CLUSTER UNIVERSITY: KURNOOL

BOARD OF STUDIES IN MATHEMATICS

(As per the new regulations of NEP 2020, APSCHE w.e.f. 2023-2024 Admitted Batch)

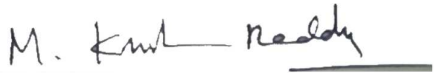
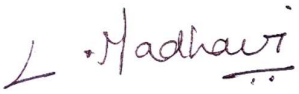
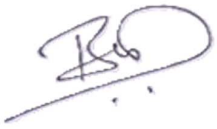
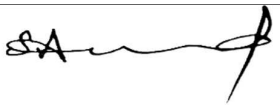
V, VI, VII, VIII SEMESTER

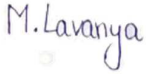
CURRICULUM FOR B.Sc. MATHEMATICS

(MAJOR & MINOR)

CLUSTER UNIVERSITY, KURNOOL
BOARD OF STUDIES in MATHEMATICS
(BSc. Mathematics Major and Minor Curriculum w.e.f. 2023-24)

Constitution of the Board of Studies in Mathematics

S. No	Name & Designation	Acted as	Signatures
1	Sri. M. Krishna Reddy, Lecturer in Mathematics, Govt. Degree College for Men, Kurnool. Mobile: 9390475868	Chairman	
2	Prof. D. Bharathi, Dept. of Mathematics, S.V. University, Tirupati-517 502, A.P Mobile: 9440343888; Email: bharathikavali@gmail.com	University Nominee	
3	Dr. N.Ch. Bhatracharyulu, Dept. of Statistics, Osmania University, University College of Science, Hyderabad-500007,T.S Mobile: 9553417182; Email: dwarakbhat@osmania.ac.in	Subject Expert	
4	Dr.L.Madhavi, Associate Professor, Dept. of Applied Mathematics, Yogi Vemana University, Kadapa-516 005, A.P. Mobile: 9441593301; Email: lmadhaviyvu@yvu.edu.in	Subject Expert	
5	Smt.T.Sunitha, Lecturer in Mathematics, KVR Govt. College for Women, Kurnool. Mobile: 9441544148	Member	
6	Dr P. Obulesu Dept. of Mathematics, Silver Jubilee Govt College, Kurnool-518002, A.P Mobile: 9704668326 Email:obulesu1977@gmail.com	Member	
7	Sri. S. Anand, School Assistant in Mathematics, Govt Boys High School, B-Camp, Kurnool	Alumni Silver Jubilee Govt. College	
8	Smt. S. Shahanaz Begum Lecturer in Mathematics, St. Joseph Degree College, Kurnool	Alumni KVR Govt. College for Women	

9	Sri. K.Sreenivasulu, Assistant Professor in Mathematics, Pullaiah Engineering College and Technology, Kurnool, AP. Mobile: 7893932318; ksreenivas158@gmail.com	Alumni Govt. Degree College for Men	
10	Bessetty Dinesh , III MPC Silver Jubilee Govt. College, Kurnool	Representative from Students	
11	B. Suhasini, III MPCs KVR Govt.Degree College for Women, Kurnool	Representative from Students	
12	M.Lavanya, III MPCs Govt. Degree College for Men, Kurnool.	Representative from Students	

MINUTES OF BOARD OF STUDIES

Board of Studies meeting in Mathematics held on 21-02-2025 in virtual mode using Google Meet platform under the chairmanship of Sri M. Krishna Reddy, In-charge of Dept. Mathematics, Govt. College for Men, Kurnool and discussed on the proposed curriculum and required changes as per the structure provided by the Cluster University and following the guidelines of APSCHE for the single major subjects.

RESOLUTIONS

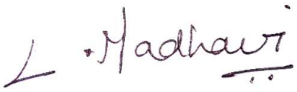
The members of BOS in Mathematics met on 21-02-2025 in virtual mode under the chairmanship of Sri M. Krishna Reddy, In-charge of Dept. Mathematics, Govt. College for Men, Kurnool, discussed the proposals on the curriculum for the BSc. Mathematics Major and Minor and passed the following resolutions.

The following resolutions are made and passed unanimously.

1. Resolved to approve the APSCHE syllabus for B.Sc. Mathematics Major and Minor Semester-V to VIII. The revised syllabus will come into effect from the academic year 2023- 2024 for B.Sc. Mathematics Major and Minor Semester-V to VIII.
2. As per APSCHE Course Structure for B.Sc. Mathematics Major, one elective from A or B should be chosen for Course 14 to Course 25.
3. As per APSCHE Course Structure in Semester-V there are two common courses for both single Major and Minor i.e., Core Course - 12(major)/5(minor), Core Course - 13(major)/6(minor) and two more papers for single major mathematics i.e., Core Course -14A or 14B, Core Course -15A or 15B.
4. As per APSCHE Course Structure, Semester-VI is allotted for Semester Internship/Apprentice-ship with 12 Credits
5. In Semester – VII, there are five courses for single major mathematics - Those are Course -16A or 16B to Course -20A or 20B
6. In Semester – VIII, there are five courses for single major mathematics - Those are Course -21A or 21B to Course -25A or 25B
7. As per B.Sc. (Honours) with Single Major Curriculum framework, there are two IKS: Indian Knowledge Systems - Audit Courses one in Semester – VII and one in Semester – VIII
8. As per B.Sc. (Honours) with Single Major Curriculum framework, there are two OOTC: Open Online Transdisciplinary Courses one in Semester – VII and one in Semester – VIII
9. Resolved to approve the syllabus and blue print for Semester End examination question paper for Course 12, 13, 14A, 14B, 15A, 15B, 16A, 16B, 17A, 17B, 18A, 18B, 19A, 19B, 20A, 20B, 21A, 21B, 22A, 22B, 23A, 23B, 24A, 24B, 25A, 25B for Mathematics Major, for Course 5,6 for Mathematics Minor and the syllabus of Two IKS Courses for Mathematics Major from the academic year 2023-2024, as prescribed in the proforma in Annexure III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, XIV, XV, XVI, XVII, XVIII, XIX, XX, XXI, XXII, XXIII, XXIV, XXV, XXVI, XXVII, XXVIII, XXIX.
10. Resolved to approve the Evaluation Pattern of Courses (Except IKS Courses) for B.Sc. Mathematics Major and Minor in Sem-V, VII and VIII, the Semester End examination is for 70 Marks, and the internal assessment is for 30 marks.
    The division for 30 marks is as follows.

i. For Internal Assessment Examinations -20 marks (Average of two to be taken).
ii. For any two of Seminars/Viva/ Assignments/Quiz -5 Marks and for Attendance -5 Marks
iii. Total Internal Assessment Marks = 20 + 10 = 30.

11. Resolved to approve the Blue Print of Question paper and Question paper pattern of Semester End Exam (Except IKS Courses) for B.Sc. Mathematics Major and Minor Semester V, VII VIII, from the academic year 2023-24 as prescribed in the proforma in Annexure - I.
12. Resolved to approve the Question paper pattern of internal assessment exam (Except IKS Courses) for B.Sc. Mathematics Major and Minor Semester V, VII VIII, from the academic year 2023-24 as prescribed in the proforma in Annexure - II.
13. Resolved to approve the Evaluation, Question Paper Pattern of IKS Courses in Sem-VII and VIII, the only Semester End examination is for 50 Marks and question paper pattern may be descriptive or objective.
14. Justification report for the syllabus of Course 12, 13, 14A, 14B, 15A, 15B, 16A, 16B, 17A,17B,18A,18B,19A,19B,20A,20B,21A, 21B, 22A, 22B, 23A, 23B, 24A, 24B, 25A and 25B for Mathematics Major and for Course 5,6 for Mathematics Minor from the academic year 2023-2024 as prescribed in the proforma Annexure - XXX
15. Resolved to recommend the panel of examiners and paper setters as prescribed in the proforma in Annexure - XXXI from the academic year 2023-24.
16. It is resolved that the BOS chairman is authorized to change in any modification in future according to the instructions of VC, Cluster University, Kurnool.



B.Sc. Mathematics (Major)
COURSES STRUCTURE (Sem-V to Sem-VIII)
(w.e.f. 2023-24)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits	IA	EA	Total
III	V	12	Linear Algebra & Problem Solving Sessions	5	4	30	70	100
		13	Vector Calculus & Problem solving Sessions	5	4	30	70	100
		14A	Functions of a complex variables & Problem solving Sessions	5	4	30	70	100
		OR						
		14B	Advanced Numerical Methods & Problem Solving Sessions	5	4	30	70	100
		15A	Number Theory & Problem Solving Sessions	5	4	30	70	100
		OR						
		15B	Mathematical Statistics & Problem Solving sessions	5	4	30	70	100
	VI	Semester Internship/Apprenticeship with 12 Credits						
IV	VII	16A	Algebra	5	4	30	70	100
		OR						
		16B	Classical Mechanics	5	4	30	70	100
		17A	Real Analysis	5	4	30	70	100
		OR						
		17B	Discrete Mathematics	5	4	30	70	100
		18A	Basic Topology	5	4	30	70	100
		OR						
		18B	Cryptography	5	4	30	70	100
		SEC						
		19A	Lattice Theory & Boolean Algebra	5	4	30	70	100
		OR						
		19B	Finite Element Analysis	5	4	30	70	100
		20A	Graph Theory	5	4	30	70	100

		OR						
		20B	Mathematical Finance	5	4	30	70	100
		IKS-1		2	0	0	50	50
	VIII	21A	Advanced Algebra	5	4	30	70	100
		OR						
		21B	Elements of Elasticity & Fluid Dynamics	5	4	30	70	100
		22A	Advanced Analysis	5	4	30	70	100
		OR						
		22B	Advanced Linear Algebra	5	4	30	70	100
		23A	Advanced Topology	5	4	30	70	100
		OR						
		23B	Differential Geometry	5	4	30	70	100
		SEC						
		24A	Ordinary Differential Equations	5	4	30	70	100
		OR						
		24B	Applications of Algebra	5	4	30	70	100
		25A	Operation Research	5	4	30	70	100
		OR						
		25B	Mathematical Modelling	5	4	30	70	100
		IKS-2		2	0	0	50	50

Programme: B.Sc. Mathematics Major (w.e.f. AY 2023-24)

B.Sc. Mathematics (Minor)
COURSES STRUCTURE (Sem-V)
Programme: B.Sc. Mathematics Minor (w.e.f. AY 2023-24)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits	IA	EA	Total
III	V	5	Linear Algebra & Problem Solving Sessions	5	4	30	70	100
		6	Vector Calculus & Problem solving Sessions	5	4	30	70	100

ANNEXURE –I

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

SEMESTER END EXAM QUESTION PAPER PATTERN FOR SEM-V, VII & VIII
(w.e.f. 2023-24)

Time: 3 Hrs **Max. Marks:**70 M

PART-A

Answer any FIVE questions. Each question carries 4 marks. 5QX4M= 20M.

1.

2.

3.

4.

5.

6.

7.

8.

(Two questions from 3 Units and One from each remaining 2 units)

PART-B

Answer ALL questions. Each question carries 10 marks. 5QX10M = 50M

9.(a)

(or)

(b)

10.(a)

(or)

(b)

11.(a)

(or)

(b)

12.(a)

(or)

(b)

13.(a)

(or)

(b)

(Set ONE question from each Unit-I, II, III, IV, V with internal choice)

ANNEXURE -II

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

INTERNAL ASSESMENT EXAM PATTERN
(w.e.f. 2023-24)

1.There will be two internal assessment examinations of each 20 marks. Average of two to be taken.

2.The first and second internal assessment consists of two sections.

- Two questions out of Four to be answered. Each question carries 5 marks
- One question out of two to be answered. Each question carries 10 marks.
- Duration 45 minutes.
- Total marks: 10+10 = 20 marks

3. Any two of Seminars/Viva/ Assignments/Quiz for 5 Marks and Attendance for 5 marks.

Total Internal Assessment Marks = 20 M + 10 M = 30 Marks.

* The above pattern stands for Semester-V, Semester-VII & Semester-VIII.

ANNEXURE -III

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 12 for Major Mathematics
COURSE 5 for Minor Mathematics
LINEAR ALGEBRA
SEMESTER-V

Theory **Credits: 4** **5 hrs/week**

Course Outcomes:

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

1. understand the concepts of vector spaces, subspaces.
2. understand the concepts of basis, dimension and their properties.
3. understand the concept of linear transformation and its properties.
4. apply Cayley- Hamilton theorem to problems for finding the inverse of a matrix and Higher powers of matrices without using routine methods.
5. learn the properties of inner product spaces and determine orthogonality in inner product spaces.

Course Content:

UNIT – I

Vector Spaces-I

Vector Spaces - General properties of vector spaces - n-dimensional Vectors - addition and scalar multiplication of Vectors - internal and external composition - Null space - Vector subspaces -Algebra of subspaces - Linear Sum of two subspaces - linear combination of Vectors- Linear span Linear independence and Linear dependence of Vectors.

UNIT –II

Vector Spaces-II

Basis of Vector space - Finite dimensional Vector spaces - basis extension - co-ordinates- Dimension of a Vector space - Dimension of a subspace - Quotient space and Dimension of Quotient space.

UNIT –III

Linear Transformations

Linear transformations - linear operators- Properties of L.T - Determination of Linear Transformations - sum and product of L.Ts - Algebra of Linear Operators - Range and null space of linear transformation - Rank and Nullity of linear transformations - Rank- Nullity Theorem.

UNIT –IV

Eigen Values and Eigen Vectors

Characteristic (Eigen) equation – Characteristic (Eigen) Values – Characteristic (Eigen) vectors of square matrix - Cayley Hamilton Theorem – Problems on Cayley Hamilton Theorem.

UNIT –V

Inner product space

Inner product spaces- Euclidean and Unitary spaces- Norm or length of a Vector- Schwartz inequality-Triangle Inequality- Parallelogram law- Orthogonality- Orthonormal set- Problems on Gram– Schmidt orthogonalization process.

Activities:

Seminar/ Quiz/ Assignments/Applications of Linear Algebra in real life problems\ Problem Solving.

Text Books

1. A Textbook of B.Sc. Mathematics, Linear Algebra by V. Venkateswara Rao et. al. published by S Chand and Company Ltd.

Reference Books

1. Linear Algebra by Stephen H. Friedberg et. al. published by Prentice Hall of India Pvt. Ltd. 4th Edition, 2007.
2. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson education (low priced edition), New Delhi.
3. Matrices by Shanti Narayana, published by S.Chand Publications.
4. Linear Algebra by J.N. Sharma and A.R. Vasishtha, published by Krishna Prakashan Media (P) Ltd.
5. Matrices by A.R.Vasishtha and A.K.Vasishtha published by Krishna Prakashan Media (P) Ltd.

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN

COURSE 12 for Major Mathematics
COURSE 5 for Minor Mathematics
LINEAR ALGEBRA
SEMESTER-V

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Vector Spaces-I	2	2	28
II	Vector Spaces-II	1	2	24
III	Linear Transformations	2	2	28
IV	Eigen Values and Eigen Vectors	1	2	24
V	Inner product space	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -IV

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 13 for Major Mathematics
COURSE 6 for Minor Mathematics
VECTOR CALCULUS
SEMESTER-V

Theory **Credits: 4** **5 hrs/week**

Course Outcomes:

Students after successful completion of the course will be able to

1. learn multiple integrals as a natural extension of definite integral to a function of two variables in the case of double integral/three variables in the case of triple integral.
2. learn applications in terms of finding surface area by double integral and volume by triple Integral.
3. determine the gradient, divergence and curl of a vector and vector identities.
4. evaluate line, surface and volume integrals.
5. understand relation between surface and volume integrals (Gauss divergence theorem), relation between line integral and volume integral (Green's theorem), relation between line and surface integral (Stokes theorem).

Unit–1
Multiple Integrals-I

Introduction –Double integrals –Evaluation of double integrals –Properties of double integrals – Region of integration –double integration in Polar Co-ordinates – Change of variables in double integrals –change of order of integration.

Unit–2
Multiple Integrals-II

Triple integral –region of integration –change of variables -Plane areas by double integrals – surface area by double integral –Volume as a double integral, volume as a triple integral.

Unit–3
Vector differentiation

Vector differentiation – Ordinary derivatives of vectors – Differentiability – Gradient, Divergence and Curl operators – Vector Identities involving the operators.

Unit–4
Vector Integration

Vector integration- Line Integrals, Surface Integrals and Volume integrals with examples.

Unit–5
Vector integration applications

Gauss theorem - Green's theorem in plane - Stokes's theorem and their applications.

Activities:

Seminar/ Quiz/ Assignments/ Applications of Vector calculus to Real life Problems /Problem Solving Sessions.

Text Books:

1. A Textbook of B.Sc. Mathematics, Volume-III by V. Venkateswara Rao et. al. published by S Chand and Company Ltd.

Reference Books:

1. Vector Calculus by P.C.Matthews, Springer Verlag publications.
2. Vector Analysis by Murray Spiegel, Schaum Publishing Company, New York.
3. A Text Book of Higher Engineering Mathematics by B.S.Grewal, Khanna Publishers, 43rd Edition.

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN

COURSE 13 for Major Mathematics
COURSE 6 for Minor Mathematics
VECTOR CALCULUS
SEMESTER-V

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Multiple Integrals-I	2	2	28
II	Multiple Integrals-II	1	2	24
III	Vector differentiation	2	2	28
IV	Vector Integration	2	2	24
V	Vector integration applications	1	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -V

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 14A: FUNCTIONS OF A COMPLEX VARIABLE
SEMESTER-V

Theory **Credits: 4** **5 hrs/week**

Course Outcomes

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

1. determine a Bilinear transformation under given condition
2. know about continuity, compactness and connectedness of sets in complex plane
3. know the necessary condition and sufficient condition for f(z)to be analytic
4. know about the inverse of an analytic function
5. know about the convergence of sequences and the necessary & sufficient condition for a sequence to be convergent
6. know the power series expansion of elementary functions

Course Content

Unit – 1
Bilinear Transformations

Extended Complex Plane – Resultant and Inverse of a bilinear transformation – The linear group – Geometrical significance of the transformation. Angle preserving property of Bilinear Transformation– Determination of Bilinear transformations under given condition, some special bilinear transformations.

Unit – 2
Topological Considerations

Neighborhood of a point – Interior, exterior and frontier points of a set, open and closed sets. Connected sets, Domains and continua - a theorem on Nests of closed rectangular domains- Bolzano Weierstrass theorem- Hein-Borel theorem. Limits - algebraic operations with limits – continuity and uniform continuity – compactness – connectedness - Jordan curve theorem - connectedness of line segments and polygonal lines. Branch line and Branch point - Characterization of open connected sets by polygonal lines.

Unit – 3
Analytic functions

Differentiable functions of a complex variable - Geometrical representation of a variable - Analytic function- Elementary rules and chain rule - Derivatives of polynomials and rational

functions - The necessary and sufficient condition for $f(z)$ to be analytic - Analytic functions in a Domain – Derivative of w in polar form - Construction of $f(z)$.

Unit – 4

Inverse of an analytic function and infinite series

The inverse of an analytic function – neighborhood preserving mappings - Domain preserving and angle preserving property of analytic mappings. Convergent sequences, necessary and sufficient condition for a sequence to be convergent, Cauchy sequence, Convergence of infinite series. Cauchy general principle of convergence for a series. Absolute convergence of a series. Abel's and Dirichilet's tests. Rearrangement of series, product of series.

Unit – 5

Power Series

Power series - exponential, trigonometric and hyperbolic functions - zeros of $sin\ z$, $cos\ z$ periods of $sin\ z$, $cos\ z$, $E(z)$ - A law of logarithms - Analytic character of $log\ z$ - generalized a^b - Analytic character of z^n - $\text{Cos}^{-1}\ z$, $\text{Sin}^{-1}\ z$ and derivatives of $\text{Cos}^{-1}\ z$, $\text{Sin}^{-1}\ z$.

Activities

Seminar/ Quiz/ Assignments/ Applications of Functions of complex variables to Real life Problem /Problem Solving Sessions.

Text Book

1. Introductory complex analysis by Richard. A. Silverman, Dover publications. Inc. (1972), New York

Reference Books

1. Theory of Functions of a Complex Variable by A. I. Markushevich, Second Edition, AMS Chelsea Publishing
2. Theory And Applications by M. S. Kasara, Complex Variables, 2nd Edition, Prentice Hall India Learning Private Limited
3. Theory of Functions of a Complex variable by Shanti Narayan &Dr. P. K. Mittal, S. Chand &Company Ltd.

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 14A: FUNCTIONS OF A COMPLEX VARIABLE
SEMESTER-V

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Bilinear Transformations	2	2	28
II	Topological Considerations	1	2	24
III	Analytic functions	2	2	28
IV	Inverse of an analytic function and infinite series	1	2	24
V	Power Series	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -VI

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 14B: ADVANCED NUMERICAL METHODS
SEMESTER-V

Theory **Credits: 4** **5 hrs/week**

Course Outcomes

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

1. find derivatives using various difference formulae
2. understand the process of Numerical Integration
3. solve Simultaneous Linear systems of Equations
4. understand Iterative methods
5. find Numerical Solution of Ordinary Differential Equations

Course Content

UNIT – I
Numerical Differentiation

Derivatives using Newton's forward difference formula - Newton's backward difference formula- Derivatives using central difference formula - Stirling's interpolation formula - Newton's divided difference formula.

UNIT – II
Numerical Integration

General quadrature formula on errors - Trapezoidal rule – Simpson's 1/3 rule - Simpson's 3/8 rule- Weddle's rule - Euler-Maclaurin formula of summation and quadrature - The Euler transformation.

UNIT – III
Solution of Simultaneous Linear systems of Equations – I

Solution of linear systems - Direct Methods - Matrix inversion method – Gaussian elimination method- Gauss Jordan Method.

UNIT – IV
Solution of Simultaneous Linear systems of Equations – II

Method of factorization - solution of Tridiagonal systems - Iterative methods - Jacobi's method - Gauss - Siedal method.

UNIT – V

Numerical Solution of Ordinary Differential Equations

Introduction – solution of Taylor's series – Picard's method of successive approximations – Euler's method – Modified Euler's method – Runge-Kutta methods.

Activities

Seminar/ Quiz/ Assignments/ Applications of Numerical methods to Real life Problem /Problem Solving Sessions.

Text Book

1. Introductory Methods for Numerical Analysis by S.S. Sasri(4^{th} Edition)

Reference Books

1. Applied Numerical Analysis by Curtis F. Gerald and Patrick O. Wheatley, Pearson Publications.
2. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S .R. K. Iyengar and R. K. Jain, New Age International Publishers.
3. Numerical Analysis by G. Shanker Rao, New Age International Publications

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 14B: ADVANCED NUMERICAL METHODS
SEMESTER-V

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Numerical Differentiation	2	2	28
II	Numerical Integration	1	2	24
III	Solution of Simultaneous Linear systems of Equations – I	2	2	28
IV	Solution of Simultaneous Linear systems of Equations – II	1	2	24
V	Numerical Solution of Ordinary Differential Equations	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -VII

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 15A: NUMBER THEORY
SEMESTER-V

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. understand the fundamental theorem of arithmetic.
2. understand Mobius function, Euler quotient function, The Mangoldt function, Liouville's function, The divisor functions and the generalized convolutions.
3. understand Euler's summation formula, application to the distribution of lattice points and the applications to μ (n) and Λ (n).
4. understand the concepts of congruencies, residue classes and complete residues systems.
5. comprehend the concept of quadratic residues mod p and quadratic non residues mod p.

UNIT-I
The Fundament Theorem of Arithmetic

Introduction, Divisibility, Greatest common divisor, Prime numbers, The fundamental theorem of arithmetic, The series of reciprocals of the primes, The Euclidean algorithm, The greatest common divisor of more than two numbers.

UNIT-II
Arithmetical Functions and Dirichlet Multiplication

Introduction- The Mobius function $\mu(n)$ – The Euler quotient function $\varphi(n)$ - A relation connecting φ and μ - A product formula for $\varphi(n)$ - The Dirichlet product of arithmetical functions- Dirichlet inverses and the Mobius inversion formula- The Mangoldt function $\Lambda(n)$- multiplicative functions- multiplicative functions and Dirichlet multiplication- The inverse of a completely multiplicative function-Liouville's function $\lambda(n)$ - The divisor functions $\sigma_\alpha(n)$.

UNIT-III
Averages of Arithmetical Functions

Introduction- The big O notation. Asymptotic equality of functions- Euler's summation formulaSome elementary asymptotic formulas-The average order of $d(n)$- The average order of the divisor functions $\sigma_\alpha(n)$- The average order of $\varphi(n)$- An application to the distribution of lattice points visible from the origin- The average order of $\mu(n)$ and $\Lambda(n)$-The partial sums of a Dirichlet product Applications to $\mu(n)$ and $\Lambda(n)$.

UNIT-IV

Congruences

Definition and basic properties of congruences- Residue classes and complete residue systems. Linear congruences - Reduced residue systems and the Euler - Fermat theorem- Polynomial congruences modulo p. Lagrange's theorem - Applications of Lagrange's theorem- Simultaneous linear congruences. The Chinese remainder theorem - Applications of the Chinese remainder theorem

UNIT-V

Quadratic Residues and the Quadratic Reciprocity Law

Quadratic Residues, Legendre's symbol and its properties, Evaluation of $(-1/p)$ and $(2/p)$, Gauss lemma, The Quadratic reciprocity law, Applications of the reciprocity law, The Jacobi Symbol, Gauss sums and the quadratic reciprocity law.

Activities:

Seminar/ Quiz/ Assignments/ Applications of Number theory to Real life Problem /Problem Solving Sessions

Text Books:

1. Introduction to Analytic Number Theory by Tom. M. Apostal, Springer Verlag-New York, HeidalbergBerlin-1976.

Reference Books:

1. Elementary Number Theory by G.A.Jones and J.M.Jones, , Springer.
2. Elementary Number Theory by David, M. Burton, 2nd Edition UBS Publishers.
3. Number Theory by Hardy & Wright, Oxford Univ., Press.
4. Elements of the Theory of Numbers by Dence, J. B &Dence T.P, Academic Press.

******

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 15A: NUMBER THEORY
SEMESTER-V

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	The fundamental Theorem of Arithmetic	1	2	28
II	The Arithmetical Functions and Dirichlet multiplication	2	2	24
III	Averages of Arithmetical Functions	2	2	28
IV	Congruences	2	2	24
V	Quadratic residues and Quadratic Reciprocity law	1	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -VIII

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 15B: MATHEMATICAL STATISTICS

SEMESTER-V

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. understand the probability set function and conditional probability.
2. understand about random variables, discrete and continuous type distributions.
3. understand the distribution of two random variables and expectation of a random variables.
4. know binomial and related distributions.
5. normal distributions and the applications of normal distributions.

Unit – 1
Probability and Distributions

Sets – set functions – The probability set function – counting rules – additional properties of probability- conditional probability and independence – simulations.

Unit – 2
Probability and Distributions(continued)

Random Variables - Discrete Random Variables - Continuous Random Variables -Quantiles. Transformations - Expectation of a Random Variable - Computation for an Estimation of the Expected Gain - Some Special Expectations - Important Inequalities.

Unit – 3
Multivariate Distributions

Distributions of Two Random Variables - Marginal Distributions - Expectation – Transformations Bivariate Random Variables - Conditional Distributions and Expectations - Independent Random Variables - The Correlation Coefficient - Extension to Several Random Variables Multivariate Variance-Covariance Matrix- Transformations for Several Random Variables - Linear combinations of Random Variables.

Unit – 4
Some Special Distributions

The Binomial and Related Distributions - Negative Binomial and Geometric Distributions - multinomial Distribution- Hyper geometric Distribution - The Poisson Distribution - The Γ, $\chi 2$ and β Distributions.

Unit – 5

Normal Distribution

The Normal Distribution. - Bivariate Normal Distribution - The Multivariate Normal Distribution. General Case- Applications -t- and F Distribution.

Activities:

Seminar/ Quiz/ Assignments/ Applications of Mathematical statistics to Real life Problem /Problem Solving Sessions.

Text Book

1. Introduction to Mathematical Statistics by Robert V Hogg, Joseph W MacKeen, Eighth Edition, Allen T Craig, Pearson.

Reference Books

1. Fundamentals of Statistics by Goon A.M., Gupta M.K. and Dasgupta B., (2002) Vol. I &II, 8th Edn. The World Press, Kolkata.
2. Fundamentals Of Mathematical Statistics by Gupta, S. C. and Kapoor, V.K. (2008): 4th Edition (Reprint), Sultan Chand &Sons.
3. Mathematical Statistics with Applications by Miller, Irwin and Miller, Marylees(2006) John E.Freund's, (7th Edn.), Pearson Education, Asia.
4. Introduction to the Theory of Statistics by Mood, A.M. Graybill, F.A. and Boes, D.C.(2007), 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co.Ltd.

******

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 15B: MATHEMATICAL STATISTICS
SEMESTER-V

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Probability and Distributions	1	2	28
II	Probability and Distributions continued	2	2	24
III	Multivariate Distributions	2	2	28
IV	Some special Distributions	2	2	24
V	Normal Distribution	1	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -IX

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 16A: ALGEBRA
SEMESTER-VII

Theory **Credits:4** **5 hrs/week**

Learning Outcomes

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

1. Understand the direct product of groups and application of Sylow's theorems
2. Understand the homomorphic relation between the groups, sum and direct sum of ideals
3. Know factorizing the domains and factorization of polynomials
4. Know about submodules and direct sums
5. About Free modules and Representation of linear mappings

Course Content

UNIT-I
Structure theorems of groups

Conjugacy and G-set, Direct products - Finitely generated abelian groups - Invariants of a finite abelian group - Sylow theorems. (Section 5.4, Sections 8.1 to 8.4 of the Chapter 8 in the Prescribed Text Book.)

UNIT-II
Ideals and Homomorphisms

Ideals –Homomorphisms - Sums and direct sums of ideals - Maximal and prime ideals - Nilpotent and nil ideals-Zorn's lemma. (Sections 10.1 to10.6 of the Chapter 10 in the Prescribed Text Book.)

UNIT-III
Unique factorization domains and Euclidean domains

Unique factorization domains -Principal ideal domains - Euclidean domains - Polynomial rings over UFD (Sections 11.1 to 11.4 of the Chapter 11 in the Prescribed Text Book.)

UNIT IV
Modules and Vector Spaces

Definition and examples – Submodules and direct sums – R-homomorphisms and quotient modules (Sections 1,2& 3 of Chapter - 14)

UNIT V
Free Modules

Completely reducible modules – Free modules – Representation of linear mappings – Rank of linear mapping (Sections 4 to 7 of Chapter - 14)

Activities

Seminar/ Quiz/ Assignments/ Applications of Algebra to Real life Problem /Problem Solving

Text Book

1. Basic Abstract Algebra by P.B.Battacharya, S.K.jain, S.R.Nagpaul, Cambridge University Press.

Reference Book

1. Topics in Algebra by I.N.Herstein,2nd Edition,JohnWiley&Sons
2. Algebra by SergeLang, Revised Third Edition,Springer
3. Algebra by ThomasW.Hungerford, Springer

****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 16A: ALGBRA
SEMESTER-VII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Structure theorems of Groups	1	2	28
II	Ideals and Homomorphisms	2	2	24
III	Unique factorization Domains and Euclidean Domains	2	2	28
IV	Modules and Vector spaces	2	2	24
V	Free Modules	1	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M Total Marks = 70 M

ANNEXURE -X

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 16B: CLASSICAL MECHANICS
SEMESTER-VII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. Identify the basic concepts of mechanics and also learn applications of Lagrangian formulation.
2. Understand derivation of Lagrange's equations from Hamilton's principle and advantages of variational principle formulation
3. Understand the simplistic approach to canonical transformations,
4. Understand Poisson and Lagrange brackets and their invariance and the Hamilton Jacobi Equations for Hamilton's principal function
5. Understand special theory of relativity, Lorentz transformation and contractions and Lorentz transformations

Course Content

Unit-I
Lagrangian Formulation

Mechanics of a particle, mechanics of a system of particles, constraints, generalized coordinates generalized velocity, generalized force and potential. D'Alembert's principle and Lagrange's equations, some applications of Lagrangian formulation (scope and treatment as in Art.1.1 to 1.4 and Art 1.6 of Text book.1).

Unit-II
Hamilton's principle to non-holonomic systems

Hamilton's principle, derivation of Lagrange's equations from Hamilton's principle, extension of Hamilton's principle to non-holonomic systems, advantages of variational principle formulation, conservation theorems and symmetry properties (scope and treatment as in Art 2.1 and 2.3 to 2.6 of Text book.1).

Unit-III
Hamiltonian formulation

Legendre transformations and the Hamilton equations of motion, cyclic coordinates and conservation theorems, derivation of Hamilton's equations from a vibrational principle, the principle of least action, the equation of canonical transformation, examples of canonical transformation, the Harmonic Oscillator, the simplistic approach to canonical transformations (scope and treatment as in Art.8.1,8.2,8.5, 8.6 and 9.1 to 9.4 of Text book.1).

Unit-IV

Canonical transformations

Poisson and Lagrange brackets and their invariance under canonical transformation. Jacobi's identity; Poisson's Theorem. Equations of motion infinitesimal canonical transformation in the Poisson bracket formulation. Hamilton Jacobi Equations for Hamilton's principal function, The harmonic oscillator problem as an example of the Hamilton – Jacobi method, the Hamilton – Jacobi equation for Hamilton's characteristic function (scope and treatment as in Art 9.5, 9.6, 10.1, 10.2 and 10.3 of Text book.1)

Unit-V

Lorentz transformation equations

New concept of space and Time, postulates of special theory of relativity, Lorentz transformation equations, Lorentz contraction, Time dilation, simultaneity, Relativistic formulae for composition of velocities and accelerations, proper time, Lorentz transformations form a group (scope and treatment as in chapters 1 and 2 of Text book.2).

Activities

Seminar/ Quiz/ Assignments/ Applications of Classical Mechanics to Real life Problem /Problem Solving

Text books

1. Classical mechanics by H.Goldstein, 2nd edition, Narosa Publishing House.
2. Relevant topics from Special relativity by W.Rindler, Oliver & Boyd, 1960.

Reference Book

1. Classical Mechanics by J.C. Upadhyaya, Himalaya Publishing House

******

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 16B: CLASSICAL MECHANICS
SEMESTER-VII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Legrangian Formulation	2	2	28
II	Hamilton's principle to non-holonomic syatems	1	2	24
III	Hamiltonian formulation	2	2	28
IV	Canonical Transformations	1	2	24
V	Lorentz transformation equations	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -XI

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 17A: REAL ANALYSIS
SEMESTER-VII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. understand to form a metric space from any non-empty set, compact sets and connected sets
2. understand continuity of functions, compactness and connectedness
3. know the derivative of a real valued function and the applications of Mean value theorems
4. know the conditions for existence of integrals and some applications of integrals
5. know the vector valued functions, differentiation and integration of vector valued functions and their applications

UNIT I
Basic Topology

Finite, countable and uncountable sets – Metric spaces – Compact sets – Perfect sets –Connected sets (Sections 2.1 to 2.47 of Chapter - 2)

UNIT II
Continuity

Limits of functions - Continuous functions – Continuity and Compactness – Continuity and Connectedness – Discontinuities. Monotonic functions (Sections 4.1 to 4.31 of Chapter - 4)

UNIT III
Differentiation

The derivative of a real function – Mean Value Theorems – The continuity of Derivatives L'Hospital's Rule. (Sections 5.1 to 5.13 of Chapter - 5)

UNIT IV
Riemann Stieltjes Integrals

Definition and existence of integral – properties of integrals –. (Sections 6.1 to 6.19 of Chapter - 6)

UNIT V
FTC and Vector Valued Functions

Integration and differentiation -Differentiation of Vector Valued Functions – Integration of Vector valued functions – Rectifiable curves. (Sections 6.20 to 6.27 of Chapter - 6)
(FTC: Fundamental Theorem of Calculus)

Activities

Seminar/ Quiz/ Assignments/ Applications of Real Analysis to Real life Problem /Problem Solving

Text Book

1. Principles of Mathematical Analysis by Walter Rudin, Mc Graw Hill International Edition

Reference Book

1. Mathematical Analysis by S C Malik, Savita Arora New age International Publishers

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 17A: REAL ANALYSIS
SEMESTER-VII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Basic Topology	2	2	28
II	Continuity	2	2	24
III	Differentiation	2	2	28
IV	Riemann Stieltjes Integrals	1	2	24
V	FTC and Vector Valued Functions	1	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -XII

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 17B: DISCRETE MATHEMATICS
SEMESTER-VII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. learn the applications of graph theory in other subjects.
2. understand representations of different problems by means of graphs.
3. learn the relation between bipartite graphs and odd cycles.
4. learn the concepts of forest, binary trees, eccentricity of a vertex and radius of connected graphs.
5. learn the importance of multi graphs in other subjects like physics and chemistry.
6. learn different characterizations of modular and distributive lattices.

UNIT- I

Basic Ideas, History, Initial Concepts, Summary, Connectivity, Elementary Results, Structure Based on Connectivity (Chapters – 1 & 2 of Text Book 1)

Unit –II

Trees, Characterizations, Theorems on Trees, Tree Distances, Binary trees, Tree Enumeration, Spanning trees, Fundamental Cycles, Summary (Chapter – 3 of Text Book 1)

Unit – III

Traversability, Introduction, Eulerian Graphs, Hamiltonian Graphs, Minimal Spanning Trees, J.B.Kruskal's Algorithm, R.C.Prim's Algorithm. (Chapter 4 of Text Book 1 and Section 7.5 of Text Book 2)

Unit –IV

Poset Definition, Properties of Posets, Lattice Definition, Properties of Lattices (Chapter 1-A of Text Book 3)

Unit –V

Definitions of Modular and Distributive Lattices and its Properties (Chapter 1-B of Text Book 3)

Activities

Seminar/ Quiz/ Assignments/ Applications of Discrete Mathematics to Real life Problem /Problem Solving

Text books

1. Graph Theory Applications by L.R.Foulds, Narosa Publishing House, New Delhi.

2. Discrete Mathematical Structures by Kolman and Busby and Sharen Ross, Prentic Hall of India – 2000, 3rd Edition
3. Applied Abstract Algebra by Rudolf Lidl and Gunter Pilz , Published by Springer-Verlag.

Reference Book

1. A text Book of Discrete Mathematics by Harish Mittal, Vinay Kumar Goyal, Deepak Kumar Goyal, IK International Publishing House Pvt.Ltd, New Delhi.

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 17B: DISCRETE MATHEMATICS
SEMESTER-VII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	UNIT-I	2	2	28
II	UNIT-II	1	2	24
III	UNIT-III	2	2	28
IV	UNIT-IV	1	2	24
V	UNIT-V	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -XIII

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 18A: BASIC TOPOLOGY
SEMESTER-VII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. handle operations on sets and functions and their properties
2. understand the concepts of Metric spaces, open sets, closed sets, convergence, some important theorems like Cantor's intersection theorem and Baire's theorem
3. familiar with the concept of Topological spaces, continuous functions in more general and characterize continuous functions in terms of open sets, closed sets etc.
4. explain the concept of compactness in topological spaces characterize compactness in Metric spaces and their properties.

UNIT I
Sets and Functions

Sets and Set inclusion – The algebra of sets – Functions – Products of sets – Partitions and equivalence relations – Countable sets – Uncountable sets – Partially ordered sets and lattices. (Chapter I: Sections 1 to 8 of the prescribed text book).

UNIT-II
Metric spaces-I

The definition and some examples – Open sets – Closed sets – Convergence, Completeness and Baire's Theorem. (Chapter 2: Sections 9 to 12 of the prescribed text book).

UNIT-III
Metric spaces-II

Continuous mappings, Spaces of continuous functions – Euclidean and Unitary spaces. (Chapter 2: Sections 13 to15 of the prescribed text book) Topological spaces: The definition and some examples – Elementary concepts– (Chapter 3: Sections 16 to 17 of the prescribed text book).

UNIT-IV
Topological spaces

Open bases and open sub bases, Weak Topologies, The function algebras C(X, R) and C(X, C). (Chapter 3: Sections 18 to 20 of the prescribed text book). Compactness: Compact spaces – Heine – Borel theorem (Chapter 4: Section 21).

UNIT-V

Compactness

Product of Spaces – Tychonoff's theorem and locally Compact spaces – Compactness for metricspaces – Ascoli's theorem. (Chapter 4: Sections 22 to 25 of the prescribed text book).

Activities

Seminar/ Quiz/ Assignments/ Applications of Topology to Real life Problem /Problem Solving.

Text Book

1. Introduction to Topology and Modern Analysis by G. F. Simmons International Student edition – McGraw – Hill Ltd.

Reference Books

1. Schaum's Outlines: General Topology by Seymour Lipschutz
2. Topology: A first Course by James Munkres

******

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 18A: BASIC TOPOLOGY
SEMESTER-VII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Sets and Fuctions	2	2	28
II	Metric spaces-I	1	2	24
III	Metric spaces-II	2	2	28
IV	Topological spaces	1	2	24
V	Compactness	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -XIV

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 18B: CRYPTOGRAPHY
SEMESTER-VII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. understand Divisibility and Euclidean algorithm and congruences.
2. understand about Enciphering matrices.
3. understand finite fields and quadratic residues.
4. understand the idea of public key cryptography.
5. understand pseudo-primes and Fermat's factorization.

UNIT-I
Elementary Number Theory

Time Estimates for doing arithmetic - Divisibility and Euclidean algorithm - Congruences - Applications to factoring (Chapter-I of the Text Book).

UNIT-II
Finite Fields and quadratic Residues

Finite fields - Quadratic residues and Reciprocity (Chapter-II of the Text Book)

UNIT-III
Cryptography

Some simple crypto systems - Enciphering matrices (Chapter-III of the Text Book)

UNIT-IV
Public Key Cryptography

The idea of public key cryptography - RSA - Discrete log - Knapsack (Chapter-IV: Sections IV.1 to IV.4 (omit sec.5) of the Text Book).

UNIT-V
Primality and Factoring

Pseudoprimes - The rho method - Fermat factorization and factor bases - The Continued fraction method - The quadratic sieve method (Chapter-V of the Text Book).

Activities

Seminar/ Quiz/ Assignments/ Applications of Cryptography to Real life Problem /Problem Solving.

Text Book

1. A Course in Number Theory and Cryptography by Neal Koblitz, Springer-Verlag, New York, 2002, Second Edition.

Reference Books

1. An Introduction to Theory of Numbers by Niven and Zuckermann, Edn. 3, Wiley Eastern Ltd., New Delhi, 1976.
2. Elementary Number Theory by David M.Burton, Wm C.Brown Publishers, Dubuque, Iowa, 1989.
3. A Classical Introduction to Modern Number Theory by K.Ireland and M.Rosen, Springer Verlag, 1972.

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 18B: CRYPTOGRAPHY
SEMESTER-VII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Elementary Number theory	2	2	28
II	Finite fields and Quadratic Residues	2	2	24
III	Cryptography	1	2	28
IV	Public key cryptography	1	2	24
V	Primality and factoring	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -XV

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 19A: LATTICE THEORY & BOOLEAN ALGEBRA
SEMESTER-VII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. Understand the concept of partially ordered set and properties of partial ordered sets
2. Understand the concept of lattice, semilattice and their properties
3. Understand the concept of ideals and homomorphisms in lattices
4. Understand the distributive and the modular lattices
5. Understand the concept of Boolean algebra and properties of Boolean algebra

Course Content

UNIT-I
Partly Ordered Sets

Set Theoretical Notations, Relations, partly ordered Sets, Diagrams, special Subsets of a Partly ordered set, length, Lower and Upper Bounds, The minimum and maximum condition. (Chapter 1, section 1 to 8 of the Text Book)

UNIT –II
Lattices in General

Algebras, lattices, The Lattice Theoretical Duality principle, semi Lattices, lattices as Partly ordered sets, Diagrams of lattices, Sub lattices, Ideals, Bound Elements of a lattice, Atoms and Dual Atoms, Complements, Relative Complements, Semi complements, Irreducible Prime Elements of a lattice, The Homomorphism of a lattice (Chapter 2, section 10-20 of the Text Book)

UNIT – III
Complete Lattices

Complete lattices, Complete Sub lattices of a Complete lattice, Conditionally Complete Lattices, Compact Elements, Compactly Generated lattices, Subalgebra lattice of an Algebra, Closure Operations (Chapter 3, Sections 22-27 of the Text Book)

UNIT – IV
Distributive and Modular Lattices

Distributive lattices, Infinitely Distributive and Completely Distributive lattices, Modular lattices, Characterization of Modular and Distributive lattices by their Sublattices, Distributive Sublattices of Modular Lattices, Isomorphism theorems of modular lattice, Meet representation in modular and distributive lattices (Chapter 4 of the Text Book)

UNIT – V

Boolean Algebras

Boolean algebras, De Morgan formulae, Complete Boolean algebras, Boolean algebras and Boolean rings, The algebra of relations, The lattice of Propositions, Valuations of Boolean algebras (Chapter 6 of the Text Book)

Activities

Seminar/ Quiz/ Assignments/ Applications of Lattice Theory and Boolean Algebra to Real life Problem /Problem Solving.

Text Book

1. Introduction to Lattice Theory, Gabor Szasz, Academic press

Reference Books

1. Lattice Theory by G. Birkhoff, Amer. Math. Soc.
2. General Lattice Theory by George Grätzer, Birkhauser Basel (1978)

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 19A: LATTICE THEORY AND BOOLEAN ALGEBRA
SEMESTER-VII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Partially Ordered sets	2	2	28
II	Lattices in general	1	2	24
III	Complete Lattices	2	2	28
IV	Distributive and Modular lattices	1	2	24
V	Boolean Algebras	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -XVI

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 19B: FINITE ELEMENT ANALYSIS
SEMESTER-VII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. Understand the concepts behind formulation methods in FEM.
2. Identify the application and characteristics of FEA elements such as bars, beams, plane and iso- parametric elements.
3. Develop element characteristic equation and generation of global equation.
4. Apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axisymmetric and dynamic problems and solve them displacements, stress and strains induced.
5. Know the Finite element modeling, stress calculation and temperature effects

Course Content

Unit-I
Fundamental Concepts

Introduction, Historical background, Outline of presentation, Stresses and Equilibrium, Boundary conditions, Strain-Displacement relations, Stress-Strain relations, Plane stress, Plane strain problems, Temperature effects, Potential energy and equilibrium. The Rayleigh-Ritz method, Hamilton's principle. Galerkin's method, Saint Venant's principle. (Chapter 1, Section 1.1. to Section 1.11)

Unit - II
One-dimensional Problems

Introduction, Finite Element Modeling: Element Division, Numbering Scheme,
Coordinates and Shape Functions, The Potential Energy Approach: Element Stiffness Matrix, Force Terms The Galerkin Approach: Element Stiffness, Force Terms, Assembly of the global stiffness matrix and load vector. (Chapter 3, Section 3.1 to 3.6)

Unit – III
One-dimensional Problems (Continued)

Properties of K, The Finite Element Equations: Treatment of boundary conditions: Types of Boundary Conditions - Elimitwtion Approach, Penalty Approach, Multipoint Constraints Quadratic shape functions, Temperature effects, Input data file. (Chapter 3, Section 3.7 to 3.10)

Unit - IV
Trusses

Introduction, Plane trusses -Local and Global Coordinate Systems, Formulas for Calculating l

and m, Element Stiffness Matrix, Stress Calculations, Temperature Effects, Three-dimensional trusses, Assembly of global stiffness matrix for the Banded and Skyline solutions - Assembly for Banded Solution, Input Data File (Chapter 4)

Unit - V

Two-dimensional Problems

Introduction, Finite element modeling, Constant strain triangle - lsoparametric Representation, Potential· Energy Approach, Element Stiffness, Force Terms, Galerkin Approach, Stress Calculations, Temperature Effects (Chapter 5, Section 5.1 to 5.3)

Activities

Seminar/ Quiz/ Assignments/ Applications of Finite Element Analysis to Real life Problem /Problem Solving.

Text Book

1. Introduction to Finite Elements in Engineering by Tirupathi R. Chandrupatla, Ashok D.Belegundu (chapters 1 to 8 only).

Reference Books

1. Introduction to Finite Element Method, by S.S.Rao, Elsevier
2. Finite Element Method by O.C. Zienkiewicz, Butterworth-Heinemann Ltd.
3. Introduction to Finite Element Method by J.N.Reddy, McGraw Hill Education

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 19B: FINITE ELEMENT ANALYSIS
SEMESTER-VII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Fundamental Concepts	2	2	28
II	One -Dimensional Problems	1	2	24
III	One- Dimensional Problems Continued	2	2	28
IV	Trusses	1	2	24
V	Two -Dimensional Problems	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -XVII

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 20A: GRAPH THEORY
SEMESTER-VII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. Be familiar with the definitions and basic theory of graphs
2. Be able to implement standard algorithms of graph theory
3. Be able to prove simple results in graph theory.
4. Identify trees and obtain spanning trees of graphs.
5. Find Euler and Hamiltonian paths and circuits in a graph

UNIT I
An Introduction to Graph

The Definition of a Graph, Graph as Models, More Definitions, Vertex Degrees, Subgraphs. (Chapter 1, Section 1.1 to 1.5 of the Text Book)

UNIT II
Matrix Representation of graphs

Paths and cycles, The Matrix Representation of graphs, Fusion (Chapter 1, Section 1.6 to 1.8) Trees and Connectivity: Definitions and Simple Properties, Bridges, Spanning Trees (Chapter 2, Section 2.1 to 2.3 of the Text Book)

UNIT III
Trees and Connectivity (Continuity)

Connector Problems, Shortest Path Problems, Cut Vertices and Connectivity (Chapter 2, Section 2.4 to 2.6 of the Text Book)

UNIT IV
Euler Tours and Hamiltonian Cycles

Euler Tours, The Chinses Postman Problem, Hamiltonian Graphs, The Travelling Salesman Problem. (Chapter 3 of the Text Book)

UNIT V
Matchings

Matching and Augmenting paths; The marriage problem; The personnel assignment problem; The optimal Assignment problem. (Chapter 4 of the Text Book)

Activities

Seminar/ Quiz/ Assignments/ Applications of Graph Theory to Real life Problem /Problem Solving

Text Book

1. A first look at Graph Theory by John Clark & Derek Allan Holton, Allied Publishers Limited 1995.

Reference Books

1. A First Course in Graph Theory by S.A. Choudham, Macmillan India Ltd.
2. Introduction to Graph Theory by RobinJ. Wilson, Longman Group Ltd.
3. Graph Theory with Applications by J.A.Bondyand U.S.R.Murthy, Macmillon, London

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 20A: GRAPH THEORY
SEMESTER-VII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	An Introduction to Graph	2	2	28
II	Matrix Representation of graphs	1	2	24
III	Trees and Connectivity (Continuity)	2	2	28
IV	Euler Tours and Hamiltonian Cycles	1	2	24
V	Matchings	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE -XVIII

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS
COURSE 20B: MATHEMATICAL FINANCE
SEMESTER-VII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

Upon successful completion of this course student should be able to:

1. Understand the that interest calculations and methods of calculations
2. Understand the annuities and types of Annuities and calculation interest and values of annuities
3. Understand the concept of Mathematics of Capital Budgeting and Depreciation and some methods of calculations
4. know the Comparison on the Discount Rate to the Interest Rate
5. know the net present value, profitability index and other capital budgeting methods

UNIT– I
Mathematics of the Time Value of Money

Simple Interest : Total Interest, Rate of Interest, Term of Maturity, Current Value, Future Value, Finding n and r When the Current and Future Values are Both Known, Simple Discount, Calculating the Term in Days, Ordinary Interest and Exact Interest, Obtaining Ordinary Interest and Exact Interest in Terms of Each Other, Focal Date and Equation of Value, Equivalent Time: Finding an Average due Date, Partial Payments, Finding the Simple Interest Rate by the Dollar-Weighted Method(Unit – II section 1.1 to 1.14 of the text book)Bank Interest : Finding FV Using the Discount Formula, Finding the Discount Term and the Discount Rate, Difference Between a Simple Discount and a Bank Discount(Unit – II section 2.1 to 2.3 of the text book)

UNIT -II
Mathematics of the Time Value of Money (Continued)

Bank Interest : Comparing the Discount Rate to the Interest Rate, Discounting a Promissory Note, Discounting a Treasury Bill(Unit – II section 2.4 to 2.6 of the text book)Compound Interest: The Compounding Formula, Finding the Current Value, Discount Factor, Finding the Rate of Compound Interest, Finding the Compounding Term, The Rule of 72 and Other Rules, Effective Interest Rate, Types of Compounding, Continuous Compounding, Equations of Value for a Compound Interest, Equated Time For a Compound Interest(Unit – II section 3.1 to 3.11 of the text book)

UNIT- III
Mathematics of the Time Value of Money (Continued)

Annuities: Types of Annuities, Future Value of an Ordinary Annuity, Current Value of an Ordinary Annuity, Finding the Payment of an Ordinary Annuity, Finding the Term of an

Ordinary Annuity, Finding the Interest Rate of an Ordinary Annuity, Annuity Due: Future and Current Values, Finding the Payment of an Annuity Due, Finding the Term of an Annuity Due, Deferred Annuity, Future and Current Values of a Deferred Annuity, Perpetuities (Unit – II section 4.1 to 4.12 of the text book)

MATHEMATICS OF DEBT AND LEASING: Credit and Loans: Types of Debt, Dynamics of Interest– Principal Proportions, Premature Payoff, Assessing Interest and Structuring Payments, Cost of Credit, Finance Charge and Average Daily Balance, Credit Limit vs. Debt Limit (Unit – III section 1.1 to 1.7 of the text book)

UNIT - IV

Mathematics of debit and leasing (Continued)

Mortgage Debt: Analysis of Amortization, Effects of Interest Rate, Term, and Down Payment on the Monthly Payment, Graduated Payment Mortgage, Mortgage Points and the Effective Rate, Assuming a Mortgage Loan, Prepayment Penalty on a Mortgage Loan, Refinancing a Mortgage Loan, Wraparound and Balloon Payment Loans, Sinking Funds, Comparing Amortization to Sinking Fund Methods Limit (Unit – III section 2.1 to 2.10 of the text book)

UNIT – V

Mathematics of Capital Budgeting and Depreciation

Capital Budgeting: Net Present Value, Internal Rate of Return, Profitability Index, Capitalization and Capitalized Cost, Other Capital Budgeting Methods

Depreciation and Depletion: The Straight-Line Method, The Fixed-Proportion Method, The Sum-of-Digits Method, The Amortization Method, The Sinking Fund Method

Limit (Unit – IV section 1.1 to 1.5 and 2.1 to 2.5 of the text book)

Activities

Seminar/ Quiz/ Assignments/ Applications of Mathematical Finance to Real life Problem /Problem Solving

Text Book

1. Mathematical Finance by M. J. Alhabeeb, A John Wiley & Sons, INC., Publication

Reference Books

1. Investment Science by David G. Luenberger, Oxford University Press, Delhi, 1998.
2. Futures and Other Derivatives by John C. Hull, Options, 6th Ed., Prentice-Hall India, Indian reprint, 2006.
3. An Elementary Introduction to Mathematical Finance by Sheldon Ross, 2nd Ed., Cambridge University Press, USA, 2003

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 20B: MATHEMATICAL FINANCE

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Mathematics of the Time value of Money	2	2	28
II	Mathematics of the Time value of Money (Continued)	1	2	24
III	Mathematics of the Time value of Money (Continued)	2	2	28
IV	Mathematics of debit and leasing (Continued)	1	2	24
V	Mathematics of capital budgeting and depreciation	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE - XIX

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 21A: ADVANCED ALGEBRA
SEMESTER-VIII

Theory	Credits: 4	5 hrs/week

Learning Outcomes

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

1. define modules, submodules and give some examples of them.
2. understand reducible modules, free modules and be able to find the rank of a linear mapping.
3. understand Einstein's criteria for irreducible polynomials and algebraic extensions
4. understand splitting fields and finite fields.
5. understand the Fundamental theorem of Galois theory.

UNIT I
Algebraic extension of fields

Irreducible polynomials and Eisenstein's criterion-Adjunction of roots-Algebraic extensionsAlgebraically closed fields. (Sections 15.1 to 15.4 of the Chapter 15 in the prescribed text book.)

UNIT II
Normal and separable extensions

Splitting fields-Normal extensions-multiple roots-finite fields.(Sections 16.1 to 16.4 of the Chapter 16 in the prescribed text book.)

UNIT III
Normal and Separable extensions: Separable extensions

Galois Theory: Automorphism groups and fixed fields- fundamental theorem of Galois Theory. (Section 16.5 of the Chapter 16 and Sections 17.1 to 17.2 of the Chapter 17 in the prescribed text book.)

UNIT IV
Galois Theory

Galois Theory and Applications of Galois Theory to Classical problems: Roots of unity and cyclotomic polynomials-Cyclic extensions (Section 17.3 of the Chapter 17 and sections 18.1and 18.2 of the Chapter 18 in the prescribed text book.)

UNIT V

Applications of Galois Theory

Applications of Galois Theory to Classical problems: Polynomials solvable by radicals-symmetric functions-Ruler and compass constructions. (Sections 18.3 and 18.4 of the Chapter 18 in the prescribed text book.)

Activities

Seminar/ Quiz/ Assignments/ Applications of Algebra to Real life Problem /Problem Solving.

Text Book

1. Basic Abstract Algebra by P.B.Battacharya, S.K.jain, S.R.Nagpaul, Cambridge University Press.

Reference Books

1. Topics in Algebra by I.N.Herstein, 2ndEdition,JohnWiley&Sons.
2. Algebra by SergeLang, Revised Third Edition, Springer.
3. Algebra by Thomas W. Hungerford, Springer

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 21A: ADVANCED ALGEBRA
SEMESTER-VIII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Algebraic extension of fields	2	2	28
II	Normal and Separable extensions	1	2	24
III	Normal and Separable extensions: Separable extensions	2	2	28
IV	Galois theory	1	2	24
V	Applications of Galois theory	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE - XX

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 21B: ELEMENTS OF ELASTICITY AND FLUID DYNAMICS
SEMESTER-VIII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. understand the equation of continuity and general analysis of fluid motion.
2. understand the equation of motion of a fluid, Bernoulli's equation and circulation theorem
3. understand the two-dimensional fluid flows and their properties.
4. understand the various deformations and equation of compatibility.
5. understand the properties of the stress, Mohr's Diagram and certain examples of stress.

Unit-I

Kinematics of fluids, real and ideal fluids, velocity of fluid at a point, streamlines and path lines, velocity potential, velocity vector, local and particle rates of change, equation of continuity, Acceleration of fluid, conditions at a rigid boundary, General analysis of fluid motion (Chapter 2 of Text book 1).

Unit-II

Equation of motion of a fluid, pressure at a point in a fluid at rest and in a moving fluid, conditions at a boundary of two in viscid immiscible fluids, Euler's equations of motion, Bernoulli's equation. Discussion of the case of steady motion under conservative body forces, Vortex motion, Kelvin's circulation theorem. Some further aspects of vortex motion (Chapter 3(excluding sections 3.8 to 3.11) of Text book 1).

Unit-III

Some two - dimensional flows: Meaning of two - dimensional flow, use of cylindrical polar coordinates, the stream function, the complex potential for two – dimensional, irrotational, incompressible flow, complex potential for standard two – dimensional flows, some worked examples, two - dimensional image systems. The Milne- Thomson circle theorem, the theorem of Blasius (Chapter 5(excluding sections 5.10 to 5.12) of Text book 1).

Unit-IV

Analysis of strain: Deformation, affine deformation, infinitesimal affine deformation, geometrical interpretation of the components of strain, strain quadric of Cauchy, principal directions, invariants, general infinitesimal deformation, Examples of strain, equations of compatibility, finite deformations. (Chapter 1 of Text book 2)

Unit-V

Analysis of stress, body and surface forces, stress tensor, equations of equilibrium, transformation of coordinates, stress quadric of Cauchy, Mohr's diagram, examples of stress (Chapter 2 of Text book2).

Activities

Seminar/ Quiz/ Assignments/ Applications of Elements Elasticity and fluid dynamics to Real life Problem /Problem Solving.

Text books

1. Text Book of Fluid Dynamics by F.Chorlton, CBS publishers and distributors, New Delhi.
2. Mathematical Theory of Elasticity by I.S.Sokolnikoff 2 nd edition; Tata Mc Graw Hill-New Delhi.

Reference Books

1. Foundations of Fluid Mechanics by S.W. Yuan, Prentice Hall
2. An introduction to Fluid Dynamics by Bachelor G. K., Cambridge University Press, 2007.

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 21B: ELEMENTS OF ELASTICITY AND FLUID DYNAMICS
SEMESTER-VIII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Unit-I	2	2	28
II	Unit-II	1	2	24
III	Unit-III	2	2	28
IV	Unit-IV	1	2	24
V	Unit-V	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE - XXI

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 22A: ADVANCED ANALYSIS
SEMESTER-VIII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

After successful completion this course, the student will be able to

1. Solve the problems on convergence of Sequences and Series of functions
2. Understand the Stone – Weierstras theorem
3. Know Exponential and Logarithmic functions and Fourier Series
4. Linear transformations and differentiation
5. Understand the contraction principle, the rank Theorem

Course Content

UNIT I
Sequences and Series of Functions

Discussion of Main Problem – Uniform Convergence - Uniform Convergence and Continuity – Uniform Convergence and Integration – Uniform Convergence and Differentiation (Sections 7.1 to 7.18)

UNIT II
Sequences and Series of Functions (Continued) and Some Special Functions

Equicontinuous families of functions and Power Series Equicontinuous families of functions – the Stone – Weierstrass theorem – Power Series (Sections 7.19 to 7.33 & 8.1 to 8.5)

UNIT III
Some Special Functions (Continued)

The Exponential and Logarithmic functions – The Trigonometric functions – Algebraic completeness of the complete field – Fourier Series (Sections 8.6 to 8.16)

UNIT IV
Functions of several variables

Linear transformation – Differentiation. (Sections 9.1 to 9.21)

UNIT V
Functions of several variables (continued.)

The contraction Principle – The Inverse function Theorem – The implicit function Theorem – The Rank Theorem – Determinants (Sections 9.22 to 9.41)

Activities

Seminar/ Quiz/ Assignments/ Applications of Analysis to Real life Problem /Problem Solving

Text Book

1. Principles of mathematical Analysis by Walter Rudin, Mc Graw Hill International Edition

Reference Books

1. Mathematical Analysis by Tom. M. Apostal, Narosa Publishing House
2. Elements of Real Analysis by Shanthi Narayan and Dr.M.D.Raisinghania, S.Chand & Company Pvt. Ltd., New Delhi
3. An Introduction to Real Analysis by Robert G.Bartle and Donlad R. Sherbert, John Wiley and sons(ASIA)Pvt. Ltd.

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 22A: ADVANCED ANALYSIS
SEMESTER-VIII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Sequences and series of Functions	2	2	28
II	Sequences and Series of Functions (Continued) and Some Special Functions	1	2	24
III	Some Special functions (Continued)	2	2	28
IV	Functions of several variables	1	2	24
V	Functions of several variables (continued…)	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE - XXII

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 22B: ADVANCED LINEAR ALGEBRA
SEMESTER-VIII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

Upon successful completion of this course student should be able to

1. Understand the basic to the analysis of a single linear transformation on a finite-
2. dimensional vector space and the analysis of characteristic values and the rational and Jordan canonical forms.
3. Understand concept of finite-dimensional inner product spaces and basic geometry, relating orthogonalization and unitary operators and normal operators.
4. Know the Jordan form, computation of invariant factors
5. Know the inner product spaces and their properties
6. Know about unitary operators and Normal operators

Course Content

UNIT-I
Elementary Canonical Forms

Introduction – Characteristic Values – Annihilating Polynomials –invariant subspaces – Simultaneous Triangulation – Simultaneous Diagonalization, Simultaneous
(Chapter 6, Section 6.1 to 6.5 of the text book)

UNIT-II
Elementary Canonical Forms (Continued)

Direct – sum Decompositions – invariant direct sums – the primary decomposition theorem (Chapter 6, Section 6.6 to 6.8 of the text book) The Rational and Jordan Forms: cyclic subspaces and Annihilators – cyclic decompositions and the rational form. (Chapter 7, Section 7.1 to 7.2 of the text book)

UNIT-III
Elementary Canonical Forms (Continued)

The Jordan Form – Computation of Invariant Factors – Semi Simple Operators. (Chapter 7, Section 7.3 to 7.5 of the text book)

UNIT-IV
Inner product spaces

Inner products, Inner product spaces, Linear functionals and adjoints, (Chapter 8, Section 8.1 to 8.3 of the text book)

UNIT - V

Inner product spaces (continued)

Unitary operations, Normal operators (Chapter 8, Section 8.4 to 8.5 of the text book)

Activities

Seminar/ Quiz/ Assignments/ Applications of Linear Algebra to Real life Problem /Problem Solving

Text Book

1. Linear Algebra by Kenneth Hoffman and Ray Kunze, second edition, Prentice Hall of India Private Limited, New Delhi.

Reference Books

1. First Course in Linear Algebra by Bhattacharya, P.B., Jain, S.K and Nagpal, S.R., Wiley Eastern Ltd. New Delhi
2. Linear Algebra by Henry Helson, Hindustan Book Agency (1994)
3. Topics in Algebra by I.N. Herstein, Second edition (Wiley Eastern Ltd.)
4. Algebra by M. Artin, Prentice - Hall of India private Ltd.

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 22B: ADVANCED LINEAR ALGEBRA
SEMESTER-VIII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Elementary canonical forms	2	2	28
II	Elementary canonical forms Continued.	1	2	24
III	Elementary canonical forms Continued…	2	2	28
IV	Inner Product Spaces	1	2	24
V	Inner Product Spaces Continued.	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE - XXIII

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 23A: ADVANCED TOPOLOGY
SEMESTER-VIII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

After successful completion this course, the student will be able to

1. define T_1-space, $T_{2\ -}$ space
2. understand Urysohn's Lemma, and the Tietz's extension theorem
3. understand the Stone – Chech compactification,
4. understand and can define the Connectedness of a topological space
5. understand the Weierstrass approximation theorem and Stone-Weierstrass theorems

UNIT-I
Separation

T1 spaces and Hausdorff spaces – Completely regular spaces and normal spaces – Urysohn's lemma and the Tietze's extension theorem. (Chapter 5: Sections 26 to 28 Prescribed text book).

UNIT-II
Separation (continued)

The Urysohn imbedding theorem – The Stone – Chech compactification. (Chapter 5: Sections 29 to 30 Prescribed text book).

Connectedness: Connected spaces– connectedness of Rn and Cn. (Chapter 6: Section 31 Prescribed text book).

UNIT-III
Connectedness (continued)

The components of a space – Totally disconnected spaces – Locally connected spaces. (Chapter 6: Sections 32 to 34 Prescribed text book)

UNIT-IV
Approximation

The Weierstrass approximation theorem - The Stone-Weierstrass theorems (Chapter 7: Section 35 to 36 Prescribed text book).

UNIT-V
Approximation (continued)

Locally compact Hausdorff spaces – The extended Stone Weierstrass theorems. (Chapter 7: Sections 37 to 38 Prescribed text book).

Activities

Seminar/ Quiz/ Assignments/ Applications of Topology to Real life Problem /Problem Solving

Text Book

1. Introduction to Topology and Modern Analysis by G. F. Simmons, International Student edition – McGraw – Hill Kogakusha, Ltd.

Reference Books

1. Schaum's Outlines: General Topology by Seymour Lipschutz
2. Topology: A first Course by James Munkres, Prentice-Hall Pvt. Ltd.

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 23A: ADVANCED TOPOLOGY
SEMESTER-VIII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Seperation	2	2	28
II	Seperation(Contd)	1	2	24
III	Connectedness(continued)	2	2	28
IV	Approximation	1	2	24
V	Approximation (Continued)	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE - XXIV

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 23B: DIFFERENTIAL GEOMETRY
SEMESTER-VIII

Theory **Credits: 4** **5 hrs/week**

Course Outcomes

After completion of the course, the student will be able to

1. to know about space curves, planar curves
2. to calculate Torsion and Curvature
3. to know parametric curves on surfaces Rodrigue's formula
4. to know about minimal surfaces
5. to know contravariant and covariant

Course Contents

Unit I
Theory of Space Curves

Space curves, Planer curves, Curvature, torsion and Serret - Frenet formulae. Osculating circles, Osculating circles and spheres. Existence of space curves. Evolutes and involutes of curves.

Unit II
Theory of Surfaces

Parametric curves on surfaces. Direction coefficients. First and second Fundamental forms. Principal and Gaussian curvatures. Lines of curvature, Euler's theorem. Rodrigue's formula, Conjugate and Asymptotic lines.

Unit III
Developable

Developable associated with space curves and curves on surfaces, Minimal surfaces.

Unit IV
Geodesics

Canonical geodesic equations. Nature of geodesics on a surface of revolution. Clairaut's theorem. Normal property of geodesics. Torsion of a geodesic. Geodesic curvature. Gauss-Bonnet theorem. Surfaces of constant curvature. Conformal mapping. Geodesic mapping. Tissot's theorem.

Unit V
Tensors

Summation convention and indicial notation, Coordinate transformation and Jacobian, Contra-variant and Covariant vectors, Tensors of different type, Algebra of tensors and contraction, Metric tensor and 3-index Christoffel symbols, Parallel propagation of vectors, Covariant and intrinsic derivatives, Curvature tensor and its properties, Curl, Divergence and Laplacian operators in tensor form, Physical components.

Activities

Seminar/ Quiz/ Assignments/ Applications of Differential Geometry to Real life Problem /Problem Solving.

Text Book

1. An Introduction to Differential Geometry by T.J. Willmore, Dover Publications, 2012.

Reference Books

1. Elementary Differential Geometry by B. O. Neill, 2nd Ed., Academic Press, 2006.
2. Differential Geometry of Three Dimensions by C.E. Weatherburn, Cambridge University Press2003.

****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 23B: DIFFERENTIAL GEOMETRY
SEMESTER-VIII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Theory of Space curves	2	2	28
II	Theory of surfaces	1	2	24
III	Developable	2	2	28
IV	Geodesics	1	2	24
V	Tensors	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE - XXV

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 24A: ORDINARY DIFFERENTIAL EQUATIONS
SEMESTER-VIII

Theory **Credits: 4** **5 hrs/week**

Learning outcomes

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

1. comprehend the bridge between the real function theory and theory of ordinary differential equations
2. understand the basic theory behind existence, uniqueness, continuity of solutions of ordinary differential equations.
3. realize the dependence of solutions on various parameters involved in the differential equations.
4. recognize the significance studying differential systems and its utility in understanding higher order differential equations
5. figure out qualitative behaviour of solutions of differential equations of various orders.

Unit I

Real Function Theory Essential concepts from Real Function Theory – The basic problem -The fundamental existence and uniqueness theorem –examples to demonstrate the theory-continuation of solutions (Sections 10.1, 10.2 of the prescribed text book).

Unit II

Existence and Uniqueness Dependence of solutions on initial conditions – dependence of solutions on parameters (causal function f) - Existence and Uniqueness theorems for systems – existence and uniqueness theorems for Higher order equations – examples (Sections 10.3, 10.4 of the prescribed text book).

Unit III

Linear differential systems Introduction to the theory of Linear differential systems – Theory and properties of Homogeneous linear systems (Sections 11.1 - 11.3 of the prescribed text book).

Unit IV

Homogeneous and Non-homogeneous Systems Theory of non-homogeneous linear systems – Theory and properties of the nth order homogeneous linear differential equations (Sections 11.4 - 11.6 of the prescribed text book).

Unit V

Higher order non-homogeneous Linear Equations Theory of nth order Non-homogeneous Linear equations – Sturm theory – Sturm Liouville Boundary value problems (Sections 11.7, 11.8, 12.1 of the prescribed text book).

Activities

Seminar/ Quiz/ Assignments/ Applications of Ordinary Differential Equations to Real life Problem /Problem Solving.

Text Book

1. Differential Equations by Shepley L. Ross, Wiley India

Reference books

1. Differential Equations with Applications and Historical Notes by George F. Simmons, (3rd edition). CRC Press. Taylor & Francis.
2. An Introduction to Ordinary Differential Equations by Earl A. Coddington, Prentice-Hall of India.

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 24A: ORDINARY DIFFERENTIAL EQUATIONS
SEMESTER-VIII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Unit I	2	2	28
II	Unit II	1	2	24
III	Unit III	2	2	28
IV	Unit IV	1	2	24
V	Unit V	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE - XXVI

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 24B: APPLICATIONS OF ALGEBRA
SEMESTER-VIII

Theory **Credits: 4** **5 hrs/week**

Course Outcomes

After completion of the course, the student will be able to

1. understand Boolean polynomials and Boolean functions.
2. understand designing and simplification of circuits.
3. understand incidence matrix of a BIBD and construction of BIBD from finite fields.
4. know the concept of coding theory.
5. generating Functions for non-isomorphic Graphs.

Unit – I

Boolean algebra and Swathing Circuits Boolean Algebras; Switches and Logic Gates; Laws of Boolean algebra; Boolean Polynomials and Boolean Functions; Switching Circuits and Gate Networks; Simplification of Circuits; Designing Circuits (1.1 to 1.7 of Chapter 1).

Unit – II

Balanced Incomplete Block Designs (BIBD) Basic Definitions and Results; Incidence Matrix of a BIBD; Construction of BIBDs from Difference Sets; construction of BIBD using quadratic residues; Difference set families, construction of BIBD from finite fields. (2.1 to 2.6 of Chapter 2).

Unit – III

Coding Theory Introduction to Error - Correcting Codes, Linear Codes, Generator and Parity - Check Matrices, Minimum Distance, Hamming Codes, Decoding, Cyclic Codes. (4.1 to 4.3 of Chapter 4).

Unit – IV

Symmetry Groups and Color Patterns Permutation Groups, Groups of Symmetries; Colouring and Colouring Patterns, Polya Theorem and Pattern Inventory, Generating Functions for non-isomorphic Graphs (5.1 to 5.3, 5.6 to 5.7 of Chapter 5).

Unit – V

Wallpaper Pattern Groups Group of Symmetries of a Plane; Wallpaper Pattern Groups; Change of Basis in R2 (6.1 to 6.3 of Chapter 6).

Activities

Seminar/ Quiz/ Assignments/ /Problem Solving.

Text Book

1. Topics in Applied Abstract Algebra by S. R. Nagpaul and S. K. Jain, Thomson Brooks and Cole, Belmont, 2005.

Reference Book

1. Applications of Abstract Algebra with Maple by Richard E. Klima, Neil Sigmon, Ernest Stitzinger, CRC Press LLC, Boca Raton, 2000.

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 24B: APPLICATIONS OF ALGEBRA
SEMESTER-VIII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Unit I	2	2	28
II	Unit II	1	2	24
III	Unit III	2	2	28
IV	Unit IV	1	2	24
V	Unit V	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE - XXVII

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 25A: OPERATIONS RESEARCH
SEMESTER-VIII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. Study on LPP enables to arrive at an optimal decision/solutions in difficult decision making.
2. Study on LPP applied to problems pertaining to both profit making and low cost related real world situation.
3. Study on Post optimal analysis enables into manage and control resource allocation.
4. Study of Transportation problem and Assignment problem introduces to implementing simplex procedure for more variables using Modi method stepping stone method and hungary method
5. Study on games and strategies helps in decision making for problems with competitive situations like candidates for elections, marketing campaigns by different companies etc.

Course Content

UNIT-I
Linear Programming: Simplex Method

Introduction-Fundamental properties of solutions-The computational procedure-Use of artificial variables. 12 hours (Sections 4.1 to 4.4 of the Chapter 4 in the Prescribed Text Book)

UNIT-II
Duality in Linear Programing

Introduction-General Primal-Dual pair - Formulating a Dual problem – Prime - Dual Pair in matrix form - Duality theorems - Complementary slackness theorem Duality and simplex method. 12 hours (Sections 5.1 to 5.7 of the Chapter 5 in the Prescribed Text Book)

UNIT-III
Duality in Linear Programing (Continued)

Economic Interpretation of Duality, Dual Simplex method Post-optimal Analysis: Introduction-Variation in the cost vector-Variation in the requirement vector-variation in the coefficient matrix- Structural variations- Applications of Post-optimal Analysis. 12 hours (Sections 5.8, 5.9 and 6.1 to 6.6 of the Chapters 5 and 6 in the Text Prescribed Book)

UNIT-IV
Transportation Problem and Assignment Problem

Introduction-General transportation problem-The transportation table-Solution of a transportation problem-Finding an initial basic feasible solution-Test for optimality-Degeneracy

in Transportation problem -Transportation Algorithm (MODI Method)- Introduction - Mathematical formulation of the problem-The Assignment method - Special cases in Assignment problem-A typical Assignment problem. 12 hours (Sections 10.1 to 10.3 and 10.8 to 10.11 of the Chapter 10 in the Prescribed Text Book.) (Sections 11.1 to 11.5 of the Chapter 11 in the Prescribed Text Book)

UNIT-V

Games and Strategies

Introduction-Two-person zero-sum games-some basic terms-The maximin - minimax principle - Games without saddle points - Mixed strategies - Graphic solution of 2xn and mx2 games. 12 hours (Sections 17.1 to 17.6 of the Chapter 17)

Activities

Seminar/ Quiz/ Assignments/ Applications of Operations Research to Real life Problem /Problem Solving

Text Book

1. Operations Research by Kanti Swarup, P.K. Gupta and Man Mohan Sultan Chand & Sons, New Delhi, 2006.

Reference Books

1. Operations Research, An Introduction by Hamdy A Taha, Maxwell Macmillan International Edition, New York, 1992.
2. Operations Research Theory, methods and Applications by S.D. Sarma, kedarnathRamnath publications, 2008.

****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 25A: OPERATIONAL RESEARCH
SEMESTER-VIII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Linear programming: Simplex method	2	2	28
II	Duality in Linear programming	1	2	24
III	Duality in Linear Programming	2	2	28
IV	Assignment problem and Transportation problem	1	2	24
V	Games and Strategies	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE - XXVIII

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE 25B: MATHEMATICAL MODELLING
SEMESTER-VIII

Theory **Credits: 4** **5 hrs/week**

Learning Outcomes

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

1. Understand concept of modelling and simulation
2. Construct mathematical models of real-world problems
3. Solve the mathematical models using mathematical techniques
4. Know the need for mathematical modelling through difference equations
5. To know Harrod Model and cobweb application model to Actuarial science

Course Content

Unit–1
Mathematical Modeling

Simple situations requiring mathematical modeling, characteristics of mathematical model. (Chapter 1 Sections 1.1-1.5 of the Text Book)

Unit – 2

Mathematical Modeling through ordinary differential equations of first order Linear Growth and Decay Models. Non-Linear growth and decay models, Compartment models. (Chapter 2 Sections 2.1- 2.4 of the Text Book)

Unit – 3

Mathematical Modeling through system of Ordinary differential equations of first order Prey-predator models, Competition models, Model with removal and model with immigrations. Epidemics: simple epidemic model, Susceptible-infected-susceptible (SIS) model, SIS model with constant number of carriers. Medicine : Model for Diabetes Mellitus. (Chapter 3 Sections 3.11, 3.12, 3.2 of the Text Book)

Unit – 4

Mathematical Modeling through difference equations Introduction to difference equations, the need for mathematical modelling through difference equations: some simple models, basic theory of linear difference equations with constant coefficients (Chapter 5 Sections 5.1 and 5.2 of the Text Book)

Unit - 5

Mathematical Modeling through difference equations Introduction to difference equations (continued…) Harrod Model, cobweb model application to Actuarial Science (Chapter 5 Sections 5.3 (5.3.3 not included))

Activities

Seminar/ Quiz/ Assignments/ Applications of Mathematical Modelling to Real life Problem /Problem Solving

Text book

1. Mathematical Modeling by J N Kapur, New Age International publishers. (2009)

Reference Books

1. Mathematical Modelling with Case Studies by Barnes, B., Fulford, G. R., CRC Press, 2008.
2. An introduction to mathematical modeling by Bender, E. A. (2012), Courier Corporation.
3. Mathematical Modelling by Meerschaert, M. M., (2013) Academic Press.

*****

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

BLUE PRINT FOR QUESTION PAPER PATTERN
COURSE 25B: MATHEMATICAL MODELING
SEMESTER-VIII

Unit	Topic	S.A.Q (including choice)	E.Q (including choice)	Total Marks
I	Unit I	2	2	28
II	Unit II	1	2	24
III	Unit III	2	2	28
IV	Unit IV	1	2	24
V	Unit V	2	2	28
	Total	8	10	132

S.A.Q. = Short answer questions (4 marks)
E.Q. = Essay questions (10 marks)
Short answer questions: 5 X 4 M = 20 M
Essay questions: 5 X 10 M = 50 M
Total Marks = 70 M

ANNEXURE - XXIX

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE NAME: RAMANUJAN AND HIS NOTEBOOK
SEMESTER-VII

Course Objectives:

This course is intended to introduce students to the great Indian Mathematician Ramanujan and to familiarize them with the major work done by him.

Course Outcomes:

After the completion of the course, the students will have a comprehensive understanding of Ramanujan's life and his findings in the field of mathematics.

Syllabus:

UNIT-I

Magic Squares, Sums Related to the Harmonie Series or the Inverse Tangent
Function, Combinatorial Analysis and Series Inversions, Iterates of the Exponential Function and an Ingenious Forma1 Technique

UNIT-II

Eulerian Polynomials and Numbers, Bernoulli Numbers and the Riemann Zeta-Function
\

UNIT-III

Ramanujan's Theory of Divergent Series, Sums of Powers, Bernoulli Numbers, the Gamma Function, Analogues of the Gamma Function, Infinite Series Identities, Transformations and Evaluations

Text Book:

1. Bruce C. Berndt, "Ramanujan's Notebooks Part 1 ", Springer (1985).

CLUSTER UNIVERSITY
DEPT. OF MATHEMATICS

COURSE NAME: MODERN APPROACH TO ANCIENT MATHEMATICS
SEMESTER-VIII

Course Objectives:

This course is an attempt to introduce the students about the importance and implementation of Ancient Mathematics in Modern Mathematics.

Course Outcomes:

After the completion of this course, the students will have a fair idea about the different aspects of the ancient mathematics which are applicable in the study of modern mathematics.

Syllabus:

UNIT-I

Topics in Sri Bharathi Krishna Thirtha's Vedic Mathematics: Some questions of Divisibility, Recurring Decimal, Square, Square Root, Cube and Cube Root, The Brahmagupta- Bhaskara Equation: Lemma of Brahmagupta, Chakravala Method of Bhaskara, Continued Fractions

UNIT-II

Selected Topics in Geometry: Geometry in Sulba Sutras, The Triangle, The Cyclic Quadrilateral, and the Circle

UNIT-III

Number Theory: The decimal place value system, Divisibility, G.C.D. and L.C.M., Simple Continued Fractions, The Eular φ function, The Mobius μ- function and Congruences

Text Book:

1. T.S. Bhanu Murthy: A Modern Introduction to Ancient Indian Mathematics, New Age International Publisher.

Reference Book:

1. David M. Burton: The History of Mathematics AN INTRODUCTION, Seventh edition.

ANNEXURE - XXX

CLUSTER UNIVERSITY, KURNOOL
DEPT. OF MATHEMATICS

JUSTIFICATION REPORT

S. No	Year	Course	Title	Major Additions/Deletions	Justifications
1	III	12	Linear Algebra	1. Determination of Linear Transformations (**Added**)	For the fulfilment of the Concepts
				2. Unit -IV Name changed to Eigen Values and Eigen Vectors	In order to make Suitable title for the Content included under the unit
				3. Bessel's inequality (**Deleted**)	It is covered as Additional Input
2	III	15A	Number Theory	1. The reciprocity law for quadratic Gauss sums, another proof of the quadratic reciprocity law (**Deleted**)	It is covered as Additional Input
3	III	15B	Mathematical Statistics	1. Mixtures of Discrete and Continuous Type Distributions (**Deleted**) 2. Contaminated Normals (**Deleted**)	It is covered as Additional Input
4	IV	16A	Algebra	1. Conjugacy and G-set (**Added**)	Basics of the Unit syllabus

ANNEXURE – XXXI

CLUSTER UNIVERSITY, KURNOOL.
DEPT. OF MATHEMATICS
(w.e.f. 2023-24)

PANEL OF EXAMINERS & PAPER SETTERS (w.e.f.2023-24)

1.Dr. V.Ramesh Chandra Babu Lecturer in Mathematics S.G.Govt Degree college, Peeleru Phone: 9440182185 Email: abhiram555@gmail.com	2.Smt. S.L.Khamar SML. Govt Degree College, Yemmiganur, Kurnool
3. DR.S. NAGENDRA Lecturer in Mathematics PVKN Degree College, Chitthoor D.O.J into Degree College : 06.11.2010 Mobile number:9985165051 Email :sndlpml@gmail.com	4. Sri.V. APPALANAIDU Lecturer in Mathematics Govt. College for Men(A), Kadapa. Phone: 9591782087 Email:naidu33143@gmail.com
5. Dr.G.VenkataSubbaiah Lecturer in Mathematics GOVT. COLLEGE FOR MEN (A), Kadapa D.O.J. AS LECTURER : 07-07-2008 MOBILE : 9491112150 Email : nskc2011@gmail.com	6. Dr.Y.Dastagiri. Lecturer in mathematics PSC&KVSC GOVT.DEGREE COLLEGE, Nandyal Phone: 9440220902. Email:yetikadidastagiri@gmail.com
7. Dr.S. Navaneeswara Reddy Lecturer in Mathematics Government College For Men(A) Kadapa,Mobile:9866927509 E Mail I'd : avaneeswar.lucky@gmail.com	8. Dr. S. Srilakshmi, Lecturer in Mathematics, N.S.P.R. Govt Degree college, Hindupur, AnantapurDist, Phone: 9866876245 Email: simha_sree@yahoo.com
9. Sri.B.Ravi, Lecturer in Mathematics Govt. College for Men(A) , Anathapur Phone: 7702806264 Email: ravidevi19@gmail.com	10. Dr K Madhavi, M.Sc., B.Ed., M.Phil., Ph.D. APSET Lecturer in Mathematics, Govt Degree College , Kuppam-517425. Phone: 9441449589, 7989187842 Email: madhubala2369@gmail.com
11.Dr. J.Shiva Shankar, Lecturer in Mathematics, Govt. Degree College for Men(A), Anathapur.Phone: 8008669744 Email: sankarj07@gmail.com	12.Dr. D. Leelavardhini, Lecturer in Mathematics, GDC (M), Kadapa. D.O.J into Degree College : 21/05/2013 Phone: 9160152096 Email :leela.durgam@gmail.com