DEPARTMENT PROFILE:

The Department of Mathematics was established in the year 1975 with under graduate programme and upgraded as PG Department in the year 1986. The Department consists of 10 teaching staff. The Department has been producing exemplary results and university rank holders right from its inception. The Department is constantly concentrating on the overall development of students. So far forty-three batches of UG students and thirty-three batches of PG students have successfully finished their courses and professionally placed as Auditors, Income tax officers, Assistant commissioner of police, Lawyers, Project leaders, HR in various MNC. Many students have joined in prestigious institutions like M.I.T., I.I.T., C.M.I., M.K.U., Sourashtra College, etc., for their higher studies and have been well placed in various fieldS in India and abroad. The Department library consists of approximately 1500 books which is useful for lending purpose to students and staff. Department is equipped with 2 computers and one printer. We have well-furnished classrooms and a separate room with LCD Projector for conducting seminars. The Department motivates the students to take part in all the job oriented competitive examinations like UPSC., SSC., TNPSC., RRB., NET, SLET, Bank exams etc., The Department has separate library (Donors book bank) with more than 200 books related to job oriented competitive examinations donated by the Staff members of the Department and Alumni. The Department is providing RO water to all students which is sponsored by our Alumni.

VISION:

Aims to create an erudite, disciplined and well-rounded mathematician by imparting high quality subject knowledge and life values to excel both academically and professionally.

MISSION:

- To guide, teach mathematical knowledge and support the students towards mathematical excellence by embracing them into our group of mathematicians, share our ideas, grow in knowledge and thus improving their capabilities and apply all learned concepts to excel in all fields.
- To develop quantitative, computational, reasoning, problem solving skills and critical thinking for the upcoming mathematicians to model, formulate and solve real life applications.
- To encourage the students with strong foundational skills and abilities to pursue higher studies and research.

Signature of the Chairman/HOD

Passed in the BOS Meeting held on 18-03-2020

PROGRAMME OUTCOMES (POS)

Postgraduate M.Sc. Mathematics is a 2-year degree programme with 4 semesters consisting of the following Programme Outcomes (POs). The students will be able to

PO 1	apply knowledge of mathematics to become competent professionals.
PO 2	identify and solve complex scientific problems using mathematical skills
PO 3	apply the mathematical concepts for the analysis and interpretational data
PO 4	enhance and adopt skills required for higher order employment or jobs through activities such as seminars, workshops and conferences.
PO 5	select, design and apply appropriate computational techniques to solve and models physical problems.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of M.Sc. Mathematics Programme, the students are expected to

PSO1	understand the mathematical concepts and applications in various fields.
PSO2	handle the advanced techniques in various fields to solve variety of problems related to real life problems.
PSO3	have necessary skills and expertise in the field of research and developments through seminars and dissertation.
PSO4	learn abstract algebraic structures and topological structures.
PSO5	learn methods of finding optimal solutions of physical and industrial problems.

DISTRIBUTION OF CREDITS

PART	SEMESTER	COURSES	NUMBER OF COURSES	HOURS	CREDITS	TOTAL CREDITS
I	I-II	CORE	8	6	4	32
I	III-IV	CORE	8	6	5	40
II	I-II	ELECTIVE	2	6	4	8
II	IV	ELECTIVE	1	6	5	5
III	III	NON MAJOR ELECTIVE (NME)	1	6	5	5
TOTAL CREDITS						90

Passed in the BOS Meeting held on 18-03-2020

M.Sc. MATHEMATICS - COURSE STRUCTURE

I SEMESTER

S.No.	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	21PMSC11	Groups and Rings	6	3	25	75	100	4
2	21PMSC12	Mathematical Analysis I	6	3	25	75	100	4
3	21PMSC13	Graph theory	6	3	25	75	100	4
4	21PMSC14	Topology	6	3	25	75	100	4
5	21PMSE11	Elective – 1 Discrete Mathematics	6	3	25	75	100	4
6	21PMSE12	Elective -2 Differential Geometry	6	3	25	75	100	4
TOTAL			30					20

II SEMESTER

S.No.	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	21PMSC21	Linear Algebra	6	3	25	75	100	4
2	21PMSC22	Real Analysis	6	3	25	75	100	4
3	21PMSC23	Differential Equations	6	3	25	75	100	4
4	21PMSC24	Numerical Analysis	6	3	25	75	100	4
5	21PMSE21	Elective – 3: Classical Mechanics	6	3	25	75	100	4
6	21PMSE22	Elective – 4 : Fuzzy sets and Logics	6	3	25	75	100	4
7	21PMSE23	Elective – 5 : Visual Basic Theory	4	3	25	75	100	3
8	21PMSEP1	Elective – 6 : Visual Basic Practical	2	3	40	60	100	1
TOTAL			30					20

Passed in the BOS Meeting held on 18-03-2020

III SEMESTER

S.No	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1		Algebra III	6	3	25	75	100	5
2		Analysis III	6	3	25	75	100	5
3		Functional Analysis I	6	3	25	75	100	5
4		Statistics I	6	3	25	75	100	5
5		NME – Business Statistics	6	3	40	60	100	5
6		NME -Mathematics for Competitive Examinations	6	3	25	75	100	5
TOTAL			30					25

IV SEMESTER

S.No	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1		Complex analysis	6	3	25	75	100	5
2		Number theory	6	3	25	75	100	5
3		Operations Research	6	3	25	75	100	5
4		Statistics II	6	3	25	75	100	5
5		Elective-7: Advanced topology	6	3	40	60	100	5
6		Elective -8: Functional Analysis II	6	3	25	75	100	5
TOTAL			30					25

I SEMESTER

S.No	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	21PMSC11	Groups and Rings	6	3	25	75	100	4
2	21PMSC12	Mathematical Analysis I	6	3	25	75	100	4
3	21PMSC13	Graph theory	6	3	25	75	100	4
4	21PMSC14	Topology	6	3	25	75	100	4
5	21PMSE11	Elective – 1 Discrete Mathematics	6	3	25	75	100	4
6	21PMSE12	Elective -2 Differential Geometry	6	3	25	75	100	4
TOTAL			30					20

CORE 1	GROUPS AND RINGS	SUBJECT CODE: 21PMSC11
SEMESTER - I	6 HOURS/WEEK	CREDITS:4

OBJECTIVES:

Groups and Rings is a very important branch of Mathematics. The objective is to introduce the concepts and to develop working knowledge on Groups, Normal Subgroups, Automorphism groups, Finite groups and Rings.

COURSE OUTCOMES(COs):

After completing this course, the student will be able to:

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	understand the concepts counting principle and Sylow's theorem	K1
CO2	analyze finite Abelian groups	K2,K3
CO3	explain rings and its applications	K1,K2,K3
CO4	provide information about Euclidean rings	K2,K3
CO5	concentrate on Polynomial rings	K2,K3

K1- KNOWLEDGE (REMEMBERING), K2-UNDERSTANDING, K3-APPLICATION

GROUPS AND RINGS

UNIT – I

Another Counting Principle, Sylow's Theorem (Sections 2.11, 2.12)

UNIT – II

Direct Products, Finite Abelian Groups (Sections 2.13, 2.14)

UNIT – III

Ideals and Quotient Rings, More Ideals and Quotient Rings, The Field of Quotients of an Integral Domain (Sections 3.4, 3.5, 3.6)

UNIT – IV

Euclidean Rings, A particular Euclidean Rings, (Sections 3.7, 3.8)

UNIT – V

Polynomials over Commutative Rings (sec 3.11)

TEXT BOOK:

Topics in Algebra by I.N. Herstein, Second Edition, John Wiley and Sons, 1999

TEXTBOOK :

Chapter 2 (Sections 2.11, 2.12, 2.13, 2.4)
Chapter 3 (Sections 3.4, 3.5, 3.6, 3.7, 3.8 and 3.11)

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	S				
CO2		M			
CO3			M		
CO4				S	
CO5					S

S- Strong, M-Medium, L-Low

Passed in the BOS Meeting held on 18-03-2020

CORE 2	MATHEMATICALANALYSIS – I	SUBJECT CODE : 21PMSC12
SEMESTER - I	6 HOURS / WEEK	CREDITS : 4

COURCE OBJECTIVES:

This course is designed to explain various concepts used to learn Analysis.

OBJECTIVES:

- To discuss main concepts of Analysis
- To recall the facts about numerical sequences and series
- To explain tests used to test series.
- To define the basic terms of limits of function and describe connectedness.
- To discuss differentiation

COURSE OUTCOMES(COs):

After completing this course, the student will be able to:

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	prove theorems using relevant definitions	K1, K2
CO2	describe the concepts of convergent, Cauchy sequence and provide the proof of numbers	K2, K3
CO3	compare and identify suitable test to test series.	K2, K3
CO4	apply connectedness concepts to prove theorems.	K1, K2
CO5	prove theorem based on the Derivative of Real Function.	K2, K3

K1- KNOWLEDGE (REMEMBERING), K2-UNDERSTANDING, K3-APPLICATION

REVIEW: Finite, countable, uncountable sets and Metric spaces
(NOT FOR EXAMINATION)

MATHEMATICAL ANALYSIS – I

UNIT - I
Compact sets – Perfect sets – Connected sets

UNIT - II
Convergent sequences – Sub Sequences – Cauchy sequences – Upper and lower limits Some special sequences – Series of Non negative terms – The Numbers

UNIT - III
The Root and Ratio test – Power series – Summation by parts – Absolute Convergence – Addition and Multiplication of series – Rearrangements

UNIT - IV
Limits of Function – Continuous Function – Continuity and Connectedness – Monotonic Function – Infinite Limits – Limits at Infinity

UNIT - V
The Derivative of Real Function – Mean value theorem – The Continuity derivatives – Hospital's Rule – Derivatives of Higher Order – Taylor's theorem – Differentiation of Vector Valued Function

TEXT BOOK:
PRINCIPLES OF MATHEMATICAL ANALYSIS by WALTER RUDIN.
Third Edition, 1976.

UNIT I	(Sec 2.31 – 2.47)
UNIT II	(Sec 3.1 – 3.32)
UNIT III	(Sec 3.33 –3.55)
UNIT IV	(Sec 4.1 – 4.34)
UNIT V	(Sec 5.1 – 5.19)

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	S				
CO2			S		
CO3		M			
CO4				S	
CO5					S

S- Strong, M-Medium, L-Low

Passed in the BOS Meeting held on 18-03-2020

CORE 3	GRAPH THEORY	SUBJECT CODE : 21PMSC13
SEMESTER - I	6 HOURS / WEEK	CREDITS : 4

COURCE OBJECTIVES:

This course is designed to explain various concepts in Graph Theory.

OBJECTIVES:

- To discuss main concepts of Graph Theory
- To discuss about trees, cut edges, bonds and Cayley's formula.
- To explain Euler tours, Hamiltonian cycles.
- To define Matchings and coverings.
- To discuss Chromatic number and Vizing theorem

COURSE OUTCOMES(COs):

After completing this course, the student will be able to:

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	solve shortest path problems	K1, K2
CO2	describe the concepts of trees, cut vertices and blocks	K2, K3
CO3	solve theorems in Eulerian and Hamiltonian graphs.	K3
CO4	identify matchings and coverings	K1, K2
CO5	find the chromatic number of a graph.	K2, K3

K1- KNOWLEDGE (REMEMBERING), K2-UNDERSTANDING, K3-APPLICATION

GRAPH THEORY

(All units are from the text-book)

UNIT – I

Graphs and simple graphs, Graph isomorphism, The incidence and adjacency matrices, Sub graphs, Vertex degrees, Paths and connection, cycles, The shortest path problem, Sperner's lemma

UNIT – II

Trees, Cut edges and Bonds, Cut vertices, Cayley's formula, the connector problem, Connectivity, Blocks, Construction of Reliable communications Network.

UNIT – III

Euler tours, Hamiltonian cycles, The Chinese postman problem, the traveling salesman problem

UNIT – IV

Matchings, Matchings and coverings in Bipartite graphs, Perfect matching, The personnel assignment problem

UNIT – V

Edge Chromatic number, Vizing's theorem

TEXT BOOK:

Graph Theory with Applications, J.A. Bondy and U.S.R. Murty
Chapters: 1, 2, 3, 4, 5 and 6

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	M				
CO2		S			
CO3			M		
CO4				S	
CO5					S

S- Strong, M-Medium, L-Low

CORE 4	TOPOLOGY	SUBJECT CODE: 21PMSC14
SEMESTER - I	6 HOURS / WEEK	CREDITS : 4

COURSE OBJECTIVES:

- To enable the students to acquire the knowledge of topology.
- To understand the concepts of various topologies and its applications.

OBJECTIVES:

- To define various topological on the spaces.
- To explain continuous functions, product topology and metric topology.
- To discuss the connected spaces and compact spaces and theorems.
- To give the definition of various axioms and theorems.
- To say about the normal spaces and Urysohn theorem.

COURSE OUTCOMES(COs):

After completing this course, the student will be able to:

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	identify the category of various topology on the given spaces.	K1,K2
CO2	describe the continuous function and product topology concepts.	K2, K3
CO3	find the given spaces are connected or not and also to identify the compact spaces.	K2
CO4	prove theorems based on countability axioms and separation axiom.	K2, K3
CO5	explain the normal spaces concepts and to prove the Urysohn's metrization theorem and lemma.	K2, K3

K1- KNOWLEDGE (REMEMBERING), K2-UNDERSTANDING, K3-APPLICATION

TOPOLOGY

UNIT – I

Topological spaces – basis for a topology – the order topology – the product topology on XxY – the subspace topology – closed sets and limit points.

UNIT - II

Continuous functions – the product topology – the metric topology.

UNIT - III

Connected spaces – connected subspaces of the real line – Compact spaces – compact subspaces of the real line.

UNIT - IV

The count ability axioms – the separation axioms.

UNIT - V

Normal spaces, the Urysohn lemma, the Urysohn's Metrization Theorem.

TEXT BOOK:

Topology (Second edition) by James R Munkress, Prentice – Hall pf India Pvt Ltd, New Delhi.

UNIT I	Chap 2 (sec 12 to 17)
UNIT II	Chap 2(Sec 18,19 and 20)
UNIT III	Chap 3 (Sec 23,24,26 and 27)
UNIT IV	Chap 4 (Sec 30,31)
UNIT V	Chap 4 (Sec 32,33 and 34)

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	S				
CO2		M			
CO3			S		
CO4				S	
CO5					M

S- Strong, M-Medium, L-Low

Passed in the BOS Meeting held on 18-03-2020

ELECTIVE 1	DIFFERENTIAL GEOMETRY	SUBJECT CODE: 21PMSE11
SEMESTER - I	6 HOURS / WEEK	CREDITS : 4

COURSE OBJECTIVES:

To enable the students to acquire the knowledge of differential geometry.To understand the concepts of radius of curvature, geodesics curvature and its properties.

OBJECTIVES :

- To define space curves, tangent, normal, curvature and torsion, involutes and evolutes.
- To explain the intrinsic properties and theorems and surfaces of revolution.
- To discuss the isometric correspondence and properties of geodesics.
- To define the geodesics curvature and Gauss-bonnet theorem.
- To discuss various curvatures and developable curves.

COURSE OUTCOMES(COs):

After completing this course, the student will be able to:

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	define tangent, normal, torsion and involutes and evolutes of the space curves..	K1, K2
CO2	describe the intrinsic properties and surfaces of revolution.	K1, L3
CO3	explain the geodesics concepts of the curve and their properties.	K1, K2
CO4	prove the theorems based on geodesics curvature and Gauss-Bonnet theorem by using higher concepts.	K1, K3
CO5	identify the developable curves associated with space curves and surfaces.	K2

K1- KNOWLEDGE (REMEMBERING), K2-UNDERSTANDING, K3-APPLICATION

DIFFERENTIAL GEOMETRY

UNIT - I
Introductory remarks about space curves-definitions –arc length-tangent, normal and binormal - curvature and torsion of a curve given as the intersection of two surfaces-contact between curves and surfaces – tangent surfaces, involutes and evolutes.

UNIT - II
Intrinsic equations, fundamental existence theorem for space curves-helices. Definition of a surface, surfaces of revolution, helicoids.

UNIT - III
Metric direction coefficients, families of curves isometric correspondence, intrinsic properties, geodesics, canonical geodesics equations, normal properties of geodesics.

UNIT - IV
Existence theorems, geodesic curvature, Gauss – Bonnet theorem, Gaussian Curvature.

UNIT - V
The Second fundamental form, principal curvatures –lines of curvature, developables. Developables associated with a space curves – developables associated with curves on surfaces-minimal surfaces – ruled surfaces.

TEXT BOOK:
An introduction to Differential Geometry by T J Willmore, Oxford University press.

UNIT I	Chap 1 (Sec 1 to 7)
UNIT II	Chap 1 (Sec 8,9) Chap 2 (Sec 1 to 4)
UNIT III	Chap 2 (Sec5 to 12)
UNIT IV	Chap 2 (Sec 13,15,16 and 17)
UNIT V	Chap 3 (Sec1 to 8)

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	S				
CO2		M			
CO3			S		
CO4				M	
CO5					S

S- Strong, M-Medium, L-Low

Passed in the BOS Meeting held on 18-03-2020

ELECTIVE 2	DISCRETE MATHEMATICS	SUBJECT CODE: 21PMSE12
SEMESTER - I	6 HOURS/WEEK	CREDITS: 4

OBJECTIVE: To enable the students to understand the concepts of connectives, truth tables, PCNF and PDNF, Grammar and Language, Lattices and to gain knowledge about special lattices and Boolean expressions and to apply the knowledge gained in solving problems.

COURSE OUTCOMES(COs):

After completing this course, the student will be able to:

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO1	understand the concepts of connectives, truth tables, tautologies and contradiction, equivalence of formulas.	K2
CO2	gain knowledge about Principal Conjunctive and Disjunctive Normal Forms.	K1
CO3	understand Grammar and Language and analyzes Polish Expressions and Complications.	K2,K3
CO4	gain knowledge about Lattices, Direct Product of Lattices.	K1
CO5	understand the concepts of Special Lattices, Boolean Algebra and Boolean Functions and applies them to find the values of Boolean Expressions.	K2,K3

K1-KNOWLEDGE(REMEMBERING), K2-UNDERSTANDING,K3-APPLICATION

DISCRETE MATHEMATICS

UNIT - I
Statement and notations – connectives – negation, conjunction, disjunction – statement formulae – truth tables – conditional and bi conditional – well formed formulae – tautologies – equivalence of formulae. (Page No. 1 to 26)

UNIT - II
Duality law – tautological implications – normal forms – conjunctive normal form – principal disjunctive normal forms – rules of inference (Page No.32 to 72)

UNIT - III
Grammar and Languages – polish expressions and complications (Page No.294 to 317)

UNIT - IV
Lattices – definition and properties of lattices – lattices algebraic system – sub-lattices – direct product and homomorphism (Page No. 378 to 392)

UNIT - V
Some special lattices – Boolean algebra – definition and examples – Boolean functions – values of Boolean expressions and Boolean functions (Page No.392 to 417)

TEXT BOOK:
Discrete Mathematical Structures with applications to Computer Science by J.P. Tremblay and R. Manohar. McGraw Hill International Editions

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	S				
CO2				M	
CO3		M			
CO4			M		
CO5					M

S- Strong, M-Medium, L-Low

Passed in the BOS Meeting held on 18-03-2020

II SEMESTER

S.No	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	21PMSC21	Linear Algebra	6	3	25	75	100	4
2	21PMSC22	Real Analysis	6	3	25	75	100	4
3	21PMSC23	Differential Equations	6	3	25	75	100	4
4	21PMSC24	Numerical Analysis	6	3	25	75	100	4
5	21PMSE21	Elective – 3: Classical Mechanics	6	3	25	75	100	4
6	21PMSE22	Elective – 4 : Fuzzy sets and Logics	6	3	25	75	100	4
7	21PMSE23	Elective – 5 : Visual Basic Theory	4	3	25	75	100	3
8	21PMSEP1	Elective – 6 : Visual Basic Practical	2	3	40	60	100	1
TOTAL			30					20

CORE – 5	LINEAR ALGEBRA	SUBJECT CODE: 21PMSC21
SEMESTER - II	6 Hours/Week	CREDITS:4

OBJECTIVES:

Linear Algebra is a very important branch of Mathematics. In this course, the student learns about Vector Spaces, Inner Product Spaces, Linear Transformation on these spaces and their canonical forms and types of linear transformations.

COURSE OUTCOMES (COs):

After completing this course, the student will be able to:

No.	Course Outcome	Knowledge level(According to Bloom's Taxonomy)
CO1	understand the concepts of Linear independence, bases and Dual spaces.	K1
CO2	discuss Algebra of Linear Transformations and Characteristics roots and Matrices.	K2
CO3	study Canonical forms Triangular forms and Nilpotent Transformations.	K2, K3
CO4	analyze rational canonical forms Trace and transpose and Determinants.	K3
CO5	understand the concept of the Hermitian, Unitary and Normal Transformations.	K2, K3

K1-KNOWLEDGE (REMEMBERING), K2-UNDERSTANDING , K3-APPLICATION

LINEAR ALGEBRA

(All Units are from the text book)

UNIT – I
Dual spaces, Inner product spaces (Chapter 4: Sections 4.3,4.4)

UNIT – II
The algebra of linear transformations, characteristic roots

UNIT – III
Canonical forms, Triangular form, Nilpotent transformations

UNIT – IV
Canonical forms: Rational canonical form, Trace and Transpose

UNIT – V
Hermitian, Unitary and Normal Transformations

TEXT BOOK:
I.N. Herstein, Topics in algebra, Second Edition, Wiley Eastern Edition, New Delhi.1999.

Chapter 4: Sections 4.3, 4.4 Chapter 6: Sections 6.1 to 6.10 (except 6.3, 6.6, 6.9)

Contents:
Unit I: Chapter 4: Sections 4.3 to 4.4
Unit II: Chapter 6: Sections 6.1 to 6.2
Unit III: Chapter 6: Sections 6.4 to 6.5
Unit IV: Chapter 6: Sections 6.7 to 6.9
Unit V: Chapter 6: Sections 6.10 and 6.11

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	M				
CO2		S			
CO3			S		
CO4				S	
CO5					M

S- Strong, M-Medium, L-Low

Passed in the BOS Meeting held on 18-03-2020

CORE - 5	REAL ANALYSIS	SUBJECT CODE: 21PMSC22
SEMESTER - II	6 HOURS/WEEK	CREDITS:4

COURSE OBJECTIVE:

To introduce the concept of Riemann-Stieltjes integral, Sequence and series of functions, properties of functions which are represented by Power series.

COURSE OUTCOMES(COs):

After completing this course, the student will be able to

No.	Course Outcome	Knowledge level(According to Bloom's Taxonomy)
CO1	define properties of Riemann-Stieltjes integral and differentiation	K1
CO2	extend to complex-valued and vector-valued functions on intervals	K2
CO3	understand the concept of uniform convergence and continuity	K2, K3
CO4	study Equi continuous families of functions and Stone-Weierstrass theorem	K1, K3
CO5	derive properties of functions by power series.	K2, K3

K1-KNOWLEDGE(REMEMBERING) , K2-UNDERSTANDING, K3-APPLICATION

REAL ANALYSIS

UNIT – I
Definition and existence of the integral – Properties of integral (Statement only)

UNIT – II
Change of variable – Integration and differentiation – fundamental theorem of calculus – Integration by parts – Rectifiable curves.

UNIT – III
Discussion of main problem = Uniform convergence, continuity, integration and differentiation.

UNIT – IV
Equi continuous families of functions – Stone-Weierstrass theorem.

UNIT – V
Power series – The exponential and Logarithmic functions – trigonometricfunctions – completeness of complex field – Parseval's theorem – Gamma function.

TEXT BOOKS:
Principles of Mathematical Analysis (3rd edition) by Walter Rudin – McGraw-Hill International Editions - 1964.
Contents:
Unit 1: Chapter 6 - 6.1 to 6.18
Unit 2: Chapter 6 - 6.19 to 6.27
Unit 3: Chapter 7 - 7.1 to 7.18
Unit 4: Chapter 7 - 7.19 to 7.33
Unit 5: Chapter 8 - 8.1 to 8.21

REFERENCE BOOKS:
1. Real Analysis – 3rd edition – H.L. Roydan – Prentice-Hall of India Pvt. Limited, 1998.
2. Mathematical Analysis – 2nd edition –Tom M Apostol - Narosa Publishing House, 1985.

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	S		M		
CO2		S			
CO3	M		S		
CO4		M		S	
CO5					M

S- Strong, M-Medium, L-Low

Passed in the BOS Meeting held on 18-03-2020

CORE – 7	DIFFERENTIAL EQUATIONS	SUBJECT CODE: 21PMSC23
SEMESTER - II	6 HOURS/WEEK	CREDITS: 4

COURSE OBJECTIVES:

This course is designed to explain various concepts and application in Differential Equations.

OBJECTIVES:

1. To enable the students to acquire the knowledge about different differential equations.
2. To understand the concept of Initial Value Problem and Its solution
3. To study Legendre's, Euler's and Bessel's equation
4. To get the knowledge about integral surfaces.
5. To know different methods of solving non-linear partial differential equations

COURSE OUTCOMES (COs):

After completing this course the students are able to

No.	Course Outcome	Knowledge level(According to Bloom's Taxonomy)
CO1	find the solution of homogeneous equation and the Relation between Wronskian and linear independence of the solution of the equation, and enable to apply uniqueness theorem	K1, k2
CO2	find the regular singular points of the second order equation and Bessel's equation and power series solution	K1, K3
CO3	apply Lipschitz's theorem and Find the Lipschitz's constant of the Initial Value Problem	K3
CO4	understand different methods of solving partial differential equations and find the integral surface passing through the given curve.	K2
CO5	identify the compatible system of First order equations and its solution.	K1, K3

K1-KNOWLEDGE(REMEMBERING) , K2-UNDERSTANDING, K3-APPLICATION

DIFFERENTIAL EQUATIONS

(Units 1,2,3 are from text-book 1 and unit 4 and 5 from text book 2)

UNIT – I

Introduction-IVP for homogeneous equation- solutions of the homogeneous equation – Wronskian and Linear independence- Reduction of the order of a homogeneous equation- the non-homogenous equation – homogeneous equation with analytical coefficient- Legendre equation.

UNIT – II

Introduction –The Euler equation- 2^{nd} order equation with regular singular points-an example-2^{nd} order equation with regular - Singular points –the general case (results only)- Exceptional cases(results only, theorem statements only)-Bessel equation- Bessel equation (continued).

UNIT – III

Introduction-equations with variables separated-exact equations-the method of successive approximation-The Lipschitz's condition.

UNIT – IV

Partial Differential equation- origin of 1^{st} order partial differential equation –Liner equations of the 1^{st} order –Integral surfaces passing through a curve.

UNIT – V

Non-linear partial differential equation of 1^{st} order-compatible system of first order- Charpit's method- special types of 1^{st} order equations.

TEXT BOOKS:

1. An introduction to ordinary differential equations by E.A Coddington, Prentice Hall of India. 1987
2. Elements of Partial Differential equations by I.N. Sneddon, Tata McGraw Hill book Company 1986.

Unit I : Textbook 1, Chapter3 (sec 1 to 8).
Unit II : Text book 1, Chapter 4 (sec:1,2,3,7,8).
Unit III: Text book 1, Chapter 5(sec:1,2,3,4,5).
Unit IV: Text book 2, Chapter2 (sec2.4, 2.5).
Unit V : Text book 2, Chapter 2 (sec.2.7,2.9,2.10)

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	M				
CO2		S			
CO3			M		
CO4				S	
CO5					M

S- Strong, M-Medium, L-Low

Passed in the BOS Meeting held on 18-03-2020

CORE - 8	NUMERICAL ANALYSIS	SUBJECT CODE: 21PMSC24
SEMESTER - II	6 HOURS/WEEK	CREDITS : 4

OBJECTIVES:

To enable the students to acquire the knowledge of numerical analysis.

COURSE OUTCOMES(COs):

After completing this course, the student will be able to

No.	Course Outcome	Knowledge level(According to Bloom's Taxonomy)
CO -1	list out and discuss various iteration methods based on first degree and second degree equations.	K1, k2
CO-2	compute Eigen values and Eigen vectors of a square matrix and its bounds.	K2, K3
CO-3	acquire the knowledge of interpolation of polynomials.	K1, K3
CO-4	discuss Numerical differentiation and Numerical integration.	K1, K3
CO-5	form difference equations and to discuss Numerical methods.	K1, K2

K1-KNOWLEDGE(REMEMBERING), K2-UNDERSTANDING, K3-APPLICATION

NUMERICAL ANALYSIS

UNIT – I

Teration methods based on first degree equation, Iteration methods based on second degree equation except multipoint iteration method- Rate of convergence

UNIT II

Introduction--Iteration methods before successive over relaxation method, Eigen values and Eigen vectors--Bounds on Eigen values

UNIT III

Introduction—Lagrange Interpolation--Hermite interpolation--piecewise and spline interpolation

UNIT IV

Introduction--Numerical differentiation before methods based on finite differences—Partial Differentiation—Numerical integration before opentype integration rules, Methods on integration--composite Integration methods--Romberg method

UNIT V

Introduction--Difference equations--Numerical methods,(Euler's method only)

TEXT BOOKS:

Numerical methods for scientific and engineering computation by M.K. Jain, S.R.K, R.K.JAIN, fifth edition, New age international Publishers, 2008.

(Note: Section B of the question paper for the end semester examination will contain only problems, scientific calculator is allowed)

Unit I:Chapter 2: sections 2.3 to 2.5
Unit II: Chapter-3: section 3.1 before SOR method,3.4 to 3.6
Unit III: Chapter 4: sections 4.1,4.2(Lagrange method),4.5,4.6
(only linear and quadratic interpolation)
Unit IV: Chapter 5: Section 5.1,5.2,5.5to5.7,5.9,5.10
Unit V:Chapter 6: section 6.1 to 6.3 (Euler's method only).

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	S				
CO2		M			
CO3			M		
CO4				M	
CO5					S

S- Strong, M-Medium, L-Low

Passed in the BOS Meeting held on 18-03-2020

PART – III :ELECTIVE - III	CLASSICAL MECHANICS	SUBJECT CODE: 21PMSE21
SEMESTER - II	6 HOURS / WEEK	CREDITS : 4

COURCE OBJECTIVES:

This course is designed to explain various concepts used to learn Classical Mechanics.

OBJECTIVES:

- To introduce the basic laws.
- To explain various techniques used to solve problems.
- To define Hamilton's principle.
- To discuss the classification of orbits.
- To list Keplers problem.

COURSEOUTCOMES (COs):

After completing this course, the student will be able to

No.	COURSE OUTCOME	Knowledge level(According to Bloom's Taxonomy)
CO 1	to list out different types constraints with examples	K1, K2
CO2	to illustrate various principle and apply calculus of variation techniques to solve problems.	K2, K3
CO3	to derive Lagrange equation..	K3
CO4	to apply viral theorem to derive special cases.	K2
CO5	to recognize and solve problem based on power law potential.	K2, K3

K1-KNOWLEDGE (REMEMBERING), K2-UNDERSTANDING, K3-APPLICATION

CLASSICAL MECHANICS

UNIT - I

Mechanics of a particle – Mechanics of a system of particles – Constraints.

UNIT - II

D'Alembert's principle – Lagrange's equation – Velocity dependent potentials –the Dissipation function – Hamilton's principle – some techniques of calculus of variations.

UNIT - III

Derivation of Lagrange's equation from Hamilton principle – Extension of Hamilton's principle to Non - Holonomic system.

UNIT – IV

Reduction to an equivalent on body problem – the equation of motion and first integral – equivalent one dimensional problem – classification of orbit- the viral theorem.

UNIT – V

The differential equation for the orbit and integrable power law potentials- The Kepler problem- Inverse square law of force – The motion in time in Kepler problem-The Laplace –Runge – Lenz vector

TEXT BOOKS:

CLASSICAL MECHANICS by H. GOLDSTEIN
Second edition, Addison Wesley, New York, 1980.

UNIT I	CH 1 (Sec 1.1 – 1.3)
UNIT II	CH 1 (Sec 1.4, 1.5) CH 2(Sec 2.2,2.2)
UNIT III	CH 2 (Sec 2.3, 2.4)
UNIT IV	CH 3 (Sec3.1 – 3.4)
UNIT V	CH 3 (Sec 3.5, 3.7 – 3.9)

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	S				
CO2		S			
CO3			M		
CO4				S	
CO5					S

S- Strong, M-Medium, L-Low

PART - III ELECTIVE	**FUZZY SETS AND LOGICS**	**SUBJECT CODE : 21PMSE22**
SEMESTER - II	**6 HOURS / WEEK**	**CREDITS : 4**

OBJECTIVES:

To enable the students to acquire the knowledge of fuzzy logic.

To understand the concepts of fuzzy numbers, fuzzy relations and fuzzy applications in science and engineering.

COURSE OUTCOMES(COs):

After completing this course, the student will be able to

No.	**COURSE OUTCOME**	**Knowledge level(According to Bloom's Taxonomy)**
CO 1	list out different types operations with examples	K1, k2
CO2	illustrate various arithmetic operations on intervals and fuzzy numbers	K2, K3
CO3	list out various fuzzy relations	K3
CO4	list out various fuzzy propositions.	K2
CO5	recognize applications of fuzzy theory in various fields.	K2, K3

K1-KNOWLEDGE(REMEMBERING) , K2-UNDERSTANDING, K3-APPLICATION

FUZZY SETS AND LOGICS

(All units are from the text books)

UNIT- I

Fuzzy sets – Basic types – Fuzzy sets – Basic concepts – Additional properties of α – cuts – Representation of fuzzy sets – Extension principle for fuzzy sets – Types of operations – fuzzy complements

UNIT- II

Fuzzy numbers – Linguistic variables – arithmetic operations on intervals – arithmetic operation on fuzzy number

UNIT- III

Crisp versus fuzzy relations – projections and cylindric extensions –Binary fuzzy relations on a single set – Fuzzy equivalence relations – Fuzzy compatibility relations – Fuzzy ordering relations

UNIT- IV

Classical logic – An over view - multi valued logic – Fuzzy propositions – Fuzzy quantifiers – Linguistic Hedges – Inference from conditional fuzzy propositions – inference from conditional and quantified propositions – Inference from quantified propositions

UNIT V

Introduction – Civil Engineering – Computer Engineering- Reliability theory – Robotics – Medicine – Economics – Fuzzy Regressions – Interpersonal Communications.

TEXT BOOKS:

Fuzzy sets and Fuzzy logic – Theory and applications – Second edition, by George J. Klir and B.Yuan . Publisher – Prentic Hall; US ed edition – 1995

Unit 1: Chapter 1 Section 1.2 to 1.4; Chapter Sections 2.1 to 2.3;
Chapter 3 Sections 3.1 to 3.2
Unit 2: Chapter 4 : Sections 4.1 to 4.4
Unit 3: Chapter 5 Sections 5.1 to 5.7
Unit 4: Chapter 8 full
Unit 5: Chapter 16 ; Sections 16.1, 16.2, 16.5 to 16.7;
Chapter 17 Sections 17.1 to 17.3 and Sections 17.5 , 17.6

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	S				
CO2		S			
CO3			M		
CO4				S	
CO5					M

S- Strong, M-Medium, L-Low

Passed in the BOS Meeting held on 18-03-2020

ELECTIVE - V	VISUAL BASIC THEORY	SUBJECT CODE: 21PMSE23
SEMESTER - II	4 HOURS/WEEK	CREDITS:4

OBJECTIVE:
To enable the students to understand the concepts of variables, lopps, functions, arrays, fundamentals of graphics, file handling and to apply the knowledge gained in writing programs.

COURSE OUTCOMES (COS):
After completing this course, the student will be able to

No.	Course Outcome	Knowledge level(According to Bloom's Taxonomy)
CO1	understand the concept of tool box, message box, input box, variables, data types and constants.	K1,K2
CO2	gain knowledge about displaying information, controlling program flow and built-in functions.	K1
CO3	understand arrays, control arrays and common dialogue boxes.	K2
CO4	analyze mouse activities and file handling.	K2,K3
CO5	gain knowledge about overview of COM/OLE and SQL base and database objects and understands the related topics.	K1,K2

K1-KNOWLEDGE(REMEMBERING), K2-UNDERSTANDING, K3-APPLICATION

VISUAL BASIC THEORY

UNIT - I

Customizing a form and writing simple programs: Starting a new project-the properties window-common form properties-scale properties-color properties-making a form responsive.

First step in building the user interface: The tool box-creating controls-the name property-properties of command buttons-simple event procedures for command buttons-access keys-image controls-text boxes-labels-navigating between controls-message boxes.

First step in programming: Variables-setting properties with code-data types-constants-input boxes.

UNIT - II

Displaying information: Displaying information on a form-the format function-picture boxes- rich text boxes-the printer object.

Controlling program flow: Determine loops-indeterminate loops-making decision –select case-nested if-then-the goto.

Built-in functions: String functions-numeric functions-date and time functions.

Writing your own functions and procedures: Function procedures-sub procedures.

UNIT - III

Organizing information via code: Lists: one dimensional arrays-fixed versus dynamic arrays-static arrays-the erase statement

Organizing information via controls: control arrays-list and combo boxes-the flex grid control-

Finishing the interface: the toolbox revisited frames-timers-option buttons-check boxes-scroll bars-common dialog boxes-the the Microsoft windows common controls-menus-MDI forms.

UNIT - IV

An introduction to graphics: Fundamentals of graphics-screen scales-the line and shape controls-graphics via code-line and boxes-circles-ellipse and pie chart

Monitoring mouse activity: The mouse event procedures-dragging and dropping operations for controls.

Basic file handling: File commands-sequential file-random access files-binary files-sharing files.

File system controls and file system objectives: File system controls.

UNIT V

Communicating with other windows applications: Overview of COM/OLE using the OLE client control at design time-OLE automation-OLE drag and drop.

Survey of database development using VB: Using the data control – SQL base-database objects-useful method and events for the data control.

TEXT BOOK:

Gary Comell(2010), visual basic 6 from ground up. Tata MC graw-hill.

Pearson Education, Asia, 2002.

Mapping of CO with PSO

CO/PSO	PSO				
	1	2	3	4	5
CO1	S				
CO2		M			
CO3			M		
CO4				M	
CO5					M

S- Strong, M-Medium, L-Low

Passed in the BOS Meeting held on 18-03-2020

ELECTIVE - VI	VISUAL BASIC LAB	SUBJECT CODE: 21PMSEP1
SEMESTER - II	2HOURS/WEEK	CREDITS:1

VISUAL BASIC LAB

1. Simple programs using text box, label and command button.
2. Implementation of string and data functions.
3. Programs using input box and message box.
4. Design of a calculator.
5. Design of font style.
6. Creation of paint brush.
7. Interactive games, number puzzle and picture puzzle.
8. Design of text editor.
9. Animation using timer control.
10. Screen saver program.
11. Pop-up menu creation.
12. Dynamic loading of controls.
13. Program using OLE.
14. Programs using data control.