GURU NANAK COLLEGE (AUTONOMOUS)

(Affiliated to University of Madras and Re-Accredited at 'A' Grade by NAAC)

Velachery Main Road, Velachery, Chennai – 600042.

B.Sc. Mathematics

(SEMESTER PATTERN WITH CHOICE BASED CREDIT SYSTEM)

Syllabus

(For the candidates admitted in the Academic year 2016-17 and thereafter)

Vision

To create an integrated teaching-learning, research and outreach unit on par with global standards that demonstrates the enhancement achievable in all spheres of life through mathematics education.

Mission

- ▣ To provide an ambience where students can learn, build on their skills and become competent users of Mathematics.

- ▣ To develop critical mathematical thinking and utilize it to solve challenging problems in various applications.

- ▣ To involve students in numerous projects this will expand their core subject interest, and help improve their analytical and logical reasoning skills.

- ▣ To conduct pedagogical training, workshops and conferences for faculty facilitating self-progression.

- ▣ To conduct outreach programs for socially excluded financially backward students and special children.

- ▣ To educate students the importance of moral values and develops self-discipline, self-reliance.

- ▣ To impart the essence of mathematics and to become frontiers in the field.

PROGRAMME OUTCOME

After completion of the programme, the student will be able to

PO 1: Demonstrate ability to formulate most suitable mathematical problems for real-time occurrences

PO 2: Enhanced critical thinking, analytical and computational skills necessary in today's society

PO 3: Develop the ability to understand, develop the mathematical concepts both numerically and graphically and enhance problem solving skills.

PO 4: Provide for professional cadres in the field of mathematics to support national development programs within public and higher education institutes.

PO 5: Build ability to contemplate latest scientific research techniques in the field

PROGRAMME SPECIFIC OUTCOME

The students at the time of graduation will be able to

PSO 1: Students will possess subject knowledge and skills required for progression in terms of higher education in mathematical/ applied fields or professional cadres.

PSO 2: Students will develop the ability to think independently and be able to cater to the needs of the society in local and global levels.

GURU NANAK COLLEGE (AUTONOMOUS)
VELACHERY, CHENNAI – 42.
B.Sc., DEGREE COURSE IN MATHEMATICS
Course Structure for 2016 – 2019 batch

Sem.	Part	Course Component	Subject Code	Subject Name	Hours	Credits	CIA	ESE	Total
I	I	Language	16UTAMF01/16UHINF01	Tamil - I / Hindi - I	6	3	50	50	100
	II	Language	16UENGF41	English - I	6	3	50	50	100
	III	Core I	16UMATC01	Algebra	4	4	50	50	100
			16UMATC02	Calculus	4	4	50	50	100
			16UCHEA11	Chemistry - I	5	5	50	50	100
			16UCHEA12P	Allied Chemistry Practical - I	3	*	*	*	*
	IV	NME	16UNME01C	Functional Mathematics - I	2	2	50	50	100
		Soft Skill	16UGSLS01	Listening and Speaking Skills		3	50	50	100
		Total Hours = 30		**Total credits = 24**					
II	I	Language	16UTAMF02/ 16UHINF02	Language – II/Hindi - II	6	3	50	50	100
	II	Language	16UENGF42	English - II	6	3	50	50	100
	III	Core II	16UMATC03	Trigonometry and Number Theory	4	4	50	50	100
			16UMATC04	Analytical Geometry	4	4	50	50	100
			16UCHEA13	Chemistry - II	5	5	50	50	100
			16UCHEA12P	Allied Chemistry Practical – I	3	4	50	50	100
	IV	NME	16UNME02C	Functional Mathematics - II	2	2	50	50	100
		Soft Skill	16UGSLS02	Reading and Writing Skills		3	50	50	100
		Total Hours = 30		**Total credits = 28**					
III	I	Language	16UTAMF03/16UHINF03	Tamil – III/Hindi III	6	3	50	50	100
	II	Language	16UENGF43	English – III	6	3	50	50	100
	III	Core III	16UMATC05	Differential Equations and Laplace Transforms	4	4	50	50	100
			16UMATC06	Vector Calculus, Fourier Series &Transforms	4	4	50	50	100
			16UPHYA13	Physics - I	5	5	50	50	100

			16UPHYA14P	Allied Physics Practical - I	3	*	*	*	*
	IV	EVS	16UEVS401	Environmental Studies	2	*	*	*	*
		Soft Skill	16UGSLS03	Personality Enrichment		3	50	50	100

<div align="center">Total Hours = 30   Total credits = 22</div>

	I	Language	16UTAMF04/16UHINF04	Language – IV/Hindi - IV	6	3	50	50	100
	II	Language	16UENGF44	English – IV	6	3	50	50	100
IV	III	Core IV	16UMATC07	Mathematical Statistics	4	4	50	50	100
			16UMATC08	Statics	4	4	50	50	100
			16UPHYA15	Physics – II	5	5	50	50	100
			16UPHYA14P	Allied Physics Practical – I	3	4	50	50	100
	IV	EVS	16UEVS401	Environmental Studies	2	2	50	50	100
		Soft Skill	16UGSLS04	Computing Skills		3	50	50	100

<div align="center">Total Hours = 30   Total credits = 28</div>

			16UMATC09	Algebraic Structures	6	4	50	50	100
			16UMATC10	Real Analysis-I	6	3	50	50	100
V	III	Core V	16UMATC11	Dynamics	6	4	50	50	100
			16UMATC12	Discrete Mathematics	6	4	50	50	100
			16UMATE01	Programming Language C with Practical's	6	5	50	50	100
		PIV Common	16UMATE01P	Value Education		2	50	50	100

<div align="center">Total Hours = 30   Total credits = 22</div>

			16UMATC13	Linear Algebra	6	3	50	50	100
			16UMATC14	Real Analysis-II	6	4	50	50	100
VI	III	Core VI	16UMATC15	Complex Analysis	6	4	50	50	100
			16UMATE02	Operations Research	6	5	50	50	100
			16UMATE03	Graph Theory	6	5	50	50	100
	V		EXTU501	Extension activities		1			

<div align="center">Total Hours = 30   Total credits = 22</div>

<div align="center">OVERALL CREDITS TOTAL = 146</div>

SEMESTER - I

CORE THEORY - 1: ALGEBRA

SUBJECT CODE: 19UMAT301	THEORY	MARKS: 100
SEMESTER - I	CREDITS: 4	TOTAL HOURS: 60

Objectives:
To develop the knowledge on linear, polynomial, exponential, and logarithmic functions, matrices and systems of equations with an emphasis on problem solving and multiple representations.

UNIT I (12 hrs)
Matrices: Symmetric; Skew Symmetric; Hermitian; Skew Hermitian; Orthogonal and Unitary Matrices; Rank of a matrix; Consistency and solutions of Linear Equations.

UNIT II (12 hrs)
Matrices: Cayley-Hamilton theorem; Eigen values; Eigen Vectors; Similar matrices; Diagonalization of a matrix.

UNIT III (12 hrs)
Theory of Equations: Polynomial equations; Imaginary and irrational roots; Symmetric functions of roots in terms of coefficients; sum of rth powers of roots; Reciprocal equations. Transformations of equations.

UNIT IV (12 hrs)
Theory of Equations: Descartes' rule of signs: Approximate solutions of roots of polynomials by Newton-Raphson method- Hornet's method; Cardan's method of solution of a cubic polynomial

UNIT V (12 hrs)
Summation of series: Binomial, Exponential and Logarithmic series (theorems without proof); Summation of finite series using method of differences- Simple problems.

Contents and treatment as in **Algebra- Volume I and II** by T.K.Manikavasagam Pillai and others (S.Viswanathan publishers)

Reference Books:

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

2. Higher Algebra: H.S Hall and S.R.Knight (HM Publications-1994)

3. Algebra, Analytical Geometry (2D) and Trigonometry: Dr.S.Sudha (Emerald

Publishers)

4. Algebra and Trigonometry (I&II): P.R.Vittal (Margham Publishers)

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answer any 10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit -1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

CORE THEORY- 2: CALCULUS

SUBJECT CODE: 16UMATC02	THEORY	MARKS: 100
SEMESTER - I	CREDITS: 4	TOTAL HOURS: 60

Objectives:
Introduction to fundamental concepts of Calculus

UNIT I (12 hrs)

Differential Calculus: n^{th} Derivative; Leibnitz's theorem (without proof) and its applications; Partial differentiations. Total differentials; Jacobians;
Differential Calculus: Maxima and Minima of functions of two independent variables Necessary and sufficient conditions (without proof); Lagrange's method (without proof)- Simple problems on these concepts.

UNIT II (12 hrs)

Curvature: Curvature; radius and centre of curvature in Cartesian coordinates; radius of curvature in polar coordinates; p-r equations; evolutes; envelopes.

UNIT III (12 hrs)

Asymptotes: Methods (without proof) of finding asymptotes of rational algebraic curves with special cases.

UNIT IV (12 hrs)

Integral Calculus: Properties of definite integrals; Reduction formula; Double integrals; triple integrals; applications to area, surface area and volume- simple problems.

UNIT V (12 hrs)

Integral Calculus: Beta and Gamma functions. Properties and simple problems.

Contents and Treatment as in **Calculus** by S.Narayanan, T.K.Manickavachagom Pillai Volume I and II (Viswanathan Publishers).

Reference Books:

1. Calculus: Dr.S.Sudha (Emerald Publishers)

2. Integral Calculus and differential equations: Dipak Chatterjee (TATA McGraw Hill

   Publishing   Company Ltd.)

3. Calculus(I&II): P.R.Vittal(Margham Publishers)

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

NON - MAJOR ELECTIVE: FUNCTIONAL MATHEMATICS - I

SUBJECT CODE: 19UNME401C	THEORY	MARKS: 100
SEMESTER - I	CREDITS: 2	TOTAL HOURS: 30

UNIT I (6 hrs)

Ratio and Proportion
Chapter 12

UNIT II (6 hrs)

Percentages
Chapter 10

UNIT III (6 hrs)

Profit and Loss, Discounts.
Chapter 11

UNIT IV (6 hrs)

Simple Interest and Compound Interest
Chapters 21, 22.

UNIT V (6 hrs)

Solutions of Simultaneous equations and problems on ages and two digit numbers.
Chapters 7,8.

Book for Reference: Quantitative Aptitude R. S. Agarwal.

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

SEMESTER - II

CORE THEORY– 3: TRIGONOMETRY AND NUMBER THEORY

SUBJECT CODE: 19UMAT303	THEORY	MARKS: 100
SEMESTER - II	CREDITS: 4	TOTAL HOURS: 60

Objectives:
The student will have developed the ability to recognize and correctly manipulate trigonometric expressions, identities, equations, prime numbers, congruence's , Euler-Fermat's and Wilson's theorems to prove relations involving prime numbers.

UNIT I (12 hrs)
Trigonometry: Expansions of $sinx, cosx, tanx$ in terms of x; Expansion of $sinnx, cosnx, tannx, sin^n x, cos^n x, sin^m x cos^n x$ hyperbolic and inverse hyperbolic functions-Simple Problems.

UNIT II (12 hrs)
Summation of series: Sums of sines and cosines of n angles which are in A.P.; Summation of trigonometric series using telescopic method, C+iS method.

UNIT III (12 hrs)
Logarithms of Complex numbers.

UNIT IV (12 hrs)
Number Theory: Prime number; Composite Number; decomposition of a composite number as a product of primes uniquely(without proof); divisors of a positive integer n; congruence modulo n.

UNIT V (12 hrs)
Number Theory: Euler function(without proof); highest power of a prime number p contained in $n!$; Fermat's and Wilson's theorems-Simple problems.

Contents and treatment as in **Algebra- Volume I and II** by T.K.Manikavasagam Pillai and others (S.Viswanathan publishers)

Reference Books:

1. Trigonometry: P.Duraipandian (Emerald Publishers)

2. Plane Trigonometry Part 2: S.L.Loney

3. Algebra and Trigonometry(I&II): P.R.Vittal (Margham Publishers)

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

CORE THEORY– 4: ANALYTICAL GEOMETRY

SUBJECT CODE: 19UMAT304	THEORY	MARKS: 100
SEMESTER - II	CREDITS: 4	TOTAL HOURS: 60

Objectives:
To enable vivid description of 2D & 3D geometry graphically and correlate the same algebraically.

UNIT I (12 hrs)
Conics:
      Parabola: pole, polar, conormal points, concyclic points.
      Ellipse : pole, polar, conormal points, conjugate lines, conjugate diameters.

UNIT II (12 hrs)
Hyperbola: Co normal points, asymptotes, conjugate diameters.
Rectangular Hyperbola: co normal points, concyclic points.

UNIT III (12 hrs)
Planes: Planes; General equation of a plane; normal form; intercept form; intersection of planes; angle between planes.

UNIT IV (12 hrs)
Straight Lines: Straight Lines; symmetric form; coplanar lines; shortest distance; image of a point and a line on a plane.

UNIT V (12 hrs)
Sphere: Equation of a sphere; general equation; section of a sphere by a plane; tangent plane; orthogonal spheres.

Contents and treatment as in **Analytical Geometry (2D & 3D)** : T.K.Manikavasagam Pillai (Viswanathan Publishers)

Reference Books:

1. Analytical Geometry of 2 dimensions: P.Duraipandian

2. Coordinate Geometry: Dr.P.Balasubramanian and Others(McGraw Hill publishers)

3. Calculus and coordinate geometry of two dimensions: P.R.Vittal (Margham

Publishers)

4. Coordinate Geometry of 3 Dimensions and probability: P.R.Vittal (Margham

Publishers)

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

NON - MAJORELECTIVE: FUNCTIONAL MATHEMATICS – II

SUBJECT CODE:19UNME402C	THEORY	MARKS: 100
SEMESTER - II	CREDITS: 2	TOTAL HOURS: 30

UNIT I   **(6 hrs)**

Time and work – pipes and cisterns – Problem.
Chapters 15, 16.

UNIT II   **(6 hrs)**

Time and distance – Relative speeds – Problems on Races.
Chapter 17, 26.

UNIT III   **(6 hrs)**

Boats and Streams, Problems on Trains
Chapter 18,19.

UNIT IV   **(6 hrs)**

Mensuration
Chapters 24, 25.

UNIT IV   **(6 hrs)**

Stocks & Shares
Chapter 29

Book for Reference: Quantitative Aptitude R. S. Agarwal.

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

SEMESTER - III

CORE THEORY– 5: **DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS**

SUBJECT CODE: 19UMAT305	THEORY	MARKS: 100
SEMESTER - III	CREDITS: 4	TOTAL HOURS: 60

Objectives:
To determine how differential equations can be used in solving many applicable oriented problems and Laplace transformation as a tool for solving it.

UNIT I (12 hrs)
Ordinary Differential Equations: First order but of higher degree equations- solvable for p, solvable for x, solvable for y, clairaut's form- simple problems.

UNIT II (12 hrs)
Ordinary Differential Equations: Second order differential equations with constant coefficients with particular integrals for $e^{ax} x^m$, $e^{ax}sinmx$, $e^{ax}cosmx$.Second order differential equations with variable coefficients $ax^2 \frac{d^2y}{dx^2} + bx \frac{dy}{dx} + cy = q(x)$,Method of variation of parameters.

UNIT III (12 hrs)
Partial Differential Equations: Formation of PDE by eliminating arbitrary constants and arbitrary functions; Lagrange's equations Pp+Qq=R-Simple problems.

UNIT IV (12 hrs)
Partial Differential Equations: complete integral; singular integral; general integral; Charpit's method and standard types f(p,q)=0, f(x,p,q)=0, f(y,p,q)=0, f(z,p,q)=0, f(x,p)=f(y,q); Clairaut's form

UNIT I (12 hrs)
Laplace transform: Laplace transform; inverse Laplace transform(usual types); applications of Laplace transform to solution of first and second order linear differential equations(constant coefficients) and simultaneous linear differential equations-simple problems.

Contents and treatment as in

1. Engineering Mathematics volume 3: M.K.Venkataraman (National Publishing Co.)

2. Engineering Mathematics volume 3: P.Kandasamy and others (S.Chand and Co.)

Reference Books:

1. Integral Calculus and differential equations: Dipak Chatterjee (TataMcGraw Hill Publishing Comp Ltd)

2. Advanced Engineering Mathematics:Erwin Kreyszig (John Wiley and sons New York 1999)

3. Calculus: Narayanan and others (S.Viswanathan Publishers)

4. Differential Equations and Integral Transforms: Dr.S.Sudha(Emerald Publishers)

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

CORE THEORY– 6: VECTOR CALCULUS, FOURIER SERIES AND FOURIER TRANSFORMS

SUBJECT CODE: 16UMATC06	THEORY	MARKS: 100
SEMESTER - III	CREDITS: 4	TOTAL HOURS: 60

Objectives:
To expose the students to various techniques of vector calculus, Fourier series and Fourier transforms

UNIT I (12 hrs)
Vector Differentiation: Gradient, divergence, curl, directional derivative, unit normal to a surface.

UNIT II (12 hrs)
Vector Integration: Surface and volume integrals; theorems of Gauss, Stoke's and Green (without proof) -problems.

UNIT III (12 hrs)
Fourier Series: Expansions of periodic function of period 2π; expansion of even and odd functions; half range series.

UNIT IV (12 hrs)

Fourier Transform: Introduction of Fourier Transform , properties of Fourier Transform, Inverse Fourier Transform- problems.

UNIT V (12 hrs)
Fourier Transform: Fourier sine and cosine transforms and their inverse Fourier transform, Convolution theorem; Parseval's identity - problems .

Contents and treatment as in

1. Engineering Mathematics volume 3: M.K.Venkataraman (National Publishing Co.)

2. Engineering Mathematics volume 3: P.Kandasamy and others (S.Chand and Co.)

Reference Books:

1. Vector Analysis: Murray Spiegel (Schaum Publishing Company, New York)

2. Vector Analysis: P.Duraipandian and Laxmi Duraipandian (Emerald Publishers)

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

SEMESTER - IV

CORE THEORY – 7: MATHEMATICAL STATISTICS

SUBJECT CODE: 16UMATC07	THEORY	MARKS: 100
SEMESTER - IV	CREDITS: 4	TOTAL HOURS: 60

Objectives:
To understand the fundamental concept of Statistics and to learn the real life application of statistics..

UNIT I (12 hrs)
Statistics: Introduction, measures of central tendency- measures of dispersion- skew ness-kurtosis.

UNIT II (12 hrs)
 Sample space – Events, Definition of probability (Classiscal, Statistical & Axiomatic) – Addition and multiplication laws of probability- Independence- Conditional probability- Bayes theorem- Simple problems.

UNIT I (12 hrs)
 Random Variables (Discrete and continuous), Distribution function- Expected values , variance Moment generating function- probability generating function- Examples. Characteristic function – Uniqueness and inversion theorems (Statements and applications only) – Cumulates, Chebychev's inequality- Simple problems.

UNIT I (12 hrs)
Correlation: Rank correlation coefficient- Concepts of partial and multiple correlation coefficients- Regression: Method of Least squares for fitting Linear, Quadratic and exponential curves – Simple problems.

UNIT I (12 hrs)
Standard distributions – Binomial, Hyper geometric, Poission, Normal and Uniform distributions- Geometric, Exponential , Gamma and Beta distributions, Inter-relationship among distributions.

Contents and treatment as in **" Elements of Mathematical Statistics"** by S.C Gupta and V.K Kapoor (S.Chand Publishers)

Reference Books:

1. Hogg R.V. & Craig A.T. 1988): Introduction to Mathematical Statistics, Mcmillan..

2. Mood A.M & Graybill F.A & Boes D.G (1974) : Introduction to theory of Statistics, Mcgraw Hill.

3. Dr.P.R.Vittal, Mathematical Statistics, Margham publications.

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

CORE THEORY – 8: STATICS

SUBJECT CODE: 19UMAT308	THEORY	MARKS: 100
SEMESTER - IV	CREDITS: 4	TOTAL HOURS: 60

Objectives:

To provide a basic knowledge of the behavior of various types of forces to give enough working knowledge to handle practical problems.

UNIT I (12 hrs)

Newton's laws of motion - resultant of two forces on a particle- Equilibrium of a particle- Limiting Equilibrium of a particle on an inclined plane
Chapter 2 - Section 2 .1 , 2.2 , Chapter 3 - Section 3.1 and 3.2

UNIT II (12 hrs)

Forces on a rigid body – moment of a force – general motion of a rigid body- equivalent systems of forces – parallel forces – forces along the sides of a triangle – couples
Chapter 4 - Section 4 .1 to 4.6

UNIT III (12 hrs)

Resultant of several coplanar forces- equation of the line of action of the resultant- Equilibrium of a rigid body under three coplanar forces – Reduction of coplanar forces into a force and a couple.-problems involving frictional forces
Chapter 4 - Section 4.7 to 4.9 , Chapter 5 - Section 5.1, 5.2

UNIT IV (12 hrs)

Centre of mass – finding mass centre – a hanging body in equilibrium – stability of equilibrium – stability using differentiation
Chapter 6 - Section 6.1 to 6.3 , Chapter 7 - Section 7.1, 7.2

UNIT I (12 hrs)

Virtual work – hanging strings- equilibrium of a uniform homogeneous string –
suspension bridge Chapter 8 - Section 8.1, Chapter 9 - Section 9.1, 9.2(12 hrs)

Contents and treatment as in **"Mechanics** – P. Duraipandian , Laxmi Duraipandian ,

Muthamizh Jayapragasham, S. Chand and Co limited 2008 .

Reference Books:

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

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

SEMESTER - V

CORE THEORY– 9: ALGEBRAIC STRUCTURES

SUBJECT CODE: 19UMAT309	THEORY	MARKS: 100
SEMESTER - V	CREDITS: 4	TOTAL HOURS: 90

Objectives:
To provide fundamentals of Mechanical systems that are rudiments for the theory of relativity.

UNIT I   **(18 hrs)**

Introduction to groups. Subgroups, cyclic groups and properties of cyclic groups;
Lagrange's Theorem; A counting principle
Chapter 2 Section 2.4 and 2.5

UNIT II   **(18 hrs)**

Normal subgroups and Quotient group; Homomorphism; Automorphism.
Chapter 2 Section 2.6 to 2.8

UNIT III   **(18 hrs)**

Cayley˝s Theorem; Permutation groups.
Chapter 2 Section 2.9 and 2.10

UNIT I   **(18 hrs)**

Definition and examples of ring- Some special classes of rings; homomorphism of rings;
Ideals and quotient rings; More ideals and quotient rings.
Chapter 3 Section 3.1 to 3..5

UNIT I   **(18 hrs)**

The field of quotients of an integral domain; Euclidean Rings; The particular Euclidean ring.
Section 3.6 to 3.8

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

Reference Books:-

1. Modern Algebra by M.L.Santiago

2. Modern Algebra by S. Arumugam and others, New Gamma publishing House, Palayamkottai.

3. Modern Algebra by Visvanathan Nayak.

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions Theory	No. of Questions Problems
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

CORE THEORY– 10: REAL ANALYSIS I

SUBJECT CODE: 19UMAT310	THEORY	MARKS: 100
SEMESTER - V	CREDITS: 4	TOTAL HOURS: 90

Objectives:
To introduce the fundamentals concepts of Mathematical analysis and to develop the mathematical concepts in advanced level.

UNIT I   **(18 hrs)**

Sets and elements; Operations on sets; functions; real valued functions; equivalence; countability ; real numbers; least upper bounds.
Chapter 1 Section 1. 1 to 1.7

UNIT II   **(18 hrs)**

Definition of a sequence and subsequence; limit of a sequence; convergent sequences; divergent sequences; bounded sequences; monotone sequences;
Chapter 2 Section 2.1 to 2.6

UNIT III   **(18 hrs)**
Operations on convergent sequences; operations on divergent sequences; limit superior and limit inferior; Cauchy sequences.
Chapter 2 Section 2.7 to 2.10

UNIT IV   **(18 hrs)**
Convergence and divergence; series with non-negative numbers; alternating series; conditional convergence and absolute convergence; tests for absolute convergence; series whose terms form a non-increasing sequence; the class l^2
Chapter 3 Section 3.1 to 3.4, 3.6, 3.7 and 3.10

UNIT V   **(18 hrs)**
Limit of a function on a real line;. Metric spaces; Limits in metric spaces.Function continuous at a point on the real line, reformulation, Function continuous on a metric space.
Chapter 4 Section 4.1 to 4.3 Chapter 5 Section 5.1-5.3

Contents and Treatment as in "**Methods of Real Analysis**" : Richard R. Goldberg (Oxford and IBHPublishing Co.)

Reference Books :-

1. Principles of Mathematical Analysis by Walter Rudin

2. Mathematical Analysis Tom M Apostol.

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

CORE THEORY– 11: DYNAMICS

SUBJECT CODE: 19UMAT311	THEORY	MARKS: 100
SEMESTER - V	CREDITS: 4	TOTAL HOURS: 90

Objectives:

To provide cogent knowledge on the basic principles and applications of varied dynamical systems in real life

UNIT I   **(18 hrs)**
Basic units – velocity – acceleration- coplanar motion – rectilinear motion under constant forces – acceleration and retardation – thrust on a plane – motion along a vertical line under gravity – line of quickest descent - motion along an inclined plane – motion of connected particles.
Chapter 1 - Section 1.1 to 1.4, Chapter 10 - Section 10.1 to 10.6

UNIT II   **(18 hrs)**
Work, Energy and power – work – conservative field of force – power – Rectilinear motion under varying Force simple harmonic motion (S.H.M.) – S.H.M. along a horizontal line- S.H.M. along a vertical line – motion under gravity in a resisting medium.
Chapter 11 - Section 11.1to 11.3 , Chapter 12 - Section 12.1 to 12.4

UNIT III   **(18 hrs)**
Forces on a projectile- projectile projected on an inclined plane- Enveloping parabola or bounding parabola – impact – impulse force - impact of sphere - impact of two smooth spheres – impact of a smooth sphere on a plane – oblique impact of two smooth spheres
Chapter 13 - Section 13.1 to 13.3, Chapter 14 - Section 14.1, 14.5

UNIT IV   **(18 hrs)**
Circular motion – Conical pendulum – motion of a cyclist on a circular path – circular motion on a vertical plane – relative rest in a revolving cone – simple pendulum – central orbits -general orbits - central orbits- conic as centered orbit.
Chapter 15 - Section 15.1 to 15.6, Chapter 16 - Section 16.1 to 16.3

UNIT V   **(18 hrs)**
Moment of inertia. Two dimensional motion of a rigid body –equations of motion for two dimensional motion – theory of dimensions- definition of dimensions.(18 hrs)
Chapter 17 -Section 17.1, Chapter 18 - Section 18.1, 18.2, Chapter 19 - Section 19.

Contents and treatment as in **"Mechanics""** – P. Duraipandian , Laxmi Duraipandian , Muthamizh Jayapragasham, S. Chand and Co limited 2008 .

Reference Books:

1. Dynamics – K. Viswanatha Naik and M. S. Kasi, Emerald Publishers.

2. Dynamics – A. V. Dharmapadam, S. Viswanathan Publishers.

3. Mechanics – Walter Grenier

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions Theory	Problems
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

CORE THEORY– 12: DISCRETE MATHEMATICS

SUBJECT CODE: 16UMATC12	THEORY	MARKS: 100
SEMESTER - V	CREDITS: 4	TOTAL HOURS: 90

Objectives:
To understand logical and Mathematical reasoning and to enumerate objects in a systematic way, This course aims to develop mathematical maturity and ability to deal with abstraction and develop contraction and verification of formal logical manipulation.

UNIT I (18 hrs)
Set, some basic properties of integers, Mathematical induction, divisibility of integers, representation of positive integers
Chapter 1 - Sections 1.1 to 1.5

UNIT II (18 hrs)
Boolean algebra, two element Boolean algebra, Disjunctive normal form, Conjunctive normal form Chapter 5 - Sections 5.1 to 5.4

UNIT III (18 hrs)
Application, Simplication of circuits, Designing of switching circuits, Logical Gates and Combinatorial circuits.
Chapter 5 - Section 5.5, 5.6

UNIT IV (18 hrs)
Sequence and recurrence relation, Solving recurrence relations by iteration method, Modeling of counting problems by recurrence relations, Linear (difference equations) recurrence relations with constant coefficients, Generating functions, Sum and product of two generating functions, Useful generating functions, Combinatorial problems.
Chapter 6 - Section 6.1 to 6.6

UNIT VI (18 hrs)
Introduction, Walk, Path and cycles, Euler circuit
Chapter 7 - Sections 7.1 to 7.3

Contents and treatment as in introduction to **Discrete Mathematics**,

2nd edition, 2002 by M. K. Sen and B. C. Chakraborty, Books and

Allied Private Ltd., Kolkata.

Reference Books:

1. Discrete mathematics for computer scientists and mathematicians by J. L. Mertt, Abraham Kendel and T. P. Baker prentice-hall, India.

2. Discrete mathematics for computer scientists by John Truss-Addison Wesley.

3. Elements of Discrete Mathematics, C. L. Liu, New York Mcgraw-Hill, 1977.

4. Discrete Mathematics by D.Somasundaram.

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answer any 10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

ELECTIVE – I: PROGRAMMING LANGUAGE 'C' WITH   PRACTICALS

SUBJECT CODE: 16UMATE01	THEORY	MARKS: 100
SEMESTER - V	CREDITS: 4	TOTAL HOURS: 90

Objectives:
The main objective of this course is to learn how to write C-programs and used to develop the technological concepts.

UNIT I   **(12 hrs)**
Introduction. Constants-Variables-Data-types (Fundamental and user defined) Operators-Precedence of operators – Library functions –Input ,Output statements-Escape sequences-Formatted outputs – Storage classes -Compiler directives.
Chapter 2 Sections 2.1 - 2.8 , Chapter 3 Sections 3.1 – 3.7, 3.12 ,Chapter 4 Sections 4.2 – 4.5

UNIT II   **(12 hrs)**
Decision making and branching: Simple if, if e

lse, nested if, else if ladder and switch statement –conditional operator – go to statement.

Decision making and looping : while, do while and for statement – nested for loops – continue and break statements.
Chapter 5 Sections 5.1 – 5.9 ,Chapter 6 Sections 6.1 – 6.5

UNIT III   **(12 hrs)**
Arrays : One dimensional and 2 dimensional arrays – declarations – initialization of arrays– Operation on strings-String handling functions.
Chapter 7 Sections 7.1 – 7.4 ,Chapter 8 Sections 8.1 – 8.8

UNIT IV   **(12 hrs)**
Functions : Function definition and declaration – Categories of functions – recursion – Concept of pointers. Function call by reference - call by value.
Chapter 9 Sections 9.1 – 9.13
Chapter 11 Sections11.1-11.5

UNIT V   **(12 hrs)**
Files : Definition, operations on files- file operation functions.
Chapter 12, Sections 12.1 – 12.

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

Reference Books:
1. Venugopal, programming in C

2. Gottfied, B.S : programming with C , Schaum"s outline series, TMH 2001

3. Yashvant Kanitkar, Let us „C" BPB Publications

PRACTICALS (30 hrs)

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

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answer any 10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

SEMESTER - VI

CORE THEORY- 13: LINEAR ALGEBRA

SUBJECT CODE: 19UMAT313	THEORY	MARKS: 100
SEMESTER - VI	CREDITS: 4	TOTAL HOURS: 90

Objectives:
To strengthen the knowledge on vector spaces and linear transformations.

UNIT I (18 hrs)
Vector spaces. Elementary basic concepts; linear independence and bases
Chapter 4 Section 4.1 and 4.2

UNIT II (18 hrs)
Dual spaces
Chapter 4 Section 4.3

UNIT III (18 hrs)
Inner product spaces.
Chapter 4 Section 4.4

UNIT IV (18 hrs)
Algebra of linear transformations; characteristic roots.
Chapter 6 Section 6.1 and 6.2

UNIT V (18 hrs)
Matrices; canonical forms; triangular forms.
Chapter 6 Section 6.3 and 6.4

Treatment and content as in **"Topics in Algebra"** – I. N. Herstein-Wiley Eastern Ltd.

Reference Books:
1. University Algebra – N. S. Gopalakrishnan – New Age International Publications, Wiley Eastern Ltd.
2. First course in Algebra – John B. Fraleigh, Addison Wesley.
3. Text Book of Algebra – R. Balakrishna and N. Ramabadran, Vikas publishing Co.

Algebra – S. Arumugam, New Gamma publishing house, Palayamkottai

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

CORE THEORY- 14: REAL ANALYSIS II

SUBJECT CODE: 19UMAT314	THEORY	MARKS: 100
SEMESTER - VI	CREDITS: 4	TOTAL HOURS: 90

Objectives:
To analyse the mathematical concepts and also to develop the mathematical concepts in advanced level.

UNIT I (18 hrs)
Open sets; closed sets; Discontinuous function on R^1. More about open sets; Connected sets : Chapter 5 Section 5.4 to 5.6
Chapter 6 Section 6.1 and 6.2

UNIT II (18 hrs)
Bounded sets and totally bounded sets: Complete metric spaces; compact metric spaces, continuous functions on a compact metric space, continuity of inverse functions, uniform continuity.
Chapter 6 Section 6.3 to 6.8

UNIT III (18 hrs)
Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral; properties of Riemann integral.
Chapter 7 Section 7.1 to 7.4

UNIT IV (18 hrs)
Derivatives; Rolle‟s theorem, Law of mean, Fundamental theorems of calculus.
Chapter 7 Section 7.5 to 7.8

UNIT V (18 hrs)
Taylor‟s theorem; Pointwise convergence of sequences of functions, uniform convergence of sequences of functions.
Chapter 8 Section 8.5 Chapter 9 Section 9.1 and 9.2

Content and Treatment as in **"Methods of Real Analysis"-** Richard R. Goldberg (Oxford and IBH Publishing Co)

Reference Books:

1. Principles of Mathematical Analysis by Walter Rudin

2. Mathematical Analysis Tom M Apostal

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions Theory	No. of Questions Problems
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

CORE THEORY- 15: COMPLEX ANALYSIS

SUBJECT CODE: 19UMAT315	THEORY	MARKS: 100
SEMESTER - VI	CREDITS: 4	TOTAL HOURS: 90

Objectives:
To enable students to build a strong intuition and support it with appropriate justification in analysing complex numbers, operations, sequences/ functions

UNIT I   **(18 hrs)**
Functions of a complex variable - mappings, limits - theorems on limits, continuity ,derivatives, differentiation formulae - Cauchy-Riemann equations - sufficient conditions for differentiability-Cauchy-Riemann equations in polar form - Analytic functions - Harmonic functions.
Chapter 2 Section 2.9 to 2.12, 2.14 to 2.20 and 2.22

UNIT II   **(18 hrs)**
Linear functions - The transformation w = 1/z - linear fractional transformations - an implicit form - exponential and logarithmic transformations – transformation w = sin z - Preservation of angles.
Chapter 8 Section 8.68 to 8.71 and 8.73, 8.74 Chapter 9 : 9.79

UNIT III   **(18 hrs)**
Complex Valued functions- contours - contour integrals - Anti derivatives - Cauchy-Goursat theorem. Cauchy integral formula - derivatives of analytic function - Liouvillie"s theorem and fundamental theorem of algebra -maximum moduli of functions.
Chapter 4 Section 4.30 to 4.42

UNIT IV   **(18 hrs)**
sequences and series – Taylor's series -Laurent's series - zeros of analytic functions. Chapter 5 Section 5.43 to 5.47

UNIT V   **(18 hrs)**
Residues - Residue theorems- Three types of isolated singular points- Residues at poles- Zeros and poles of order 'm' - Evaluation of improper integrals – Improper integrals involving sines and cosines - Definite integrals involving sines and cosines – Argument principle and Rouche"s theorem.
Chapter 6 Section 6.53 to 6.57 and Chapter 7 Section 7.60 to 7.65.

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

Reference Books:

1. Theory and problems of Complex Variables – Murray R.Spiegel, Schaum outline series

2. Complex Analysis – P.Duraipandian

3. Introduction to Complex Analysis S. Ponnuswamy , Narosa Publishers 1993

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

ELECTIVE- II: OPERATIONS RESEARCH

SUBJECT CODE: 19UMATE01	THEORY	MARKS: 100
SEMESTER - V	CREDITS: 5	TOTAL HOURS: 90

Objectives:

The central objective of operations research is optimization. To impart knowledge on formulating mathematical models for quantitative analysis of managerial problems in industry, understand and analyze managerial problems in industry so that they are able to use resources.

UNIT II (18 hrs)

Linear programming: Formulation – graphical solution. Simplex method. Big-M method. Duality-primal-dual relation.
Chapter 6 Sections 6.1 – 6.13, 6.20 – 6.31

UNIT II (18 hrs)

Transportation problem: Mathematical Formulation. Basic Feasible solution. North West Corner rule, Least Cost Method, Vogel's approximation. Optimal Solution. Unbalanced Transportation Problems. Degeneracy in Transportation problems.

Assignment problem: Mathematical Formulation. Comparison with Transportation Model. Hungarian Method. Unbalanced Assignment problems
Chapter 9 Sections 9.1 – 9.12, Chapter 8 Sections 8.1 – 8.5

UNIT III (18 hrs)

Sequencing problem: n jobs on 2 machines – n jobs on 3 machines – two jobs on m machines – n jobs on m machines.

Game theory : Two-person Zero-sum game with saddle point – without saddle point – dominance – solving 2 x n or m x 2 game by graphical method.
Chapter 10 Sections 10.1 – 10.6, Chapter 12 Sections 12.1 – 12.15

UNIT IV (18 hrs)

Queuing theory: Basic concepts. Steady state analysis of M / M / 1 and M / M / S models with finite and infinite capacities.
Chapter 5 Sections 5.1 – 5.18

UNIT V (18 hrs)

Network: : Project Network diagram – CPM and PERT computations. (Crashing excluded)
Chapter 13 Sections 13.1 – 13.10.

Content and treatment as in
Operations Research, by R.K.Gupta , Krishna Prakashan India (p),Meerut Publications

Reference Books:

1. Gauss S.I. Linear programming , McGraw-Hill Book Company.

2. .Gupta P.K. and Hira D.S., Problems in Operations Research,Chand& Co.

3. Kanti Swaroop, Gupta P.K and Manmohan, Problems in Operations Research,Sultan Chand &

Sons.

4. Ravindran A., Phillips D.T. and Solberg J.J., Operations Research, John Wiley& Sons.

5. Taha H.A. Operation Research, Macmillan pub. Company, New York.

6. Linear Programming, Transpiration, Assignment Game by Dr.Paria, Books and Allied (p) Ltd.,1999.

7. V.Sundaresan,K.S. Ganapathy Subramaian and K.Ganesan,Resource Management Techniques..A.R Publications.

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

ELECTIVE – III: GRAPH THEORY

SUBJECT CODE: 19UMATE02	THEORY	MARKS: 100
SEMESTER - VI	CREDITS: 5	TOTAL HOURS: 90

Objectives:

To translate real life situations to diagrammatic representations to develop problem solving skills and solve real life problems.

UNIT I   **(18 hrs)**

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

UNIT II   **(18 hrs)**

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

UNIT III   **(18 hrs)**

Eulerian and Hamiltonian graphs
Chapter 5 Sections 5.0 – 5.2

UNIT IV   **(18 hrs)**

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

UNIT V   **(18 hrs)**

Digraphs and matrices, tournaments, some application connector problem
Chapter 10 Sections 10.0 – 10.4 ,Chapter 11 Sections 11.0 – 11.1

Content and treatment as in

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

 Reference Books

1. A first book at graph theory by John Clark and Derek Allan Holton, Allied publishers

2. Graph Theory by S.Kumaravelu and Susheela Kumaravelu,Publishers authors C/o

182 Chidambara Nagar, Nagarkoil

Question paper pattern:

Section	Question Component	Numbers	Marks	Total
Section A	**Definition/Principles** Answerany10 out of 12 questions	1 – 12	2	**20**
Section B	**Short Answer** Answer any 5 out of 7 questions	13 – 19	8	**40**
Section C	**Essay Answer** Answer any 2 out of 5 questions	20 – 24	20	**40**
TOTAL MARKS				**100**

Distribution of Questions:

Sections	Units	No. of Questions	
		Theory	**Problems**
Section A	Unit– 1	2	
	Unit– 2	2	
	Unit– 3	2	
	Unit– 4	2	
	Unit– 5	2	
	Any Unit	2	
Section B	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

ALLIED MATHEMATICS

(For B.Sc., Physics & Chemistry)

ALLIED MATHEMATICS - I
(For Physics & Chemistry Students)

SUBJECT CODE: 19UMAT331	THEORY	MARKS: 100
SEMESTER - I	CREDITS: 5	TOTAL HOURS: 90

UNIT I   (15 hrs)
Algebra: Partial Fractions, binomial, exponential and logarithmic series(without proof) summation and approximation-Simple Problems.

UNIT II   (15 hrs)
Theory of Equations: Polynomial equations with real coefficients, irrational roots, complex roots, transformation of equation by increasing or decreasing roots by a constant, reciprocal equations. Newton's method to find a root approximately- Horner's method-simple problems.

UNIT III   (15 hrs)
Matrices: Symmetric, Skew-Symmetric, Hermitian, Skew-Hermitian matrices, Orthogonal and Unitary Matrices. Characteristic roots and characteristic vectors-Cayley- Hamilton theorem(statement only) verification, to find the inverse using the above theorem, Diagonalization of a matrix.

UNIT IV   (15 hrs)
Finite Differences: Operator E, difference tables, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae.
Trigonometry: Expansions of $sinn\theta, cosn\theta, tann\theta$. Expansions of $sin^n\theta$, $cos^n\theta$, $tan^n\theta$. Hyperbolic and inverse hyperbolic function.

UNIT V   (30 hrs)
Differential Calculus: n^{th} derivatives, Leibnitz theorem (without proof) and applications, Jacobians. Curvature and radius of curvature in Cartesian coordinates, maxima and minima of functions of two variables, Lagrange's Multipliers-Simple Problems.

Contents and treatment as in **"Ancillary Mathematics:** S.Narayanan and T.K.Manickavasagam pillai (Viswanathan Printers)"

Reference books:

1. Allied Mathematics Volume I&II: P.Kandasamy and K.Thilagavathi (S.Chand and Co.)

2. Ancillary Mathematics Volume I&II: P.Balasubramanian & K.G.Subramanian.

3. Allied Mathematics: P.R.Vittal (Margham Publications)

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	Any Unit	2	
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	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	
	Any Unit	2	
Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	

ALLIED MATHEMATICS - II
(For Physics & Chemistry Students)

SUBJECT CODE: 19UMAT332	THEORY	MARKS: 100
SEMESTER - II	CREDITS: 5	TOTAL HOURS: 90

UNIT I (15 hrs)

Integral Calculus: Integration of irrational, trigonometric functions, Bernoulli's formula integration by parts, reduction formulae, properties of definite integral and simple problems, Evaluation of double, triple integrals, Fourier series for functions in $(0, 2\pi), (-\pi, \pi)$.

UNIT II (15 hrs)

Ordinary Differential Equations: First order and higher degree equations solvable for p, y, x. Second order linear differential equations with constant coefficients $ay'' + by' + cy = F(x)$ where $F(x) = e^{ax}x^m, e^{ax}sinmx, e^{ax}cosmx$.

UNIT III (30 hrs)

Partial Differential Equations: Formation, complete integrals and general integrals, four standard types of Lagrange's equations.

UNIT IV (15 hrs)

Laplace Transforms: Laplace transformations of standard functions and simple properties, inverse Laplace transforms, Solving Differential equations of second order with constant coefficients using Laplace transform.

UNIT V (15 hrs)

Vector Analysis: Scalar point functions, Vector point functions, gradient, divergence, curl, directional derivatives, normal to a surface. Line and surface integrals, Gauss, Stoke's and Green's theorems (without proof)-Simple Problems.

Contents and treatment as in "**Ancillary Mathematics**: S.Narayanan and T.K.Manickavasagam pillai (Viswanathan Printers)"

Reference books:

1. Allied Mathematics Volume I&II: P.Kandasamy and K.Thilagavathi (S.Chand and Co.)

2. Ancillary Mathematics Volume I&II: P.Balasubramanian & K.G.Subramanian.

3. Allied Mathematics: P.R.Vittal (Margham Publications)

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Section C	Unit– 1	1	
	Unit– 2	1	
	Unit– 3	1	
	Unit– 4	1	
	Unit– 5	1	