



Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Name of the Program: M. Sc. in Mathematics

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA201	DC	Abstract Algebra II	60	20	20	-	-	4	0	-	4

Course Objective

To introduce the students to the basics of abstract Algebra.

Course Outcomes

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

1. apply the basics of the abstract algebra
2. understand the concept of Noetherian & Artinian modules
3. demonstrate knowledge and understanding of the concept of Modules and Submodules
4. to apply Hilbert basis theorem and Wedderburn-Artin theorem to solve problems of Algebra.

Course Content:

Unit-I

Symmetric functions, Cyclotomic Extensions, Insolvability of Quintic.
(5. Section 54, 55, 56)

Unit II

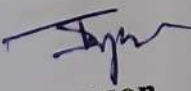
Introduction to Modules, Examples, Submodules and direct sums, Cyclic module, R- homomorphisms and Quotient modules, Isomorphism.

(1. Chapter 14 Sections 1-3)

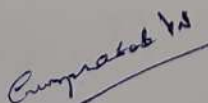
UNIT-III

Completely reducible modules Schur's lemma, Free modules, Representation of linear mappings, Rank of linear mappings.

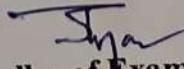
(1. Chapter 14 Sections 4 - 7)


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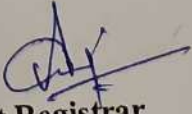
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MSMA201	DC	Abstract Algebra II	60	20	20	-	-	4	0	-	4

UNIT-IV

Noetherian & Artinian modules and rings, Hilbert basis theorem. Weddeburn-Artin theorem.

(1. Chapter 19 Sections 1-3)

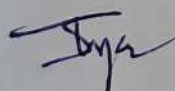
UNIT-V

Uniform modules, Primary, modules, finitely generated modules over a PID, Decomposition theorem, Uniqueness of the decomposition. Application to finitely generated abelian groups.

(1. Chapter 19 Sections 4, Chapter 21 Sections 1-3)

References

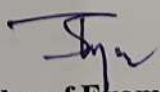
1. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge University Press.
2. I.N. Herstein, Topics in Algebra, Wiley Eastern, New Delhi.
3. V. Sahai & V. Bisht, Algebra, Narosa Publishing House.
4. N. Jacobson, Basic Algebra I and II, 2nd Ed., W. H. Freeman, 1985 and 1989.
5. John B. Fraleigh, A First Course in Abstract Algebra, Narosa Publication.


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			THEORY			PRACTICAL		Tb	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA202	DC	Theory of Measure and Integration	60	20	20	-	-	4	0	-	4

Course Objective

To introduce the students to the Theory of Measure and Integration.

Course Outcomes

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

- understand and apply the basics of the Theory of Measure and Integration.
- analyse and construct the outer measure, measurable sets, Lebesgue measure and measure space.
- apply the concepts of measure theory to probability theory.
- evaluate integrals beyond Riemann's integration theory.
- synthesize real-world applications of measure theory.

Course Content:

Unit I:

F_σ , G_δ sets, Introduction to Lebesgue Outer Measure, Measurable sets and Lebesgue Measure, Non-Measurable sets.


(1. Chapter 2 sections 7, Chapter 3 sections 1- 4)

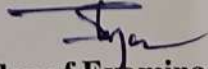
Unit II:

Measurable Functions, Egoroff's theorem, Lusin's theorem, Little-Wood's three Principles, A Non-Borel Measurable Set. The Riemann Integral, Lebesgue Integral of a Bounded Function over a set of Finite Measure.

(1. Chapter 3 sections 4 - 6, Chapter 4 sections 1, 2)


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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA202	DC	Theory of Measure and Integration	60	20	20	-	-	4	0	-	4

Unit III:

The Integral of a Non-Negative Function, The General Lebesgue Integral, Convergence in Measure, Differentiation of Monotone Functions, The Four Derivatives.

(1. Chapter 4 sections 3-5, chapter 5 section 1)

Unit-IV

Functions of Bounded Variation, Differentiation of an Integral, Absolute Continuity, Convex Functions, Jensen Inequality. The LP-spaces, The Holder and Minkowski Inequalities.

(1. Chapter 5 sections 2 - 5, Chapter 6 sections 1, 2)

Unit-V

Convergence and Completeness, Riesz-Fischer Theorem, Approximation in LP, Bounded Linear Functionals on the LP-spaces, Riesz Representation Theorem.

(1. Chapter 6 sections 3 - 5)

Reference Books:

1. H.L. Royden, Real Analysis Third Edition, PHI.
2. Walter Rudin, Principles of Mathematical Analysis, McGraw-Hill, International Student Edition.
3. G. De Barra. Measure Theory and Integration, Wiley Eastern (Indian Edition).
4. Inder K Rana, An Introduction to Measure and Integration, Second Edition, Narosa Publication.
5. Lebesgue Measure and Integration, 2nd Edition by P.K. Jain, V.P. Gupta, Pankaj Jain

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA203	DC	Complex Analysis II	60	20	20	-	-	4	0	-	4

Course Objective

To introduce the students to the basics of Complex analysis.

Course Outcomes

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

1. find solutions to field and flow problems
2. analyse the nature of the complex-valued functions
3. evaluate complex and real definite integrals by using the Residue theorem
4. evaluate improper real integrals of the type $\int_{-\infty}^{\infty} f(z) dz$
5. solve problems based on analytic continuation.

Course Content:

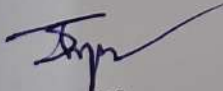
Unit I:

Isolated Singularities, Problems based on Singularities, Meromorphic functions, Poles and zeroes, N - P theorem, the argument principle, Rouché's theorem, and Problems based on Rouché's theorem.

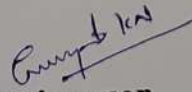
(2. Chapter 4)

Unit - II

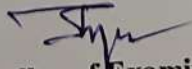
Residues, Computation of Residue at a finite pole, Cauchy's Residue theorem, Problems based on Residue, Integration Round the circle, Evaluation of the integral $\int_0^{2\pi} f(\cos\theta, \sin\theta) d\theta$.


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(2. Chapter 5 page (81-98))

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA203	DC	Complex Analysis II	60	20	20	-	-	4	0	-	4

Unit - III

Jordan's inequality, Jordan's lemma, Evaluation of improper real integrals of the type $\int_{-\infty}^{\infty} f(z) dz$, Evaluation of the integral $\int_{-\infty}^{\infty} f(z) dz$, when poles of $f(z)$ lie on the real axis, Integrals of the type $\int_0^{\infty} x^{\alpha-1} f(x) dx$, $\int_0^{\infty} \frac{\log x dx}{g(x)}$ Evaluation of integrals involving Quadrant, Sector and Rectangular contours.

(2. Chapter 5 page (99-121))

Unit - IV

Gamma function, Infinite product, Properties of gamma functions, Legendre's duplication formula, Riemann Zeta function, Riemann functional equation, relation between gamma and Zeta functions, Weierstrass factorization theorem.

Unit V:

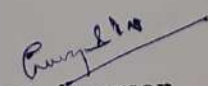
Analytic Continuation, Uniqueness of direct analytic Continuation, Uniqueness of analytic Continuation along a curve, Schwartz reflection principle, Harmonic function, Mean value theorem, Poisson kernel, Problems based on analytic Continuation.

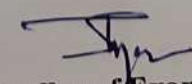
(2. Chapter 11 page (211 - 217) Article 3.1, Chapter 13 page 252- 259)

Reference Books:

1. J.B. Convey, Functions of one complex variable, Springer-Verlag
2. Complex Analysis-Dr. Brijendra Singh, Dr. Varsha Karanjgokar, Dr. R. S. Chandel, Golden Valley Publications Agra.
3. S. Ponnuswamy, Foundations of complex analysis, Narosa Publishing House, L.V. Ahlfors, Complex analysis, McGraw Hill


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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MSMA204	DC	Topology II	60	20	20	--	--	4	0	0	4

Course Objective

To introduce the students to the basics of Topology.

Course Outcomes

After completing the course the student will be able to:

5. understand and apply the concept of compactness
6. apply separable axioms
7. understand concepts of Nets and filter
8. analyse and apply the covering axiom and consequences
9. synthesis of basic topology to formulate and solve problems of a topological nature in mathematics and other fields where topological issues arise.

Course Content:

Unit I:

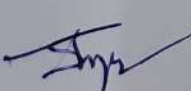
Compactness, Continuous functions and compact sets, basic properties of compactness. Compactness and F.I.P. (Finite intersection property). Sequential and countably compact spaces. Local compactness and one-point compactification. Compactness in metric space. Equivalence of compactness. Countable compactness.

(1. Sections 26, 27, 28 and 29)

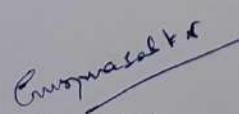
Unit- II

The Separation axioms. Regular and Normal spaces. Urysohn's Lemma. Tietze's Extension Theorem.

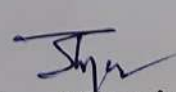
(1. Sections 31, 32, 33 and 35)


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MSMA204	DC	Topology II	60	20	20	--	--	4	0	0	4

Unit-III

Tychonoff product topology in terms of standard sub-base and its characterizations, Embedding and metrization. Embedding lemma and Tychonoff embedding. The Urysohn's metrization.

(1. Section 37) and (2. chapter 9)

Unit -IV

Nets and filters. Topology and convergence of nets. Hausdorffness and nets. Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters. Ultra-filters and compactness.

(2. Chapter 10 sections 1-4)

Unit-V

The Fundamental group and covering spaces-Homotopy of paths. The Fundamental group. Covering spaces. The Fundamental group of the circle and the fundamental theorem of algebra.

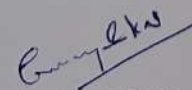
(1. Sections 51, 52, 53, 54 and 56)

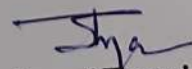
Reference Books:


1. James R. Munkres: Topology, A First Course, Prentice Hall of India Pvt. Ltd. New Delhi.
2. K. D. Joshi: Introduction to general Topology, Wiley Eastern Limited.
3. G. F. Simmons: Introduction to Topology and Modern Analysis. Mc-Graw Hill.


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