

TRUNCATED UG SYLLABUS IN MATHEMATICS PROGRAMME COURSE
UNDER CBCS SYSTEM FOR EVEN (2ND, 4TH AND 6TH) SEMESTERS
2020-2021

Credit Distribution

Sl. No.	Course Type	Total Papers	Credits	Marks
1	Discipline Specific Core (DSC)	12	$(12 \times 5) + (12 \times 1) = 72$	75 (60+10+5)
2	Discipline Specific Elective (DSE)	6	$(6 \times 5) + (6 \times 1) = 36$	75 (60+10+5)
3	Skill Enhancement (SEC)	4	$4 \times 2 = 8$	75 (60+10+5)
4	Ability Enhancement Compulsory Course (AECC)	2	$2 \times 2 = 4$	100 (80+15+5) (AE-I)
				50 (35+10+5) (AE-II)
		24	120	1800

SEMESTER-1

Subject Course No.	Syllabus Code	Alpha Numeric Code	Course	Credit
MAT 14 AE-I	AE-I		Env. Sc.	2
MATP 11 DSC	DSC Paper 1	MATHPDSC1	Calculus and Geometry	5+1
	DSC		Other Department	5+1
	DSC		Other Department	5+1

SEMESTER-2

Subject Course No.	Syllabus Code	Alpha Numeric Code	Course	Credit
MATP 24 AE-I	AE-I		Env. Sc.	2
MATP 21 DSC	DSC Paper 2	MATHPDSC2	Algebra	5+1
	DSC		Other Department	5+1
	DSC		Other Department	5+1

SEMESTER-3

Subject Course No.	Syllabus Code	Alpha Numeric Code	Course	Credit
MATP 31 DSC	DSC Paper 3	MATHPDSC3	Real Analysis	5+1
	DSC		Other Department	5+1
	DSC		Other Department	5+1
MATP 33 SEC	SEC SEM 3 Paper 1	MATHP3SEC1	Logic & Sets/ C++	2

SEMESTER-4

Subject Course No.	Syllabus Code	Alpha Numeric Code	Course	Credit
MATP 41 DSC	DSC Paper 4	MATHPDSC4	D.E & Vector Calculus	5+1
	DSC		Other Department	5+1
	DSC		Other Department	5+1
MATP 43 SEC	SEC SEM 4 Paper 2	MATHP4SEC2	Theory of Equations/ Number Theory	2

SEMESTER-5

Subject Course No.	Syllabus Code	Alpha Numeric Code	Course	Credit
MATP 52 DSE	DSE Paper 1	MATHPDSE1	Mechanics/ Group Theory and Linear Algebra	5+1
	DSE		Other Department	5+1
	DSE		Other Department	5+1
MATP 53 SEC	SEC SEM 5 Paper 1	MATHP5SEC1	Probability and Statistics/ Differential Geometry	2

SEMESTER-6

Subject Course No.	Syllabus Code	Alpha Numeric Code	Course	Credit
MATP 62 DSE	DSE Paper 2	MATHPDSE2	Metric Spaces and Complex Analysis/ Linear Programming	5+1
	DSE		Other Department	5+1
	DSE		Other Department	5+1
MATP 63 SEC	SEC SEM 6 Paper 2	MATHP6SEC2	Graph Theory/ Boolean Algebra and Automata Theory	2

DETAILED SYLLABUS

SEMESTER-2

Subject Course No.	Syllabus Code	Alpha Numeric Code	Course	Credit
MATP 24 AE-I	AE-I		Env. Sc.	2
MATP 21 DSC	DSC Paper 2	MATHPDSC2	Algebra	5+1
	DSC		Other Department	5+1
	DSC		Other Department	5+1

MATP 24 DSC Paper 2 (MATHPDSC2): ALGEBRA

6 Credits

Unit 1

Polar form of complex numbers, n^{th} roots of unity, De Moivre's theorem (statement only) and its applications.

Theory of equations: Relation between roots and coefficients, transformation of equation, Descartes rule of signs, cubic and biquadratic equation.

Inequality: The inequality involving $AM \geq GM \geq HM$, Cauchy-Schwartz inequality (statement) and its application.

Unit 2

Equivalence relations, Functions, Composition of functions, Invertible functions, Congruence relation between integers. Principles of mathematical induction, Statement of Fundamental Theorem of Arithmetic.

Unit 3

Row reduction and echelon forms, Rank of matrix, Eigen values, Eigen vectors, Cayley-Hamilton theorem and its use in finding the inverse of a matrix. Solution of system of linear equations $Ax = b$ by using row reduced echelon form.

Reference Books

- Titu Andreescu and Dorin Andrica, Complex Numbers from A to Z, Birkhauser, 2006
- Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory, 3rd Ed., Pearson Education (Singapore) P. Ltd., Indian Reprint, 2005.
- David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.
- K. B. Dutta, Matrix and linear algebra.
- K. Hoffman, R. Kunze, Linear algebra.
- W. S. Burnstine and A. W. Panton, Theory of equations.

SEMESTER-4

Subject Course No.	Syllabus Code	Alpha Numeric Code	Course	Credit
MATP 41 DSC	DSC Paper 4	MATHPDSC4	D.E & Vector Calculus	5+1
	DSC		Other Department	5+1
	DSC		Other Department	5+1
MATP 43 SEC	SEC SEM 4 Paper 2	MATHP4SEC2	Theory of Equations/ Number Theory	2

MATP 41 DSC PAPER 4 (MATHPDSC4): DE & VECTOR CALCULUS

6 Credits

Unit 1

Lipschitz condition and Picard's Theorem (Statement only), General solution of homogeneous equation of second order, Wronskian, Linear homogeneous and non-homogeneous equations of higher order with constant coefficients, Euler's equation, Method of undetermined coefficients, Method of variation of parameters.

Unit 2

System of linear differential equations, Types of linear systems, Differential operators, An operator method for linear systems with constant coefficients, Homogeneous system of two linear equations with constant coefficients in two unknown functions.

Unit 3

Introduction to vector functions, Operations with vector-valued functions, Limits and continuity of vector functions.

Reference Books

- C. H. Edwards and D. E. Penny, Differential Equations and Boundary Value problems Computing and Modeling, Pearson Education India, 2005.
- S. L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, India, 2004.
- Martha L Abell, James P Braselton, Differential Equations with MATHEMATICA, 3rd Ed., Elsevier Academic Press, 2004.
- Murray, D., Introductory Course in Differential Equations, Longmans Green and Co.
- Boyce and Diprima, Elementary Differential equations and boundary Value problems, Wiley.
- G. F. Simmons, Differential Equations, Tata McGraw Hill.
- Marsden, J., and Tromba, Vector Calculus, McGraw Hill.
- Maity, K. C. and Ghosh, R. K. Vector Analysis, New Central Book Agency (P) Ltd. Kolkata.
- M. R. Spiegel, Schaum's outline of Vector Analysis.

MATP 43 SEC Paper 2 (MATHP4SEC2): THEORY OF EQUATIONS

2 Credits

Unit 1

Polynomials, Divisional algorithm (statement only), Process of Synthetic division, Statement of Fundamental Theorem of Algebra, Nature of roots of an equation, Rolle's Theorem (statement only), Descartes' rule of signs, Separation of the roots of equations, Relation between the roots and the coefficients of equations and its application in symmetric function of the roots.

Unit 2

Transformation of equations, Solutions of reciprocal and binomial equations, Algebraic solutions of a cubic equation by Cardon's method and a biquadratic equation by Ferrari's method, Finding the number of real roots of a polynomial in a given interval using Strum's algorithm.

Reference Books

- W.S. Burnside and A.W. Panton, The Theory of Equations, Dublin University Press, 1954.
- C. C. MacDuffee, Theory of Equations, John Wiley & Sons Inc., 1954.

OR

MATP 43 SEC Paper 2 (MATHP4SEC2): NUMBER THEORY

2 Credits

Unit 1

Diophantine equation, Gaussian integers, Euclidean Algorithm for GCD, linear representation of GCD, primes and factorizations, consequences of unique prime factorization, linear Diophantine equation.

Unit 2

Congruence arithmetic, Linear congruence, Chinese remainder theorem, inverse mod p , Fermat's little Theorem, congruence theorem of Wilson and Lagrange, Divisibility and primes in \mathbb{Z} and $\mathbb{Z}[i]$. Conjugates, division in $\mathbb{Z}[i]$.

Reference Books

- Elements of Number Theory, John Stillwell, Springer, 2003.
- An introduction to theory of numbers, Niven and Zuckerman, Wiley 1991.
- David M. Burton, Elementary Number Theory, 6th Ed., Tata McGraw-Hill (Indian) 2007.
- Neville Robinns, Beginning Number Theory, 2nd Ed., Narosa Publishing House Pvt. Ltd., Delhi, 2007.

SEMESTER-6

Subject Course No.	Syllabus Code	Alpha Numeric Code	Course	Credit
MATP 62 DSE	DSE Paper 2	MATHPDSE2	Metric Spaces and Complex Analysis/ Linear Programming	5+1
	DSE		Other Department	5+1
	DSE		Other Department	5+1
MATP 63 SEC	SEC SEM 6 Paper 2	MATHP6SEC2	Graph Theory / Boolean Algebra and Automata Theory	2

MATP 62 DSE Paper 2 (MATHPDSE2): METRIC SPACES AND COMPLEX ANALYSIS

6 Credits

Unit 1

Metric spaces: Definition and examples, Open and closed balls, neighbourhood, open set, interior of a set, Limit point of a set, closed set, diameter of a set, dense sets, subspaces, separable spaces, Sequences in metric spaces, Cauchy sequences, Complete metric spaces, Cantor's theorem.

Unit 2

Basic properties of complex numbers, Limits, continuity, regions in the complex plane, functions of complex variable, Derivatives, Cauchy-Riemann equations, sufficient conditions for differentiability.

Unit 3

Analytic functions, examples of analytic functions, derivative and integral of functions, Cauchy integral formula (statement only) and its applications.

Reference Books

- S. Kumaresan, Topology of Metric Spaces, 2nd Ed., Narosa Publishing House, 2011.
- G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill, 2004.
- James Ward Brown and Ruel V. Churchill, Complex Variables and Applications, 8th Ed., McGraw – Hill International Edition, 2009.
- S. Ponnusamy, Foundations of Complex analysis.
- Joseph Bak and Donald J. Newman, Complex Analysis, 2nd Ed., Undergraduate texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.
- E. M. Stein and R. Shkrachi, Complex Analysis, Princeton University Press.

OR

MATP 62 DSE Paper 2 (MATHPDSE2): LINEAR PROGRAMMING

6 Credits

Unit 1

Introduction to linear programming problem and their formulation. Graphical solution, Optimal solution and unboundedness, Basic feasible solutions, convex sets, Simplex method in tableau format, Big-M method.

Unit 2

Transportation problem and its mathematical formulation, northwest-corner method, least cost method and Vogel approximation method. Assignment problem and its mathematical formulation, Hungarian method for solving assignment problem.

Unit 3

Formulation of two persons zero sum games, solving two persons zero sum games including mixed strategies only.

Reference Books

- Hamdy A. Taha, Operations Research, An Introduction, 8th Ed., Prentice-Hall India, 2006.
- G. Hadley, Linear Programming, Narosa Publishing House, New Delhi, 2002.

MATP 63 SEC Paper 2 (MATHP6SEC2): GRAPH THEORY

2 Credits

Unit 1

Definition, examples and basic properties of graphs, Paths, Shortest paths, Cycles, Tree, Spanning tree, Complete graphs, Bipartite graphs, Isomorphism of graphs.

Unit 2

Representation of a graph by matrix, Adjacency matrix, Incidence matrix, Weighted graph. Eulerian circuits, Eulerian graph, Hamiltonian cycles.

Reference Books

- B.A. Davey and H.A. Priestley, Introduction to Lattices and Order, Cambridge University Press, Cambridge, 1990.
- Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory, 2nd Edition, Pearson Education (Singapore) P. Ltd., Indian Reprint 2003.

- Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice-Hall of India Pvt. Ltd., New Delhi.
- Reinhard Diestel, Graph Theory, Springer-Verlag, 2000.

OR

**MATP 63 SEC PAPER 2 (MATHP6SEC2): BOOLEAN ALGEBRA
AND AUTOMATA THEORY**

2 Credits

Unit 1

Definition, examples and basic properties of ordered sets, duality principle, lattices as ordered sets, lattices as algebraic structures, sublattices, Modular and distributive lattices.

Unit 2

Boolean algebra, Boolean polynomials, minimal and maximal forms of Boolean polynomials, Karnaugh diagrams, Logic gates, switching circuits and their applications.

Unit 3

Introduction: Alphabets, strings and languages, Finite automata, Regular expressions, Regular languages and their relationship with finite automata.

References Books

- B. A. Davey and H. A. Priestley, Introduction to Lattices and Order, Cambridge University Press, Cambridge 1990.
- Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory, (2nd Ed.), Pearson Education (Singapore) P. Ltd., Indian Reprint 2003.
- J. E. Hopcroft, R. Motwani and J. D. Ullman, Introduction to Automata Theory, Languages and Computation, 2nd Ed., Addison-Wesley, 2001.
- J. A. Anderson, Automata Theory with Modern Appl., Cambridge University Press, 2006.

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