

**RANI DURGAVATI UNIVERSITY, JABALPUR**

**SYLLABUS OF M.A./M.Sc. MATHEMATICS SEMESTER SYSTEM**

**Semester-II (Session 2016-17 and onwards)**

**Syllabus opted by the board of studies in Mathematics, R. D. University  
in the meeting held on 30-04-2016.**

Session	Course	Title of papers	Max. Marks Theory/CCE	Mini. Passing Marks Theory/CCE	Total Marks
Second	Paper-I	Advanced Abstract Algebra-II	35/15	12/05	300
	Paper-II	Advanced Discrete Mathematics	35/15	12/05	
	Paper-III	Complex Analysis-II	35/15	12/05	
	Paper-IV	Lebesgue Measure and Integration	35/15	12/05	
	Paper-V	Ordinary and Partial Differential Equations	35/15	12/05	
		Project & Attendance	50 = 40+10	17	

**Note:**

- In project 40 marks is allocated. Out of 40 marks, 15 marks is allocated for project file, 15 marks is allocated for presentation of their project work and 10 marks is allocated for project Viva-Voce examination.
- In attendance 10 marks is allocated as per ordinance No. 79 of R.D. University Jabalpur.
- The students, whose attendance is less as per ordinance No. 79 of R.D. University Jabalpur, will not allow to appear in the examination at the close of semester and he/she would be declared having failed in that semester.

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M.P. Pani  
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**M.A./M.Sc. (Mathematics) Second Semester**  
**Paper I: ADVANCED ABSTRACT ALGEBRA – II**

Max. Marks: 35  
Min. Pass. Marks: 12

- Unit-I:** The elements of Galois theory: Automorphism of a field, Group of automorphisms of a field, Fixed field, Normal extension, Galois group of a polynomial, Fundamental theorem of Galois theory, Solution of polynomial equations by radicals, Insolvability of the general equation of degree 5 by radicals.
- Unit-II:** Introduction to Modules, Examples, Submodules and Direct sum of submodules, R-homomorphisms and Quotient modules, Finitely generated modules, Cyclic module.
- Unit-III:** Simple modules, Semi-simple modules, Schur's lemma, Free modules, Rank of a module.
- Unit-IV:** Noetherian and Artinian modules, Ascending and Descending chain condition (acc & dcc), Noetherian and Artinian rings, Examples, Hilbert basis theorem.
- Unit-V:** Fundamental Structure theorem of finitely generated modules over a Principal Ideal Domain and its applications to finitely generated abelian groups.

**Text Books:**

1. I. N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975. (For Unit-I).
2. P. B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra (2nd Ed.), Cambridge University Press, Indian Edition, 1997. (For Units II, III, IV and V).

**Reference Books:**

1. Vivek Sahai and Vikas Bist, Algebra, Narosa Publishing House, 1999.
2. N. Jacobson, Basic Algebra, Vols. I & II, Hindustan Publishing Company, 1980.
3. S. Lang, Algebra, 3rd Edition, Addison-Wesley, 1993.
4. I.S. Luther and I.B.S. Passi, Algebra, Vol. III - Modules, Narosa Publishing House, 1996.
5. Surjeet Singh and Quazi Zameeruddin, Modern Algebra, Vikas Publishing House Pvt. Ltd., 1990.
6. Ramji Lal, Algebra, Vols. I & II, Shail Publication, 2002.

M. Dhruv  
30.4.16  
H. S.  
30/4/2016

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M. P. Jain  
30-4-2016  
Jain  
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A. S. Mehta  
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A. S. Mehta

**M.A./M.Sc. (Mathematics) Second Semester**  
**Paper II : ADVANCED DISCRETE MATHEMATICS**

Max. Marks: 35  
Min. Pass. Marks: 12

- Unit-I:** Algebraic Structures : Introduction, Algebraic Systems : Examples and General Properties : Definition and examples, Some Simple Algebraic Systems and General properties, Homomorphism and isomorphism, congruence relation, Semigroups and Monoids : Definitions and Examples, Homomorphism of Semigroups and Monoids.
- Unit-II:** Lattices: Lattices as Partially Ordered Sets : Definition and Examples, Principle of duality, Some Properties of Lattices, Lattices as Algebraic Systems, Sublattices, Direct product, and Homomorphism.
- Unit-III:** Some special Lattices, e.g. Complete, Complemented and Distributive Lattices, Boolean Algebra: Definition and Examples, Subalgebra, Direct product and Homomorphism, join irreducible, atoms and antiatoms.
- Unit-IV:** Graph Theory: Definition of a graph, applications, Incidence and degree, Isolated and pendant vertices, Null graph, Path and Circuits: Isomorphism, Subgraphs, Walks, Paths and circuits, Connected graphs, disconnected graphs, and components, Euler graph.
- Unit-V:** Trees: Trees and its properties, minimally connected graph, Pendant vertices in a tree, distance and centers in a tree, rooted and binary tree. Levels in binary tree, height of a tree, Spanning trees, rank and nullity.

**Text Books:**

1. J. P. Tremblay & R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Co., 1997 (for Units I, II, and III).
2. N. Deo, Graph Theory with Applications to Engineering and Computer Sciences, Prentice Hall of India (for Units IV and V).

**Reference Books:**

1. C. L. Liu, Elements of Discrete Mathematics, McGraw-Hill Book Co.
2. S. Wiitala, Discrete Mathematics- A Unified Approach, McGraw-Hill Book Co.
3. Seymour Lipschutz, Finite Mathematics, Schaum Series, MGH.
4. J. L. Gersting, Mathematical Structures for Computer Science (3<sup>rd</sup> ed.) Computer Science Press, New York.

M. Dhoke  
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M. P. Lanni  
30.4.2016

J. A.  
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A. N. S.  
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M.A./M.Sc. (Mathematics) Second Semester  
Paper III: COMPLEX ANALYSIS - II

Max. Marks: 35  
Min. Pass. Marks: 12

- Unit-I:** Weierstrass factorization theorem, Gamma function and its properties, Riemann zeta function, Riemann's functional equation.
- Unit-II:** Rung's theorem, Mittag-Leffler's theorem, Schwartz Reflection principle, Analytic Continuation, Analytic Continuation along a path.
- Unit-III:** Monodromy theorem and its consequences, Harmonic function, Harmonic functions on a disk, Harnack's inequality and theorem.
- Unit-IV:** Dirichlet's problem, Green's function, Jensen's formula, Poisson-Jensen Formula.
- Unit-V:** Order of an entire function, Hadamard's three circle theorems, Hadamard's factorization theorem, Bloch's theorem, The Little Picard theorem.

**Text Book:**

J.B. Conway, Functions of one complex variable, Springer-Verlag, International student-Edition, Narosa publishing house, 1980.

**Reference Books:**

1. L.V. Ahlfors, Complex Analysis, McGraw Hill, 1979.
2. E.C. Titchmarsh, The theory of functions, Oxford University, Press, London.
3. S. Ponnusomy, Fundamental of complex Analysis, Narosa Publishing House, 1997.

*M. Dubey*  
30.4.16

*M.P. Parri*  
30.4.2016

*J. S. Jais*  
30/04/16

*A. S. S. S.*  
30.4.16  
*Dubey*

*H. S. S. S.*  
30/4/2016

**M.A./M.Sc. (Mathematics) Second Semester**  
**Paper IV: LEBESGUE MEASURE AND INTEGRATION**

Max. Marks: 35  
Min. Pass. Marks: 12

- Unit-I:** Lebesgue outer measure. Measurable sets. Regularity. Measurable functions. Borel and Lebesgue measurability. Non-measurable sets.
- Unit-II:** Integration of ,Non-negative functions. The General integral. Integration of Series, Reimann and Lebesgue Integrals.
- Unit-III:** The Four derivatives. Functions of Bounded variation. Lebesgue Differentiation Theorem, Differentiation and Integration.
- Unit-IV:** The  $L^p$ -spaces, Convex functions, Jensen's inequality. Holder and Minkowski inequalities. Completeness of  $L^p$ .
- Unit-V:** Dual of space when  $1 \leq p < \infty$ , Convergence in Measure, Uniform Convergence and almost Uniform Convergence.

**Text Book:**

G. de Barra. Measure Theory and Integration, Wiley Eastern (Indian Ed.).

**Reference Books:**

1. Walter Rudin, Principles of Mathematical Analysis, McGraw-Hill, International student edition.
2. H.L. Royden, Real Analysis, Macmillan, Indian Edition.

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**M.A./M.Sc. (Mathematics) Second Semester**  
**Paper V : ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS**

Max. Marks: 35

Min. Pass. Marks: 12

- Unit-I:** Exact differential equations and adjoints, The adjoint operator, Lagrange's identity, Strum-Liouville differential equation, Eigen values, The normal form, Change of independent's variable, Lagrange's method of variation of parameters.
- Unit-II:** Partial differential equations, Construction of partial differential equations of first order, Lagrange's linear equation, Charpit's general method of solutions, Green's functions, Domain and range of the operators, One dimensional Green's functions, Construction of Green's functions.
- Unit-III:** Power series solutions and special functions, A review of power series, Series solution of first order linear equations, Second order linear equations, Ordinary points, Regular singular points, Gauss's hypergeometric series.
- Unit-IV:** Laplace Transforms, Integral transforms, A few remarks on the theory, Conditions for the existence of Laplace transforms, Applications to differential equations.
- Unit-V:** Derivatives and integrals of Laplace transforms, Convolutions and Abel's Mechanical problem, More about convolutions, The unit step and impulse functions.

**Text Books:**

1. G.F.Simmons, Differential Equations with applications and Historical Notes, McGraw Hill International Editions, 1991 (for Units IV & V).
2. B.P.Parashar; Diffrential and Integral Equations , CBS publishers and Distributors Ltd. 1992 (for Units I, II, & III).

**Reference Books:**

1. H.T.H.Piaggio, An Elementary Treatise on differential Equations and Their Applications, Indian Reprint, 1966.
2. E.A. Coddington, An Introduction, The Solution of Ordinary Differential Equations, Indian reprint.
3. B.L.Ince and I.N.Sneddon, The Solution of Ordinary Differential Equations, Longman. 1987.
4. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill International Editions, 1957.

M. Sharma  
30.4.16

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30/4/2016

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M. Parashar  
30.4.2016

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30/04/16

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