



SHREE H. N. SHUKLA COLLEGE OF I.T. & MGMT.

(AFFILIATED TO SAURASHTRA UNIVERSITY)

3- Vaishalinagar
Nr. Amrapali Railway Crossing
Raiya Road, Rajkot – 360001
Ph. No–(0281)2471645

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Ph.No–(0281)2440478, 2472590

M. Sc. MATHEMATICS SEMESTER – 4

1	CMT – 4001	Linear Algebra
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Name of the Course : Linear Algebra

Course credit : 04

Teaching Hours : 80 (Hours)

Total marks :70+30

Objectives :

To understand the concepts of linear algebra including transformations. Select proper methods to solve a given system of linear equations. Concept of bilinear and quadratic forms.

Unit	Content	No. of Lectures
1	The Algebra of linear transformations, Characteristic roots, Matrices.	20
2	Canonical Forms: Triangular Form, Nilpotent linear transformations, Invariants of a nilpotent linear transformation.	20
3	Canonical Forms: The primary decomposition theorem, Jordan Form, Rational canonical Form.	15
4	Trace and Transpose, Determinants, Cramer's rule, Cayley-Hamilton theorem, a quick review of inner product spaces, Hermitian, Unitary and Normal transformations.	15
5	Real Quadratic Forms, Sylvester's law of inertia, Bilinear Forms, Symmetric Bilinear Forms, Skew-Symmetric Bilinear Forms, Groups preserving Bilinear Forms.	10
Total Lectures		80

Important instructions for paper setter –

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UNIVERSITY EXAMINATION

(All questions are compulsory for all student candidates)

Sr. No.	Particulars	Marks
1	QUESTION - 1 Short question. 07/10	14
2	QUESTION - 2 Long answer question 02/03	14
3	QUESTION - 3 (A) Long answer question 02/02 OR (B) Long answer question 02/02	14
4	QUESTION - 4 Long answer question 02/02	14
5	QUESTION - 5 Long answer question 02/03	14
Total Marks for candidates		70

Recommended Reading:

- N. Herstein, Topics in Algebra, 2/e, Wiley Publication, 1975. (For Unit 1 to Unit 4).
- K. Hoffman & R. Kunze, Linear Algebra, 2/e, Prentice Hall of India, New Delhi, 1992. (For Unit 5).

2	CMT - 4002	Integration Theory
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Name of the Course :Integration Theory

Course credit :04

Teaching Hours :80 (Hours)

Total marks :70+30

Objectives:

Understand basic notions in abstract integration theory, the n-dimensional space. Methods useful for further study in a range of other fields, e.g. Stochastic calculus, Quantum Theory and Harmonic analysis

Unit	Content	No. of Lectures
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1	Measures spaces, Measurable functions, Integration and General convergence theorems.	20
2	Signed measures, Positive sets, negative sets, null sets and their properties, Hahn-Decomposition Theorem, Mutually singular measures, Jordan-Decomposition for a signed measure.	20
3	Measure absolutely continuous with respect to another measure, RadonNikodym theorem for measure and for signed measure, Lebesgue decomposition theorem, outer measure on a set, Algebra of sets Caratheodary extension theorem.	15
4	Product measure, structure of measurable sets in the product measure space, Fubini's theorem, Fonelli's theorem, and Riesz Representation theorem for bounded linear functional on Baire measure on the real line, Lebesgue Stieltjes integral of Borel measurable function with respect to monotonically increasing function.	15
5	Locally compact Hausdorff spaces, Baire and Boral measures, continuous functions with compact support, Regularity of measures on locally compact Hausdorff spaces, Integration of continuous functions with compact support, Riesz Markov-theorem.	10
Total Lectures		80

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4	QUESTION - 4 Long answer question 02/02	14
5	QUESTION - 5 Long answer question 02/03	14
Total Marks for candidates		70

Recommended Reading:

- H. L. Royden, Printice Hall of India, Third edition, 1987.
- K. Hoffman & R. Kunze, Linear Algebra, 2/e, Prentice Hall of India, New Delhi, 1992. (For Unit 5).
- P. R. Halmos, Measure Theory, Van Nostrand, Princeton, 1950.
- W. Rudin, Real and complex analysis, Tata McGraw Hill Publishing Company, Second Edition, 1974.
- S. K. Berberian, Measure and Integration, Chelsa Publishing Company, Newyork,1965.
- K. Rana, An Introduction to Measure and Integration, Narosa

3	CMT – 4003	Number Theory-2
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Name of the Course :Number Theory-2

Course credit :04

Teaching Hours :70 (Hours)

Total marks :70+30

Objectives:

Understand, analyses and solve the Diophantine Equations. Approximate Irrationals by Rationals.

Unit	Content	No. of Lectures
1	Farey Fractions, Irrational numbers, Farey Fractions, Approximation of Irrationals by Rationals.	20



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2	Continued Fractions(Finite and Infinite), Approximations of Irrationals by Rationals, Hurwitz's Theorem.	20
3	Periodic Continued Fractions, Pell's Equations.	15
4	Diophantine Equations, Pythagorean Triplets, Some other Examples..	15
Total Lectures		70

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5	QUESTION - 5 Long answer question 02/03	14
Total Marks for candidates		70

Recommended Reading:

- THE THEORY OF NUMBERS (Authors: Ivan Niven, Herbert S. Zuckerman, Hugh L. Montgomery).
- NUMBER THEORY (Authors: Z. I. Borevich and I. R. Shafarevich)
- AN INTRODUCTION TO THE GEOMETRY OF NUMBERS (Authors: J. W. S. Cassels)
- HISTORY OF THE THEORY OF NUMBERS (Authors: L. E. Dickson) 3.



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4	CMT – 4004	Graph Theory
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Name of the Course :Graph Theory

Course credit :04

Teaching Hours :80 (Hours)

Total marks :70+30

Objectives:

Understand the fundamental concepts of graphs. Characterize the Euler and Hamiltonian Graphs. Understand and apply the Kruskal's and Prim's algorithm and the concept of graph coloring.

Unit	Content	No. of Lectures
1	Graph, degree of a vertex, path, circuit, connected and disconnected graphs, components, adjacency and incidence matrix.	15
2	Euler circuits, Euler graph, Hamiltonian Paths and circuits.	10
3	Trees and their characterizations, Cut-Sets and Cut-Vertices	10
4	Planar Graphs, Kuratowski's two graphs, Different representation of planarity, Detection of Planarity.	15
5	Coloring of graphs, chromatic number, chromatic polynomial, the four color problem matching	15
6	Graph theory in Operation Research: transport networks, extension of Max-Flow, Min-Cut theorem, minimal cost flows.	15
Total Lectures		80

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5	QUESTION - 5 Long answer question 02/03	14
Total Marks for candidates		70

Recommended Reading:

The syllabus is covered from chapters 1 & 2 (for quick review), Chapter 3 (3.1 to 3.6), 4 (4.1 to 4.6), 5 (5.1 to 5.5), 8 (8.1 to 8.4) and 14(14.1 to 14.3) from “Graph theory with application to Engineering & computer science” by Narsingh Deo, Prentice – Hall of India New Delhi.

- Graph theory by F. Harary, Addison – Wesley, 1969
- Graph Theory and Its application by J. Gross and J. Yellen, CRC Press, 2000.
- Introduction to Graph Theory by D. B. West, 2/e, Prentices – Hall of India, 2001.
- A textbook of Graph Theory by R. Balakrishnan and K. Ranganathan, Springer, 2012.

5	EMT – 4011	Financial Mathematics
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Name of the Course :Financial Mathematics

Course credit :04

Teaching Hours :60 (Hours)

Total marks :70+30

Objectives:

To categorize the various financial markets including stock markets, currency market and bond markets. Differentiate between options and contracts.



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Unit	Content	No. of Lectures
1	Basic option theory, Types of options, interest rates and present value, Asset price	15
2	Random walk, Ito's lemma, Black-Sholes model, arbitrage theorem, option values	15
3	The Black – Sholes formulae, hedging the practice, partial differential equations and Black – Sholes formulae.	15
4	Variations in Black – Sholes model to include dividends as well as forward and future contracts, American Options.	15
Total Lectures		60

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- P. Willmontt, S. Howison and J. Dewynne, the Mathematics of Financial Derivatives, Cambridge Univ. Press, 1995.
- Sheldon M. Ross, An elementary introduction to Mathematical Finance, Cambridge Univ. Press, 2003.