CODE	COURSE TITLE
18MSPC101	LINEAR ALGEBRA

Category	CIA	ESE	L	T	P	Credit
Core	25	75	72	3	-	3

Preamble

To develop the capability among students for handling the concepts of Algebra of linear transformations, polynomials and to prepare students to learn about bilinear forms.

Prerequisite

- Knowledge in transformation, determinants, characteristic functions and polynomials

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of linear transformations and its representation by matrices	K2
CO2	Discuss the concepts of polynomials and prime factorization of a polynomial	K2
CO3	Demonstrate the properties of determinants and characteristics values	K3
CO4	Analyze the concept of triangulation, diagonalization and decomposition	K4
CO5	Evaluate the concepts of various bilinear forms	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	S	S	M	S	M
CO3	S	S	M	M	S
CO4	S	S	S	M	S
CO5	S	M	M	S	M

S – Strong; M – Medium; L-Low

UNIT I   **(15 hrs.)**

Linear transformations: linear transformations –the algebra of linear transformations – isomorphism – representation of transformations by matrices – linear functionals.

UNIT II   **(15 hrs.)**

Polynomials: Algebras – The Algebra of Polynomials – Lagrange Interpolation – Polynomial Ideals – The Prime Factorization of a Polynomial.

UNIT III   **(15 hrs.)**

Determinants: Commutative Rings – Determinant Functions – Permutations and the Uniqueness of Determinants – Additional Properties of Determinants. **Elementary Canonical Forms:** Introduction - Characteristic Values – Annihilating Polynomials – Invariant Subspaces.

UNIT IV   **(15 hrs.)**

Elementary Canonical Forms: Simultaneous Triangulation and Simultaneous Diagonalization – Direct Sum Decompositions - Invariant Direct Sums – The Primary Decomposition Theorem. **The Rational and Jordan Forms:** Cyclic Subspaces and Annihilators – Cyclic Decompositions and The Rational Form – The Jordan Form.

UNIT V   **(15 hrs.)**

Bilinear Forms: Bilinear Forms – Symmetric Bilinear Forms – Skew-Symmetric Forms – Groups Preserving Bilinear Forms.

Text Book

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Kenneth Hoffman and Ray Kunze.	Linear Algebra	Prentice Hall of India Private Limited, New Delhi	1971, 2nd Edition

Unit	Chapter	Sections
I	3	3.1 to 3.5
II	4	4.1 to 4.5
III	5	5.1 to 5.4
	6	6.1 to 6.4
IV	6	6.5 to 6.8
	7	7.1 to 7.3
V	10	10.1 to 10.4

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Gilbert Strang	Linear Algebra	Wellesley – Cambridge Press	2009, 4th Edition
2.	Kumaresan. S	Linear Algebra	Prentice Hall of India Ltd, New Delhi	2000, 1st Edition
3.	I. N. Herstein	Topics in Algebra	John Wiley & Sons, New York	2007, 2nd Edition

Web Resources

1. http://faculty.atu.edu/mfinan/algebra2.pdf

2. http://joshua.smcvt.edu/linearalgebra/book.pdf

3. https://www.math.ucdavis.edu/~linear/linear-guest.pdf
4. http://nptel.ac.in/courses/111108098/
5. http://nptel.ac.in/courses/111106051/
6. https://ocw.mit.edu/courses/mathematics/18-06sc-linear-algebra-fall-2011/

Pedagogy

Lecture, PPT, Group Discussion, Seminar and Viva-Voce

- Question Paper Setters Confine to the above Text Book only.

CODE	COURSE TITLE
18MSPC102	REAL ANALYSIS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	86	4	-	4

Preamble

　　To introduce the concept of Riemann Stieltjes integral, Lebesgue Measure, Lebesgue Integral, uniform convergence and also to work comfortably with continuity, Integration and differentiation. To make the students to understand the concept and notion of pure Mathematics in a logical fashion.

Prerequisite

- Knowledge in real fields, Euclidean space, continuity and connectedness

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire the knowledge of countable sets, uncountable sets and compact sets in metric spaces	K2
CO2	Apply the concept of continuity and compactness in metric spaces	K3
CO3	Demonstrate Riemann Stieltjesintegral and examine the properties of integration and differentiation	K4
CO4	Analyze the convergence in sequences and series	K4
CO5	Evaluate the concepts of linear transformation in vector spaces	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	M	S
CO2	S	S	M	S	M
CO3	M	S	S	M	S
CO4	S	M	M	M	S
CO5	M	S	S	S	M

S – Strong; M – Medium; L–Low

Syllabus

UNIT I **(18hrs.)**

Basic Topology: Finite, Countable and Uncountable Sets – Metric Spaces – Compact Sets.

UNIT II **(18 hrs.)**

Continuity: Limits of Functions – Continuous Functions – Continuity and Compactness – Continuity and Connectedness – Discontinuities – Monotonic Functions – Infinite Limits and Limits at Infinity.

UNIT III **(18 hrs.)**

Riemann Stieltjes Integral: Definition and Existence of the Integral – Properties of the Integral – Integration and Differentiation – Integration of Vector-Valued Functions – Rectifiable Curves.

UNIT IV **(18 hrs.)**

Sequences and Series of Functions: Uniform Convergence and Continuity – Uniform Convergence and Integration – Uniform Convergence and Differentiation – Equicontinuous Families ofFunctions – The Stone Weierstrass Theorem.

UNIT V **(18 hrs.)**

Functions of Several Variables: Linear Transformations – Differentiation – The Contraction Principle – The Inverse Function Theorem – The Implicit Function Theorem.

Text Book

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Walter Rudin	Principles of Mathematical Analysis	McGraw-Hill Education (India) Private Limited	2013, 3rd Edition,

Unit	Chapter	Sections
I	2	Page no 24 – 40
II	4	Page no 83 – 98
III	6	Page no 120 – 137
IV	7	Page no 147 – 165
V	9	Page no 204– 227

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Bartle R.G	Elements of Real Analysis	John wiley and sons, New York	1976, 2nd Edition
2.	Rudin W.	Real and complex Analysis	McGraw- Hill, New York	1986, 3rd Edition
3.	Tom M. Apostal	Mathematical Analysis	Narosa Publishing House	2002, 2nd Edition

Web Resources

1. http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH_REAL_ANALYSIS.PDF

2. http://nptel.ac.in/courses/nptel_download.php?subjectid=111105069

3. http://npteldownloads.nptel.ac.in/downloads/download3gp.php?subjectId=111105069&
   filename=mod01lec39.3gp&subjectName=Riemann/Riemann%20Stieltjes%20Integral

4. http://www.ddegjust.ac.in/studymaterial/msc-math/mal-512.pdf

Pedagogy

Lecture, PPT, Quiz, Group Discussion and Seminar

- Question Paper Setters Confine to the above Text Book only.

CODE	COURSE TITLE
18MSPC103	ORDINARY DIFFERENTIAL EQUATIONS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	87	3	-	4

Preamble

To equip the students to study in-depth concepts and applications of differential equations. Differential Equations play a very important role in all modern scientific and engineering studies.

Prerequisite

- Knowledge in differential equations and initial value problems

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Obtain series solutions for second order ordinary differential equations both at ordinary and regular singular points	K2
CO2	Construct systems of linear differential equations and identify the uniqueness	K3
CO3	Demonstrate the solution of non-homogeneous linear systems and the properties linear system with constant and periodic coefficients	K3
CO4	Analyze the existence and uniqueness solution of initial value problems	K4
CO5	Determine the oscillations of second order equations	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	S	M	S	M	S
CO3	S	S	M	S	S
CO4	S	S	S	S	M
CO5	S	S	S	S	M

S – Strong; M – Medium; L – Low

Syllabus

UNIT I   (**18   hrs.**)
Solutions in Power Series: Second Order Linear Equations with Ordinary Points – Legendre Equation and Legendre Polynomials – Second Order Equations with Regular Singular Points-Bessel Functions.

UNIT II   (**18 hrs.**)
Systems of Linear Differential Equations: Systems of First Order Equations – Existence and Uniqueness Theorem –Fundamental Matrix.

UNIT III   (**18 hrs.**)
Systems of Linear Differential Equations: Non-homogeneous Linear Systems – Linear Systems with Constant Coefficients - Linear Systems with Periodic Coefficients.

UNIT IV   (**18 hrs.**)
Existence and Uniqueness of Solutions: Picard'sSuccessive Approximations – Picard's Theorem – Some Examples– Continuation and Dependence on Initial Conditions–Existence of Solutions in the Large – Existence and Uniqueness for Systems.

UNIT V   (**18 hrs.**)
Oscillations of Second Order Equations: Introduction – Sturm's Comparison Theorem – Elementary Linear Oscillations. Comparison Theorem of Hille-Winter – Oscillations of $x'' + a(t)x = 0$.

Text Book

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Deo S.G., Raghavendra V., RasmitaKar, Lakshmikanthan V.	Textbook of Ordinary Differential Equations	Tata McGraw – Hill Publishing company Limited, New Delhi	2015, 3rdEdition

Unit	Chapter	Sections
I	6	6.2 - 6.5
II	5	5.2, 5.4, 5.5
III	5	5.6 - 5.8
IV	2	2.3 - 2.8
V	7	7.1 - 7.5

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Coddington E.A. Levinson N.	Theory of Ordinary Differential Equations	McGraw Hill	1955, 1st Edition
2.	Sanchez D.A.	Ordinary Differential Equations and Stability Theory	W.H.Free man and co	1968, 1st Edition
3.	Nandhakumaran A.K Datti P.S Raju K. George	Ordinary Differential Equations Principles and Applications	Cambridge University Press	2017, 1st Edition

Web Resources

1. https://www.khanacademy.org/math/differential-equations/first-order-differential-equations

2. http://mathworld.wolfram.com/OrdinaryDifferentialEquation.html

3. http://www.math.psu.edu/tseng/class/Math251/Notes-2nd%20order%20ODE%20pt1.pdf

4. http://nptel.ac.in/courses/111105038/

Pedagogy

Lecture, PPT, Quiz, Group Discussion, Seminarand Case Study

- Question Paper Setters Confine to the above Text Book only.

CODE	COURSE TITLE
18MSPC104	NUMBER THEORY

Category	CIA	ESE	L	T	P	Credit
Core	20	55	72	3	-	3

Preamble

Introduction to elementary Number Theory has been introduced toshow how certain number theoretical theorems can be applied to solve perfect numbers and to enable the students to learn the detailed aspects of theory of numbers and identify certain number theoretic functions & their properties.

Prerequisite

- Knowledge in divisibility, groups, rings and greatest integer function

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of divisibility and primes	K2
CO2	Solve the congruences of different degrees	K2
CO3	Demonstrate about power residue, multiplicative groups, rings and fields	K3
CO4	Discuss the ideas about quadratic residues and Jacobi symbol	K4
CO5	Analyze the concepts of greatest integer function and recurrence functions	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	M	S	M	S
CO3	S	S	M	M	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S – Strong; M – Medium; L–Low

Syllabus

UNIT I (15 hrs.)

Divisibility: Introduction, Divisibility, Primes.

UNIT II (15 hrs.)

Congruences: Solutions of Congruences - Congruences of Degree 1 - The function $\phi(n)$ - Congruences of Higher Degree - Prime Power Moduli–Prime Modulus.

UNIT III (15 hrs.)

Congruences: Congruences of Degree 2 - Prime Modulus - Power Residues - Number Theory from an Algebraic View Point - Multiplicative Groups - Rings and Fields - Quadratic Residues.

UNIT IV (15 hrs.)

Quadratic Reciprocity: Quadratic Reciprocity - The Jacobi Symbol - Greatest Integer Function.

UNIT V (15 hrs.)

Some Functions of Number Theory: Arithmetic Functions-The Moebius Inversion Formula - The Multiplication of Arithmetic Function - Recurrence Functions.

Text Book

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	HerbertsZucherman, Ivan Nivan	An Introduction to Theory of Numbers	John Wiley, New York	1972

Unit	Chapter	Sections
I	1	1.1 to 1.3
II	2	2.1 to 2.7
III	2,3	2.8 to 2.11 & 3.1
IV	3,4	3.2, 3.3 & 4.1
V	4	4.2 to 4.5

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Apostol T.M.	Introduction to Analytic number Theory	Springer Verlag	1976
2.	George E. Andrews	Number Theory	Hindustan Publishing Corporation New Delhi	1989
3.	Kennath, Rosan	Elementary Number Theory and Its Application Linear Algebra	Addision Wesley Publishing Company	1968

Web Resources

1.https://freevideolectures.com/course/3027/cryptography-and-network-security/3

2. https://books.google.co.in/books?id=eVwvvwZeBf4C&printsec=frontcover
&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

3. https://www.khanacademy.org/computing/computer-science/cryptography/
modarithmetic/a/congruence-modulo

4. https://ocw.mit.edu/courses/mathematics/18-785-number-theory-i-fall-2017/lecture-
notes/MIT18_785F17_lec27.pdf

Pedagogy

Lecture, PPT, Quiz, Group Discussion, Seminar and Case Study

- Question Paper Setters Confine to the above Text Book only.

CODE	COURSE TITLE
18MSPC105	MATHEMATICAL PROGRAMMING

Category	CIA	ESE	L	T	P	Credit
Core	20	55	72	3	-	3

Preamble

To study about the different methods of solving optimization problems in the area of Linear and Non-Linear Programming and helps to know the methods of using Operations Research techniques in decision making. It plays a very important role in all modern scientific and engineering studies.

Prerequisite

- Knowledge in Linear and Non-Linear Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of Graphical, Simplex and Dual methods.	K2
CO2	Obtain solutions for Integer Programming and Gomory cutting plane Algorithm.	K2
CO3	Solve integer linear programming and dynamic programming problems.	K3
CO4	Analyze the concepts of constrained and unconstrained problems.	K4
CO5	Compare the algorithms of constrained and unconstrained in non-linear programming problems.	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	S	M	M
CO3	S	M	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	M

S – Strong; M – Medium; L – Low

Syllabus

UNIT I (15 hrs.)
Modeling with Linear Programming: Introduction to L.P- Graphical L.P.Solution- Simplex Method.**The Simplex Method And Sensitive Analysis**: L.P.Solution Space in Equation Form-Transition from Graphical to Algebra Solution-The Simplex Method-Artificial Starting Solution-Special Cases in Simplex Method Applications. **Duality and Post Optimal Analysis:** - Primal and Dual-Relationships-Additional Simplex Algorithm for L.P.

UNIT II (15 hrs.)

Advanced Linear Programming: Generalized Simplex Table in Matrix Form–Matrix Definition of Dual Problem- Optimal Dual Solution. **Integer Linear Programming**:-Integer Programming Algorithm-Gomory Cutting Plane Algorithm.

UNIT III (15 hrs.)

Integer Linear Programming: Branch and Bound Algorithm- Solution of the Traveling Sales Person Problem-**Deterministic Dynamic Programming**: Recursive Nature of Computation in D.P.-Forward and Backward Recursion.

UNIT IV (15 hrs.)

Classical Optimization Theory: Unconstrained Problems-Necessary and Sufficient Conditions-The Newton-Raphson Method-Constrained Problems-Equality Constraints (Jacobi Method and Lagrangian Method).

UNIT V (15 hrs.)

Non-Linear Programming: Unconstrained Algorithms-Direct Search Method-Gradient Method-Constrained Algorithms-Separable Programming-Quadratic Programming.

Text Book

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	HamdyA.Taha	Operations Research	Prentice Hall of India Pvt.Ltd., New Delhi	2006, 8th Edition

Unit	Chapter	Sections
I	2	2.2
	3	3.1 to 3.5, Omit 3.3.3
	4	4.2& 4.4
II	7	7.1.2, 7.4
	9	9.2.2.
III	9	9.2.1 & 9.3 Omit 9.3.1 – 9.3.3.
	10	10.1& 10.2
IV	18	18.1, 18.2.1. Omit 18.2.2
V	19	19.1, 19.2.1, 19.2.2

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Hiller F.S., Lieberman J.	Introduction to Operation Research	Tata – McGraw Hill Publishing Company, New Delhi	2001, 7th Edition
2.	KantiSwarup, Gupta P.K., ManMohan	Operations Research	Sultan Chand and sons Publishers, New Delhi	2005, 12th Edition

1. www.nptel.ac.in/courses/111105039/

2. https://www.pdfdrive.net/operations-research-e26549089.html

3. https://ocw.mit.edu/courses/sloan-school-of-management/15-053-optimization-methods-in-management-science-spring-2013/lecture-notes/

4. https://www.khanacademy.org/math/multivariable-calculus/applications-of-multivariable-derivatives/lagrange-multipliers-and-constrained-optimization/v/lagrange-multipliers-using-tangency-to-solve-constrained-optimization

Pedagogy

Lecture, PPT, Quiz, Group Discussion and Seminar

- Question Paper Setters Confine to the above Text Book only.

SEMESTER I

Non Major Elective Paper - 1

NUMERICAL APTITUDE AND REASONING

Instructional Hrs: 45   **Sub.Code:18MSPN101**

Max. Marks : CIA 25; ESE 75   **Credits: 5**

Objective: To Introduce the Concepts of Mathematics with Emphasis on Analytical Ability andComputational Skills Needed in Competitive Examinations.

UNIT I   **(9 hrs.)**

Numbers – Problems on Numbers – Surds & Indices – Partnership – Problems.

UNIT II   **(9 hrs.)**

Time & Work - Time and Distance – Problems on Trains –Problems.

UNIT III   **(9 hrs.)**

Calendar – Clocks – Stocks and Shares – Problems.

UNIT IV   **(9 hrs.)**

Permutations and Combination – Probability – True Discount –Problems.

UNIT V   **(9 hrs.)**

Odd Man Out and Series – Analytical Reasoning – Problems.

TEXT BOOK

FOR UNIT I – IV

Aggarwal R.S., *Quantitative Aptitude*, S Chand& company Ltd, New Delhi, 2007.

Unit I	:	Pg.No. 3 – 29, 161 – 178, 195 – 207, 311 – 321
Unit II	:	Pg No. 341 – 365, 384 – 401, 405 - 417
Unit III	:	Pg. No. 593 – 612
Unit IV	:	Pg.No. 613 – 636

FOR UNIT V

1. **Aggarwal R.S.**, *Quantitative Aptitude*, S Chand& company Ltd, New Delhi, 2007.

2. **Aggarwal R.S.,** *A Modern Approach to Non Verbal Reasoning,* S Chand& company Ltd, New Delhi.

| Unit V | : | Pg.No. 649 – 657 |
| | | Pg.No. 241 – 266 |

REFERENCE BOOKS

1. **AbhijitGuha,***Quantitative Aptitude for Competitive Examinations*, Tata McGraw – Hill Publishing Company Ltd, New Delhi, 3rd Edition , 2008.
2. **Bharat Jhunjhunwala,***Quantitative Aptitude*, S. Chand &Company Ltd, New Delhi, 2008.
3. **Trishna**, *Quantitative Aptitude*, Pearson Education, New Delhi, 2nd Edition, 2009.
   - Data Sufficiency Type Questions should be omitted.

CODE	COURSE TITLE
18MSPC206	ALGEBRA

Category	CIA	ESE	L	T	P	Credit
Core	25	75	86	4	-	4

Preamble

To develop the capability among students for handling abstract concepts and to provide the students with experience in Axiomatic Mathematics while keeping in close touch with the computational aspects of the subject and to prepare students to understand principles, concepts necessary to formulate, solve and analyze Algebra.

Prerequisite

- Acquire basic knowledge in groups, rings and fields

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify the basic ideas of algebra including the concepts of groups and direct products.	K2
CO2	Understand the concept of a particular Euclidean ring and other forms of polynomial rings.	K2
CO3	Demonstrate knowledge of the structures of fields and extension fields	K3
CO4	Appreciate the concept of Galois theory and finite fields	K4
CO5	Compose clear and accurate proofs using the concepts of linear transformations	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	S	S	S
CO3	S	S	M	M	S
CO4	S	M	S	S	S
CO5	S	S	S	S	S

S – Strong; M – Medium; L - Low

Syllabus

UNIT I (18 hrs.)
Group Theory: Another Counting Principle – Sylow's Theorem - *Direct Products*.
Unit II (18 hrs.)
Ring Theory: Euclidean Rings –A Particular Euclidean Ring –*Polynomial Rings* – Polynomials Over the Rational Field.

Unit III   **(18 hrs.)**
Fields: Extension Fields – *Roots of Polynomials* – More About Roots.
Unit IV   **(18 hrs.)**
Fields: Elements of Galois Theory - *Finite Fields*.
Unit V   **(18 hrs.)**
Linear Transformations: Canonical Forms: Triangular Form – *Trace and Transpose* – Hermitian, Unitary and Normal Transformations.

Text Book

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Herstein I.N.	Topics in Algebra	John Wiley & Sons, New York	2007, 2ndEdition

Unit	Chapter	Sections
I	2	2.11 to 2.13
II	3	3.7 to 3.10
III	5	5.1, 5.3 and 5.5
IV	5	5.6
	7	7.1
V	6	6.4, 6.8 and 6.10

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Artin M.	Algebra	Prentice – Hall, Engleword Cliff	1991, 1stEdition
2.	Fraleigh J.B.	A First Course in Abstract Algebra	Narosa Publishing House, New Delhi	1988
3.	Herstein I.N.	Abstract Algebra	Prentice - Hall, New Delhi	1996, 3rd Edition

Web Resources

1. https://ocw.mit.edu/courses/mathematics/18-703-modern-algebra-spring-2013/lecture-notes/MIT18_703S13_pra_l_1.pdf

2. http://math.umaine.edu/~weiss/NotesonAbstractAlgebra2013.pdf

3. http://www.cs.cmu.edu/~elaw/files/grouptheory.pdf

4. http://nptel.ac.in/courses/106104149/2

5. https://www.khanacademy.org/math/algebra/introduction-to-algebra/overview-hist-alg/v/origins-of-algebra

Pedagogy

Lecture, PPT, Quiz, Group Discussion, Seminar and Viva-Voce

- Question Paper Setters Confine to the above Text Book only.

CODE	COURSE TITLE
18MSPC207	COMPLEX ANALYSIS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	86	4	-	4

Preamble

To study Cauchy's integral formula, local properties of analytic functions and harmonic functionsand to introduce the concepts and to develop working knowledge on conformality, series and product developments and conformal mapping of polygons.

Prerequisite

- Basic knowledge in analysis, Cauchy's Integral formulas and skill to solve definite integrals

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand analytic functions, rational functions and elementary Riemann surfaces.	K2
CO2	Apply Cauchy's theorem for a rectangle and disk.	K2
CO3	Derive the calculus of residues and harmonic functions.	K3
CO4	Determine series and product development, partial fractions and factorization.	K4
CO5	Evaluate Riemann mapping, conformal mapping of polygons and rectangle.	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	S	M	S	M
CO3	S	S	M	M	S
CO4	S	S	S	M	S
CO5	S	M	M	S	M

S – Strong; M – Medium; L - Low

Syllabus

UNIT I (18 hrs.)

Introduction to the Concept of Analytic Function: Limits and Continuity –Analytic Functions – Polynomials – Rational Functions – **Conformality**: Arcs and Closed Curves – Analytic Functions in Regions – Conformal Mapping – Length and Area – **Linear Transformations** : The Linear Group – The Cross Ratio – Elementary Riemann Surfaces.

UNIT II (18 hrs.)

Complex Integration: Line Integrals - Rectifiable Arcs – Line Integrals as Functions ofArcs– Cauchy's Theorem for a Rectangle – Cauchy's Theorem in a Disk. **Cauchy's Integral Formula**: The Index of a Point with Respect to a Closed Curve – The Integral Formula – Higher Derivatives- Removable Singularities, Taylor's Theorem – Zeros and Poles – The Local Mapping – The Maximum Principle.

UNIT III (18 hrs.)

The Calculus of Residues: The Residue Theorem – The Argument Principle – Evaluation of Definite Integrals. **Harmonic Functions**: The Definitions and Basic Properties – Mean Value Property – Poisson's Formula.

UNIT IV (18 hrs.)

Series and Product Developments: Weierstrass Theorem – The Taylor Series – The Laurent Series – **Partial Fractions and Factorization**: Partial Fractions – Infinite Products – Canonical Products.

UNIT V (18 hrs.)

The Riemann Mapping Theorem: Statement and Proof – Boundary Behaviour – Use of The Reflection Principle – Analytic Arcs – **Conformal Mapping of Polygons**: The Behaviour at an Angle – The Schwarz – Christoffel Formula – Mapping on a Rectangle.

Text Book

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ahlfors L.V.	Complex Analysis	McGraw Hill	2006, 3rd Edition

Unit	Chapter	Sections
I	2	1.1 – 1.4
	3	2.1 – 2.4, 3.1, 3.2 and 4.3
II	4	1.1 – 1.5, 2.1 – 2.3, 3.1 – 3.4 and 4.1
III	4	5.1 – 5.3, 6.1 – 6.3
IV	5	1.1 – 1.3, 2.1 – 2.3
V	6	1.1 – 1.4, 2.1 – 2.3

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ponnusamy S.	Foundations of Complex Analysis	Narosa publishing house	2002
2.	Rudin W.	Real and Complex Analysis	McGraw Hill International Editions	1987, 3rd Edition
3.	Theodore W.Gamelin	Complex Analysis	Springer, New York	2006

Pedagogy

Lecture, PPT, Quiz, Group Discussion and Seminar

- Question Paper Setters Confine to the above Text Book only.

CODE	COURSE TITLE
18MSPC208	PARTIAL DIFFERENTIAL EQUATIONS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	86	4	-	4

Preamble

Partial Differential Equationsarise in every field of Science and Engineering and so the solutions of the partial differential equations are of great interest in understanding various physical phenomena and to study non-linear partial differential equations of first order, Equations with variable coefficients.

Prerequisite

- Knowledge in partial differential equations with initial and boundary conditions

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Obtain solutions for non-linear partial differential equations using Cauchy's, Charpit's and Jacobi's Method.	K2
CO2	Understand the concept of differential equations with constant and variable coefficients and solve them.	K2
CO3	Demonstrate the knowledge of linear hyperbolic equations and the method of integral transforms.	K3
CO4	Analyze the boundary value problems and solve them by using separation of variables.	K4
CO5	Compose clear and accurate proofs using the concepts of Partial Differential Equations	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	M	S
CO2	M	S	S	S	S
CO3	S	M	S	S	S
CO4	S	S	S	M	S
CO5	S	S	M	S	S

S – Strong; M – Medium; L – Low

UNIT I (18 hrs.)

Partial Differential Equations of the First Order: Nonlinear Partial Differential Equations of the First Order – Cauchy's Method of Characteristics - Compatible Systems of First Order Equations – Charpit's Method – Special Types of First Order Equations – Jacobi's Method.

UNIT II (18 hrs.)

Partial Differential Equations of Second Order: The Origin of Second-Order Equations – Linear Partial Differential Equations with Constant Coefficients – Equations with Variable Coefficients – Characteristic Curves of Second-Order Equations – Characteristics of Equations in Three Variables.

UNIT III (18 hrs.)

Partial Differential Equations of the Second Order: The Solution of Linear Hyperbolic Equations – Separation of Variables – The Method of Integral Transforms.

UNIT IV (18 hrs.)

Laplace's Equation: The Occurrence of Laplace's Equation in Physics- Elementary Solutions of Laplace's Equation – Families of Equipotential Surfaces – Boundary Value Problems – Separation of Variables – Problems with Axial Symmetry.

UNIT V (18 hrs.)

The Wave Equation: The Occurrence of Wave Equation in Physics – Elementary Solutions of the One-Dimensional Wave Equation. **The Diffusion Equation**: Elementary Solutions of Diffusion Equation – Separations of Variables.

Text Book

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ian Sneddon N.	Elements of Partial Differential Equations	McGraw - Hill book company	1957, 1st Edition

Unit	Chapter	Sections
I	2	7,8,9,10,11 and 13
II	3	1,4,5,6 and 7
III	3	8, 9 and 10
IV	4	1, 2,3,4,5 and 6
V	5	1 and 2
	6	3 and 4

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Raisinghania M.D.	Ordinary and Partial Differential Equations	S.Chand& company Ltd.	2013, 18th Edition
2.	Evans C.	ParitalDifferential Equations	Ams, Providence RI	2003, 2nd Edition
3.	Sharma, Keharsingh J.N.	Differential Equations for Engineers and Scientists	Narosa Publishing house	2000, 1st Edition

Web Resources

1.www.nptel.ac.in/courses/111103021/

2. https://www.pdfdrive.net/partial-differential-equations-e20521421.html

3. https://ocw.mit.edu/courses/mathematics/18-152-introduction-to-partial-differential-equations-fall-2011/

4.https://www.khanacademy.org/math/differential-equations/second-order-differential-equations/linear-homogeneous-2nd-order/v/2nd-order-linear-homogeneous-differential-equations-1

Pedagogy

Lecture, PPT, Quiz, Group Discussion, Seminar and Case Study

- Question Paper Setters Confine to the above Text Book only.

CODE	COURSE TITLE
18MSPC209	MATHEMATICAL STATISTICS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	86	4	-	4

Preamble

To enable the students to learn the different aspects of Statistics that provides them a systematic knowledge to analyze, organize and it helps to interpret different statistical methods.

Prerequisite

- Knowledge in Random variables and distributions

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of marginal and conditional distributions	K2
CO2	Apply the ideas of mathematical expectation and chebyshev's inequality to solve problems	K3
CO3	Determine the Poisson, Binomial, Normal and Gamma distributions	K4
CO4	Analyze chi-square, t distributions and their applications	K4
CO5	Evaluate significance test and theory of estimation	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	M	S	M	S	S
CO3	S	M	S	M	S
CO4	S	S	S	S	S
CO5	S	M	S	S	M

S – Strong; M – Medium; L– Low

UNIT I **(18 hrs.)**

Random Events: Preliminary Remarks- Random Events and Operations Performed on them-The System of Axioms of the Theory of Probability-Conditional Probability- Bayes Theorem-Independent Events-**Random Variables:** The Concept of a Random Variables – The Distribution Function- Random Variables of the Discrete Type and Continuous Type-Functions of Random Variables-Multidimensional Random Variables- Marginal Distributions – Conditional Distributions-Independent Random Variables-Functions of Multidimensional Random Variables.

UNIT II **(18 hrs.)**

Parameters of The Distribution of A Random Variable: Expected Values- Moments- The Chebyshev Inequality- Absolute Moments. **Characteristic Functions**: Properties of Characteristic Functions- The Characteristic Function and Moments. Semi-Invariants- The Characteristic Function of the Sum of Independent Random Variables - Determination of the Distribution Function by the Characteristic Function – Probability - Generating Functions.

UNIT III **(18 hrs.)**

Some Probability Distributions: One Point and Two Point Distributions- The Bernolli Scheme. The Binomial Distribution- The Poisson Distribution- The Uniform Distribution-The Normal Distribution- The Gamma Distribution-The Beta Distribution-The Cauchy and Laplace Distributions- **Limit Theorems:** Preliminary Remarks- Stochastic Convergence-Bernoulli's Law of Large Numbers - The Levy-Crammer Theorem.

UNIT IV **(18 hrs.)**

Some Probability Distributions: The De Moivre Laplace Theorem-The Lindeberg- Levy Theorem. **Sample Moments And Their Functions**: The Notion of a Sample- The Notion of a Statistic- The Distribution of the Arithmetic Mean of Independent Normally Distributed Random Variables- The χ^2 Distribution- The Distribution of The Statistic (X, S) – Student's t-Distribution.

UNIT V **(18 hrs.)**

Significance Test: The Concept of Statistical Tests- Parametric Tests for Small Samples-Parametric Tests for Large Samples- The χ^2 test- Independent Test By Contingency Tables-**The Theory of Estimation**: The Preliminary Notions- Consistent Estimates- Unbiased Estimates- The Sufficiency of an Estimate- The Efficiency of an Estimate- Asymptotically-Most Efficient Estimates- Methods of Finding Estimates.

Text Book

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	MarekFisz	Probability Theory and Mathematical Statistics	John Wiley, New York	1980

Unit	Chapter	Sections
I	1	1.1-1.3, 1.5-1.7
	2	2.1-2.9
II	3	3.1-3.4
	4	4.1-4.5, 4.7
III	5	5.1-5.2, 5.5-5.10
	6	6.1-6.3, 6.6
IV	6	6.7, 6.8
	9	9.1-9.6
V	12	12.1-12.4, 12.7
	13	13.1-13.7

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Anderson T.W.,	Introduction to Multivariate Statistical Analysis	John Wiley, New York	2003, 3rd Edition
2.	Bharucha-Reid A.T.,	Elements of the Theory of MarkovProcesses and their Applications	McGraw Hill, New York	1997, 4th Edition
3.	Deming W.E.,	Some Theory of Sampling,	John Wiley, New York	1966, 7th Edition

Web Resources

1.http://nptel.ac.in/courses/nptel_download.php?subjectid=111105041

2. https://www.khanacademy.org/math/ap-statistics

3. https://ocw.mit.edu/courses/mathematics/18-655-mathematical-statistics-spring-2016/

4. https://www.researchgate.net/publication/272237355_Probability and Mathematical_Statistics

Pedagogy

Lecture, PPT, Quiz, Group Discussion, Seminar and Case Study

- Question Paper Setters Confine to the above Text Book only.

CODE	COURSE TITLE
18MSPCP01	PROGRAMMING IN PYTHON

Category	CIA	ESE	L	T	P	Credit
Core Practical	-	50	-	-	45	2

Preamble

To enable the students to understand the concepts of Python Programming to gain practical knowledge in Sets and Probability, Statistics and Data with graphs. Also Python uses dynamic typing and the combination of reference counting and a cycle-detecting garbage collection for memory management.

Prerequisite

Knowledge in C and C++.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Formulate the program for differential equations	K2
CO2	Visualize Statistics with graphs	K3
CO3	Show the pictorial results from sets and probability	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	M	S	S	M
CO3	S	S	M	S	M

S – Strong; M – Medium; L –Low

List of Programs

1. Write a program to create a class and object in Python.
2. Write a program to create Probabilistic graphical method.
3. Write a program to calculate mean, median and mode.
4. Write a program to find the variance and standard deviation.

5. Write a program to find the correlation coefficient.

6. Write a program to find the probability of a prime number appearing when a 20 sided die is rolled.

7. Write a program for conversion from temperature Celsius to Fahrenheit.

8. Write a program to draw a graph which shows the relationship between gravitational force and distance between two bodies.

9. Write a program to draw the trajectory of a body in projectile motion.

10. Write a program for finding the roots of quadratic function.

11. Write a program to solve a system of two equations.

12. Write a program to solve the initial value problem using Runge - Kutta method.

13. Write a program to solve ordinary differential equation using Python.

14. Write a program to solve partial differential equation using Python.

CODE	COURSE TITLE
18MSPS201	ADVANCED MULTI – SKILL DEVELOPMENT PAPER

Category	CIA	ESE	L	T	P	Credit
Skill Based Subject	40	60	43	2	-	5

Preamble

To equip the students with knowledge on all topics as desirable from the point of view of brilliant success in the competitive examinations and to familiarize the students with Interpersonal skills, Group Discussion and Interview Techniques.

Prerequisite

- Knowledge about general awareness, numerical aptitude and logical reasoning

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of General Awareness and Scientific Aptitude.	K2
CO2	Apply Logical Reasoning	K3
CO3	Analyze Numerical Reasoning and Quantitative Aptitude	K4
CO4	Identify and improve the skills in PPT, interview, abstract writing and counseling	K3
CO5	Discuss the movement and gestures to be avoided in Group Discussion and study about online services.	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	M	M
CO2	M	S	S	M	S
CO3	S	S	M	M	S
CO4	S	S	M	S	M
CO5	S	S	M	S	S

S – Strong; M – Medium; L – Low

Syllabus

UNIT I (9 hrs.)

Communication: Question tags - Gerund and Infinitives - Spotting the errors - Synonyms - Antonyms - One word substitution - Sentence completion - Prepositions - Articles.

General Awareness and Scientific Aptitude: Socio - Economic - Banking - Basic Sciences. People and Environment, Politics and Current Affairs, Higher Education, Information and Communication Technology, Teaching Aptitude, Research Aptitude.

UNIT II (9 hrs.)

Logical Reasoning : Syllogism - Statement Conclusions - Statement Arguments - Statement Assumptions - Statement Courses of Action - Inference - Cause and Effect - Visual Reasoning - Direction Sense Test - Blood Relation - Coding and Decoding - Deductive Reasoning.

UNIT III (9 hrs.)

Numerical Reasoning and Quantitative Aptitude: Age - speed - Heights and Distance - Time and Distance - Ratio and Proportion - Percentage - Fraction - Profit and Loss - Interest - Average - Calendar - Clocks - Probability - Series - Venn Diagram - Data Interpretation.

UNIT IV (9 hrs.)

Self Introduction- Presentation Skills - Presentation through Power point - Soft Skills - Interpersonal Skills - Employability Skills Training - Resume Preparation - Preparation for interview.**Interview Techniques:** Meaning of Interview - Types of Interview - Advantages - Limitations - Unstructured interview - merits & Demerits of Interview - How to make interview successful.

UNIT V (9 hrs.)

Group Discussion - Importance - Types of GD - GD Skills - GD Etiquette (do's and don'ts) - Essential elements of a GD - Movements and gestures to be avoided in a GD - Online Services.

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Agarwal.R.S	Quantitative Aptitude	S. Chand and Company	2012, Reprint
2.	Chopra.J.K	Bank Probationary Officers' Examination	Unique Publishers	2010
3.	Datason. R.P, Manish Arora and Gulati.SW.L	Clerical Cadre Recruitment in State Bank ofIndia	Newlight Publishers	2013
4.	DavinderKaur Bright	Railway Recruitment Board	Bright Publications	2010
5.	Lal, Jain and Vashishtha, K.C	UGC NET/JRF/SET Teaching and Research Aptitude	Upkar Prakashan Publishers	2012
6.	PratyogitaDarpan	UGC NET/JRF/SET Teaching and Research Aptitude	Upkar Prakashan Publishers	2012
7.	Sharma.J.K	IBPS Recruitment of Bank Clerical Cadre Examination	Unique Publishers	2013
8.	Tara Chand	General Studies for Civil Services Preliminary Examinations, Paper -I	TataMcGraw Hill Education Private Ltd	2013

9.	Hari Mohan Prasad and Uma Rani Sinha	Objective English for Competitive Examinations	Tata McGraw Hill Education Private Ltd	2011
10.	Jain T.S.	Upkar's SBI Clerical Cadre Recruitment Examination	UpkarPrakashan	2010
11.	R.Pannerselvam	Research Methodology	Prentice Hall of India, Private Limited, New Delhi	2005
12.	Dr.P.Ravilochanan	Research Methodology with Business Correspondence and Report Writing	Margham Publications, Chennai	2002

Web Resources

1. http://www.write.com/writing-guides/research-writing/research-process/primary-research-methods-interviewing-techniques-and-tips/
2. http://howtogiveselfintroductionininterview.blogspot.in/2012/03/how-to-give-self-introduction-in.html
3. https://www.softwaretestinghelp.com/how-to-crack-the-gd/

Pedagogy

Lecture, PPT, Quiz, Assignment, Group Discussion and Seminar

- Question Paper Setters Confine to the above Text Book only.