.1, 1.3 – 1.5	Chapter 2 Sections 2.1, 2.2, 2.4 – 2.6
UNIT II	Chapter 2 Sections 2.7 to 2.9	Chapter 3 Sections 3.1 – 3.4
UNIT III	Chapter 3 Sections 3.7,3.8,3.10	Chapter 4 Sections 4.1 – 4.3
UNITIV	Chapter 4 Sections 4.4 & 4.5	Chapter 5 Sections 5.2 -5.4
UNIT V	Chapter 7 Sections 7.1 – 7.4 & 7.6 – 7.8	

Reference Books:
1. Arumugam.S and Dr.Ramachandran.S , Invitation to Graph Theory, New Gamma Publishing House, 2006.
2. Harary.F , Graph Theory, Narosa Publishing House.

SKILL BASED ELECTIVE -II
THREE DIMENSIONAL GEOMETRY AND TRIGONOMETRY

Sub Code:	**11UMA5702**	**Max Marks:**	**100**
Hours/Week:	**4**	**Internal Marks:**	**25**
Credit:	**4**	**External Marks:**	**75**

UNIT I:
Plane: The general equation of a plane – Intercept form of a plane – Normal form of a plane – The equation of a plane passing through three points –Direction Cosines of a straight line - Angle between two planes – Equation of a plane through the line of intersection of two planes – Length of perpendicular from a point to a plane.

UNIT II
Straight lines: Symmetrical form of the equation of a line – The Symmetrical form of the equation of a line as the intersection of two planes – Equation of a straight line passing through two given points – The condition for a line to be parallel to a given plane – Angle between a plane and a straight line – The condition that two given straight lines are coplanar.

UNIT III
Sphere: Equation of a sphere – Finding centre and radius – Length of the tangent from a point to a sphere- Plane section of a sphere - Equation of a circle on a sphere – Equation of a sphere passing through a given circle - Intersection of two spheres is a circle – Equation of the tangent plane to a sphere at a point - Related examples.

UNIT IV
Expansion of $\sin n\theta$, $\cos n\theta$, and $\tan n\theta$ - Powers of sines and cosines of θ in terms of functions of multiples of θ

UNIT V
Hyperbolic functions: Relations between Hyperbolic functions – Inverse hyperbolic functions – logarithms of complex numbers

Text Books:
T.B-1   T.K. Manicavachagom Pillay and T. Natarajan, Analytical Geometry – Part II-Three Dimensions, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2009.
T.B-2   S. Narayanan and T.K. Manicavachagom Pillay, Trigonometry, S. Viswanathan Publishers, Pvt. Ltd., 2006.

UNIT I	Chapter II Sec. 1- 7, 9, 10	T.B-1
UNIT II	Chapter III Sec. 1 – 7	T.B-1
UNIT III	Chapter IV Full	T.B-1
UNIT IV	Chapter III Sec 1-2, 4	T.B-2
UNIT V	Chapter IV Full; Chapter V Sec 5	T.B-2

Reference Books:
1.   Shanti Narayan, Analytical Solid Geometry - S.Chand & Company Ltd.
2.   Duraipandian and Chatterjee, Analytical Geometry.

CORE COURSE - XI
NUMBER THEORY

Sub Code:	11UMA6411	**Max Marks:**	100
Hours/Week:	5	**Internal Marks:**	25
Credit:	5	**External Marks:**	75

UNIT I

Divisibility theory in the Integers: The division algorithm-the greatest common divisor-the Euclidean algorithm-the Diophantine equation $ax + by = c$

UNIT II

Primes and their distribution: The fundamental theorem of arithmetic- The Sieve of Eratosthenes- The Goldbach Conjecture.

UNIT III

The theory of congruences: Carl Friedrich Gauss- Basic properties of congruence- Binary and decimal representation of integers - linear congruences and the Chinese remainder Theorem.

UNIT IV

Fermat's theorem: Pierre de Fermat – Fermat's Little theorem and Pseudoprimes - Wilson's theorem – The Fermat-Kraitchik Factorization Method.

UNIT V

Number – theoretic functions: The sum and number of Divisions – The MÖbius inversion formula- The greatest integer function.

Text Book:

David M. Burton, Elementary Number Theory, Sixth Edition, TMH, 2010.

UNIT I	Chapter II – 2.2,2.3,2.4,2.5
UNIT II	Chapter III – 3.1,3.2,3.3
UNIT III	Chapter IV – 4.1,4.2,4.3,4,4
UNIT IV	Chapter V – 5.1,5.2,5.3,5.4
UNIT V	Chapter VI – 6.1,6.2,6.3

Reference Book:

Ivan Niven and Herbert S. Zuckerman, An introduction to the Theory of Numbers, Third Edition, Wiley Eastern Ltd, 1972.

CORE COURSE - XII
COMPLEX ANALYSIS

Sub Code:	11UMA6412	Max Marks:	100
Hours/Week:	5	Internal Marks:	25
Credit:	5	External Marks:	75

UNIT I
Functions of a Complex variable , Limits, Theorems on Limits , Continuous functions , Differentiability , Cauchy, Riemann equations , Analytic functions , Hormonic functions.

UNIT II
Conformal Mapping, Bilinear transformations, Elementary transformations , Bilinear transformations , Cross ratio , fixed points of Bilinear Transformation , Some special bilinear transformations .

UNIT III
Complex integration - definite integral , Cauchy's Theorem ,Cauchy's integral formula ,Higher derivatives.

UNIT IV
Series expansions - Taylor's series , Laurant's Series , Zeroes of analytic functions , Singularities

UNIT V
Calculus of Residues - Residues , Cauchy's Residue Theorem ,Evaluation of definite integrals .

Text Books:

S.Arumugam,A.Thangapandi Isaac,& A.Somasundaram, Complex Analysis, New Scitech Publications Pvt Ltd, Tenth Reprint, 2009.

UNIT   I   Chapter 2 section 2.1 to 2.8
UNIT II   Chapter 2 section 2.9 & Chapter 3 Sections 3.1 to 3.5
UNIT III   Chapter 6 sections 6.1 to6.4
UNIT IV   Chapter 7 Sections 7.1 to 7.4
UNIT V   Chapter 8 Sections 8.1 to 8.3

Reference Books:
1. J.N. Sharma, Functions of a Complex variable, Krishna Prakasan Media(P) Ltd, 13th Edition, 1997.
2. T.K.Manickavachaagam Pillai,Complex Analysis, S.Viswanathan Publishers Pvt Ltd,1994.

CORE COURSE – XIII a
NUMERICAL METHODS

Sub Code:	11UMA6413	Max Marks:	60
Hours/Week:	4	Internal Marks:	15
Credit:	4	External Marks:	45

UNIT I

Solution of Algebraic and Transcendental equation – Introduction, Bisection Method, Iteration Method, Method of False position, Newton Raphson Method.

UNIT II

Interpolation: Finite differences – Forward differences, Backward differences, Central differences, Symbolic relations, Newton`s formula for interpolation. Interpolation with unevenly spaced points – Lagranges interpolation formula.

UNIT III

Numerical differentiation and integration – Introduction, Numerical differentiation (Excluding cubic spline method, maximum and minimum values of a tabulated function), Numerical integration – Trapezoidal Rule and Simpson`s Rule.

UNIT IV

Matrices and Linear system of Equation: Gaussian Elimination method, Method of Factorization, Iterative method – Jacobi and Gauss Seidal methods.

UNIT V

Numerical Solution of ordinary differential equations – Solution by Taylor Series, Picard's method of Successive approximations, Euler method, Modified Euler method, Runge-Kutta methods

Text Book:

S.S. Sastry, Introductory Methods of Numerical Analysis, Third Edition, PHI, 2000

UNIT I	Chapter 2 Section 2.1 to 2.5
UNIT II	Chapter 3 Section 3.3,3.6, 3.9.1
UNIT III	Chapter 5 Section 5.1, 5.2 (Excluding 5.2.1 and 5.2.2), 5.4, 5.4.1, 5.4.2
UNIT IV	Chapter 6 Section 6.3.2, 6.3.4, 6.4.
UNIT V	Chapter 7 Section 7.2 to 7.4, 7.4.2, 7.5

Reference Books:

1. F.B. Hildebrand, Introduction to Numerical Analysis, Second Edition, TMH.
2. A. Singaravelu, Numerical Methods, Meenachi Agency, June 2000.

CORE COURSE – XIII b
MATLAB

Sub Code: **11UMA6413 P**   **Max Marks:**   **40**
Hours/Week: 2   **Internal Marks:**   **10**
Credit: **2**   **External Marks:**   **30**

List of Practicals:

1.   Bisection Method.

2.   False- Position Method.

3.   Lagrange's Method.

4.   Newton's interpolation method.

5.   Trapezoidal Rule.

6.   Simpsons Rule.

7.   Gauss Jordan Method.

8.   Gauss Jacobi Iteration Method.

9.   Euler's Method.

10.   Runge Kutta Fourth order method.

MAJOR BASED ELECTIVE - II
OPERATIONS RESEARCH

Sub Code:	11UMA6502	**Max Marks:**	100
Hours/Week:	5	**Internal Marks:**	25
Credit:	5	**External Marks:**	75

UNIT I

Definitions of Operations Research - Applications - Linear Programming Problem-Mathematical formulation - Graphical Solution Method, Alternative optimal solution, Unbounded solution, Infeasible solution, General LPP- Standard LPP-Basic Solution-Basic Feasible and Infeasible solution-Degenerate solution.

UNIT II

Simplex Algorithm-Artificial variable Techniques – Big M method and Two-phase method – Alternate optimal solution – Degeneracy – Unbounded and Infeasibility.

UNIT III

Introduction – General Primal Dual pair – Formation of a Dual problem - Duality and Simplex method, Dual simplex method.

UNIT IV

Introduction – General Transportation Problem -Finding an Initial Basic Feasible Solution using North-West Corner Rule, Least Cost Entry Method and VAM - MODI method –Assignment problem – Hungarian method, Travelling Salesman Problem.

UNIT V

Network scheduling by CPM and PERT – Network Basic components logical sequencing, Rules of network constructions – Critical Path Analysis – Probability consideration in PERT, Distinction between CPM & PERT.

Note: Theoretical proof not expected.

Text Book:

Kanti Swarup, P.K.Gupta and Manmohan, Operations Research, Twelfth Edition, Sultan Chand and Sons, 2004.

UNIT I	Chapter 1.1, 1.2, 1.7, 2.1, 2.2, 3.1 to 3.5, 4.1
UNIT II	Chapter 4.3 and 4.4.
UNIT III	Chapter 5.1, 5.2, 5.3, 5.4, 5.7, 5.9
UNIT IV	Chapter 10.1, 10.2,10.9.10.12,10.14,11.1,11.2 to11.4, 11.6
UNIT V	Chapter 21.1-21.7

Reference Books:

1. P.K.Gupta and Manmohan, Problems in Operations Research (Methods & Solutions) Sultan Chand and Sons.
2. J.K.Sharma, Operations Research Theory and Applications, Macmillian India Ltd 2000.

MAJOR BASED ELECTIVE - III
LINEAR ALGEBRA

Sub Code:	11UMA6503	**Max Marks:**	100
Hours/Week:	4	**Internal Marks:**	25
Credit:	4	**External Marks:**	75

Unit I

Vector spaces – Properties – Subspaces – linear combinations – linear span.

Unit II

Linear independence – Linear dependence - Basis – Dimension.

Unit III

Quotient Spaces - Isomorphism of Vector Spaces - Direct sums .

Unit IV

Dual spaces - Annihilators - Linear transformations - Algebra of Linear transformations.

Unit V

Matrix of a Linear transformation - Rank and Nullity of Linear transformation - Regular transformation – Characteristic roots of a transformation.

Text Book:

K.S. Narayanan and T. K. Manicavachagom Pillay, Modern Algebra, Volume II, S. Viswanathan and Publishers, Pvt., Ltd. 1983.

UNIT I	Chapter VIII Section 8.1 – 8.4
UNIT II	Chapter VIII Section 8.5 – 8.7
UNIT III	Chapter VIII Section 8.8 – 8.10
UNIT IV	Chapter VIII Section 8.11 – 8.13
UNIT V	Chapter VIII Section 8.14 – 8.17

Reference Books:

1.   I. N. Herstein, Topics in Algebra, Second Edition, John Wiley and Sons, Pvt. Ltd,2000.
2.   Seymour Lipschutz, Theory and Problems of Linear Algebra, Schaum's outline series, Mc. Graw Hill Company, 1981.

SKILL BASED ELECTIVE - III
DISCRETE MATHEMATICS

Sub Code:	11UMA6703	Max Marks:	100
Hours/Week:	4	Internal Marks:	25
Credit:	4	External Marks:	75

UNIT I

Statement and notation – Connectives – Negative – Conjunctive – disjunctive – Statement Formulae and Truth table – Conditional and Biconditional statements – well defined formulae – Tautologies – Contradictions.

Unit II

Normal forms – Disjunctive Normal forms – Conjunctive Normal forms – Principal conjunctive Normal forms – ordering and uniqueness of Normal forms – The Predicate calculus – Inference theory of the Predicate calculus.

UNIT III

Functions – Composition of functions – Inverse function – Binary and n-ary operations – Characteristic function of a set – Hashing functions – Natural numbers – Recursive functions.

UNIT IV

Lattice as partially ordered set – Some properties of Lattices – Lattices as Algebraic systems – Sublattice, Direct product and homomorphism – Some special Lattices.

UNIT V

Boolean algebra – Boolean forms and free Boolean algebras – Values of Boolean expressions and Boolean functions.

Text Book:

J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with applications to Computer Science, Tata-McGraw Hill, New Dehli, Thirteenth Edition, 2001.

UNIT I	Chapter I	Sections 1.1 – 1.2.14
UNIT II	Chapter I	Sections 1.3, 1.5 and 1.6
UNIT III	Chapter II	Sections 2.4 – 2.6.1
UNIT IV	Chapter IV	Section 4.1
UNIT V	Chapter IV	Sections 4.2 and 4.3

Reference Books:

1. Rakesh Dube, Adesh Pandey, and Ritu Gupta, Discrete Structures and Automata Theory, Narosa Publishing House, 2000.
2. John E.Hopcroft, Jeffery D.Ullman, Introduction to Automata Theory, Languages and Computation .