SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA 101	DC	**Abstract Algebra I**	60	20	20	-	-	4	1	-	5

Course Objective

To introduce the students with the Sylow Theory, Field Extension and Galois Theory.

Course Outcomes

After the successful completion of this course students will be able to

1. *understand and apply the basics of the Group theory.*
2. *know the fundamental principles of the Rings.*
3. *know the basic principles of the Modules.*

Course Content:

UNIT – I
Sylow Theorem: p-group, Cauchy Theorem, Sylow Theorem, Sylow p-subgroups, Applications of Sylow Theory: Application to p-groups and Class equation (Text 1. Section 36, 37.1-37.6).

UNIT – II
Extension Fields: Introduction to Extension Fields, Kronecker's Theorem, Algebraic and Transcendental Elements, Irreducible Polynomials, Simple Extensions. (Text 1: Section 29, 30.23)
Algebraic Extension: Finite Extensions, Algebraic Closed Fields and Closure. (Text 1: Section 31)

UNIT – III **Automorphisms of Fields:** Automorphisms and Fixed Fields. The Frobenius Automorphism. (Text 1: Section 48)
The isomorphism Extension Theorem: The Extension Theorem, Isomorphism Extension Theorem, The Index of Field Extension. (Text 1: Section 49)

UNIT – IV Splitting Fields: Definition, Properties and Examples (Text 1: Section 50).
Separable Extension: Multiplicities of Zeros of a Polynomial, Separable Extension, Perfect Fields, The Primitive Element Theorem Totally Inseparable Extension. (Text 1: Section 51, 52)

UNIT – V Galois Theory: Normal Extension, The Main Theorem of Galois Theory, Galois Group over Finite Fields.

Texts:

1. John B. Fraleigh, A First Course in Abstract Algebra, Narosa Publication.
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge University Press.
3. Herstein, I.N., Topics in Abstract Algebra, Wiley Eastern Limited. Hungerford, T.W., Algebra, Springer.
4. Jacobson, N., Basic Algebra, I & II, Hindusthan Publishing Corporation, India.
5. V. Sahi and V. Bisht, Algebra, Narosa Publication.

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA 102	DC	**Real Analysis**	60	20	20	-	-	4	1	-	5

Course Objective

To introduce the students with the Fundamentals of the Real Analysis

Course Outcomes

After the successful completion of this course students will be able to understand and apply the basics of the Real Analysis.

Course Content:

UNIT – I:
Definition and existence of Riemann-Stieltjes Integral and its properties, Integration and Differentiation, The fundamental Theorem of Calculus, Integration by Parts (Text 1: Chapter 6, Sec. 6.1-6.22).

UNIT – II:
Integration of Vector-valued Functions, Rectifiable Curves, Sequence and Series of Functions: Uniform Convergence, Uniform Convergence and Continuity. (Text 1: Chapter 6, Sec. 6.23-6.27, Chapter 7, Sec 7.1-7.15).

UNIT – III:
Uniform Convergence and Integration, Uniform Convergence and Differentiation, Equicontinuous Families of Functions, Stone-Weierstrass Theorem (Text 1: Chapter 7, Sec. 7.16-7.33).

UNIT – IV:
Some Special Functions: Power Series, The Exponential and Logarithmic Functions, The Trigonometric Functions, The Algebraic Completeness of the Complex Field, Functions of Several Variables: Linear Transformation. (Text 1: Chapter 8, Sec. 8.1-8.8, Chapter 9, Sec. 9.1-9.9).

UNIT – V:
Functions of Several Variables: Differentiation, Chain Rule, Partial Derivatives, The Contraction Principle, The Inverse Function Theorem, The Implicit Function Theorem, Derivatives of Higher Order, Differentiation of Integrals. (Text 1: Chapter 9, Sec. 9.10-9.29, 9.39-9.43).

Texts:

1. W. Rudin, Principles of Mathematical Analysis, *Third Edition,* McGraw-Hill Book Co.
2. C.D. Aliprantis, O. Burkinshaw, *Principles of Real Analysis*, 3rd Edition, Harcourt Asia Pte Ltd., 1998.
3. H.L. Royden, *Real Analysis*, 3rd Edition, Macmillan, New York & London, 1988.
4. T.M. Apostal, Mathematical Analysis, Narosa.

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA 103	DC	**Complex Analysis**	60	20	20	-	-	4	1	-	5

Course Objective

To introduce the students with the Fundamentals of the Complex Analysis.

Course Outcomes

After the successful completion of this course students will be able to understand and apply the basics of the Calculus of the Complex Variable.

Course Content:

Unit I:
Complex Numbers: Complex Numbers, Geometrical representation, Complex Conjugate, Modulus and Argument, Properties of Modulus, Properties of Arguments, Inequalities of Modulus, Cauchy's Inequality, D'Moiver's Theorem, Limit and Continuity, Analytic Function, C-R equations, Conjugate and Harmonic Functions.
(Text 1: Chapter 1 and 2)
Unit II:
Complex Integration, Cauchy's Fundamental Theorem, Cauchy-Gaursat Theorem, Cauchy Integral Formula, Higher Order Derivatives, Extension of Cauchy Theorem to multiply connected regions.
(Text 1: Chapter 3: Sections 3.1-3.4,3.6)
Unit III:
Morera's Theorem, Cauchy's Inequality, Liouville's Theorem, The Fundamental Theorem of Algebra, Taylor's Theorem, Problems based on Taylor's Theorem.
(Text 1: Chapter 3: Sections 3.7-3.8, 3.10 Only Taylor's Theorem, Theorem 5-8 and Theorem 13)
Unit IV:
The Maximum Modulus Principle, Schwartz Lemma, Laurentz's Series, Problems based on Laurentz Series, Uniqueness of Laurent Expansion.
(Text 1: Chapter 3: Sections 3.9-3.10 (Laurentz's Theorem), Theorem 9-11, 14-15)
Unit V:
Bilinear Transformation, Fixed Points, Critical Points, Cross Ration, Normal Form of a Bilinear Transformation and Problems, Mapping by Elementary Transformations (Translation, Rotation., Magnification, Rotation and Magnification, Inversion), Conformal Mappings, Necessary and Sufficient Condition for Conformal Mapping.
(Text 1: Chapter 6)

Text Books :-

1. B. Singh, V. Karanjgaokar, R.S. Chandel, *Complex Analysis*, Golden Valley Publ., Agra.

2. J.B. Conway, *Functions of one complex variable*, Second Edition, Narosa Publishing
3. L.V. Ahlfors, *Complex Analysis*, McGraw-Hill, 1979.
4. W. Rudin, *Real and Complex Analysis*, McGraw-Hill Book Co., 1966.
5. S. Ponnusamy, *Foundations of Complex Analysis*, Narosa Publishing House, 1997.

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA 104	DC	**Topology**	60	20	20	-	-	4	1	-	5

Course Objective

To introduce the students with the Fundamentals of the Topology.

Course Outcomes

After the successful completion of this course students will be able to understand and apply the basics of the Topology.

Course Content:

Unit I:.
Finite and Infinite Sets, Countable and Uncountable Sets, Schroeder-Bernstein Theorem, Axiom of Choice, Well-ordered Set. Cardinal Numbers and its Arithmetic, Zorns's Lemma (Text 1. Sections 6,7,9,10,11).
Unit II:.
Definition and Examples of Topological Space, Bases and Subbeses, Order Topology, Product Topology, Subspace and Relative Topology. (Text1. Section 12 to16)
Unit III:.
Closed Sets and Limit Points, Closure of a Set, Dense Subsets, Interior Exterior and Boundary of Sets, Neighborhoods and Neighborhood System. Continuous Functions and Homeomorphism, Examples. (Text 1. Section 17.1 to 17.7, 18)
Unit IV:.
Connected Spaces, Connected Subspaces of the Real Line, Path Connectedness, Components and Local Connectedness (Text 1. Section 23 to 25).
Unit V:.
The Countability axiom, First and Second Countable Space, Lindeioff's Theorem, Separable Space, Second Countability and Separability Hausdorff space. (Text 1. Section 17.8 to 17.10, 30)

Text Books :

1. James R. Munkres, Topology, A First Course, Prentice Hall of India Pvt. Ltd. New Delhi.
2. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill.
3. K.D. Joshi, Introduction to General Topology, Kelley, Eastern
4. K.P. Gupta, Topology, Pragrati Prakashan.

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA 105(1)	DC	**Differential Equations I**	60	20	20	-	-	3	1	-	4

Course Objective

To introduce the students with the Fundamentals of the Differential Geometry.

Course Outcomes

After the successful completion of this course students will be able to understand and apply the basics of the Differential Geometry.

Course Content:

Unit I:.
Tensors: Tensor and their transformation laws, Tensor algebra, Contraction, Quotient law, Reciprocal tensors, Kronecker delta, Symmetric and skew- symmetric tensors, Metric tensor, Riemannian space, Christoffel symbols and their transformation laws,
Unit II:.
Covariant differentiation of a tensor, Riemannian curvature tensor and its properties, Bianchi identities, Ricci-tensor, Scalar curvature, Einstein space.
Unit III:.
Curves in Space: Parametric representation of curves, Helix , Curvilinear coordinates in *E*3. Tangent and first curvature vector, Frenet formulas for curves in space, Frenet formulas for curve in *E*n. Intrinsic differentiation, Parallel vector fields,Geodesic.
Unit IV:.
Surfaces: Parametric representation of a surface, Tangent and Normal vector field on a surface, The first and second fundamental tensor, Geodesic curvature of a surface curve,
Unit V:.
The third fundamental form, Gaussian curvature, Isometry of surfaces, Developable surfaces, Weingarten formula, Equation of Gauss and Codazzi, Principal curvature, Normal curvature, Meusnier's theorem.

References :

1. Tensor Calculas and Application to Geometry and Mechanics: (chapter-II and III) – I.S.SOKOLNIKOFF.
2. An Introduction to Differential Geometry: (chapter – I,II,III,V and VI) - T.T.WILMORE.
3. Differential Geometry:- BARY SPAIN.

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA 105(2)	DC	**Discrete Mathematics I**	60	20	20	-	-	3	1	-	4

Course Objective

To introduce the students with the Fundamentals of the Discrete Mathematics.

Course Outcomes

After the successful completion of this course students will be able to understand and apply the basics of the Discrete Mathematics.

Course Content:

Unit I:.
Formal Logic: Statement, Connectives, Tautologies, Normal Forms, Ordering and Uniqueness of Normal form (Text 1, Chapter 1, Section 1.1-1.3)
Unit II:.
Semigroups and Monoids: Definition and Examples of Semigroups and Monoids (including those pertaining to concatenation operation), Homomorphism of Semigroups and Monoids, Congruent Relation and Quotient Semigroups and Subsemigroups and Submonoids direct products, Basic Homomorphism Theorem (Text 1, Chapter 3, Section 3.2).
Unit III:.
Lattices: Lattices as Partially Ordered Sets, their properties, Lattices as Algebraic Systems. Sublattices, Direct Products and Homomorphism, Some Special Lattices, e.g., Complete Complemented and Distributive Lattices (Text 1, Chapter 4, Section 4.1).
Unit IV:.
Boolean Algebras: Boolean Algebras as Lattices, Various Boolean Identities, Sub-Algebras, Direct Products and Homomorphism, Join-irreducible Elements (Text 1, Chapter 4, Section 4.2).
Unit V:.
Boolean Functions: Boolean forms and free Boolean Algebras, Sum-of-products Canonical forms, Product-of-sum Canonical Forms. Value of Boolean Expressions and Boolean Functions. Representation and Minimization of Boolean Functions, Application of Boolean Algebra to Switching Theory (using AND, OR and NOT Gates). The Karnaugh Map Method. (Text 1, Chapter 4, Section 4.3-4.4).

References :

1. Jean-Paul Tremblay and R Manohar, Discrete mathematical structures with applications to computer science, McGraw-Hills Book Co. 1997.

2. C.L. Liu, Elements of Discrete Mathematics, McGraw-Hills Book Co.
3. N. Deo, Graph Theory with Application to Engg. and Computer Science, Prentice Hall of India