KADI SARVA VISHWAVIDYALAYA, GANDHINAGAR

B.Sc. Curriculum as Per NEP

Mathematics Subject Syllabus
Semester 3

W.E.F. June 2024

KADI SARVA VISHWAVIDYALAYA

B.Sc Semester 3 (Mathematics Subject's Syllabus)

Mathematics Major Course-5

MTM230-2C Linear Algebra

Learning Outcomes:

After completing this course student will be able to

- Know about vector space, dimension and basis.
- Identify that given vectors are linearly dependent or independent.
- Understand the concept of linear transformation.
- Understand the several forms of linear functional and duality
- Know about inner product space.

TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
				Hrs.	Max Marks		
		Theory hrs Per Week			CCE	SEE	
MTM230-2C	Linear Algebra	4	4	2.5	50	50	100

Unit 1 Vector Space **Teaching Hours: 15**

Introduction, Elementary properties of vector space, Subspace, Linear sum of two subspaces, Direct sum of two subspaces, Linear combination of vectors, Linear dependence and independence of vectors, Span of a set, Basis of a vector space, Finite dimensional vector space.

Unit 2 Linear Transformation **Teaching Hours: 15**

Introduction, Algebra of linear transformation, Linear operator, Range and Kernel of linear transformation, Rank and Nullity of a linear transformation, Rank-Nullity Theorem, Invertible linear transformation, Matrix representation of a linear transformation.

Unit 3 Linear Functional and Duality **Teaching Hours: 15**

Linear functional, Dual spaces, Dual Basis, Second dual space, Natural mapping, Annihilator, Annihilator of an annihilator.

Unit 4 Inner Product Space **Teaching Hours: 15**

Introduction, Properties of inner product space, Norm and Distance of vectors, Inner product space generated by matrices, Orthogonal vectors, Orthogonal complement, Orthogonal and Orthonormal basis, Cauchy-Schwarz inequality, Parallelogram law, Pythagorean theorem of an inner product space, Gram Schmidt procedure, Least square approximation.

- *Continuous Evaluation: It consists of Assignments / Seminars / Presentations / Quizzes / Surprise Tests

Reference Books:

1. An Introduction to linear algebra, by V. Krishnamurthy, J.L. Arora, East West Press Pvt Ltd, New Delhi.
2. Linear Algebra, Ramchandra Rao, P. Bhimasankar, Tata McGraw Hill.
3. Linear Algebra, S K Berberion, Oxford University Press.
4. Linear Algebra, Sharma and Vashishtha, Krishna Prakashan, Meerut.
5. Linear Algebra, Gupta KP, PragatiPrakshan, Meerut.
6. Advanced Linear Algebra, Steven Roman, 3rd edition, Springer.

KADI SARVA VISHWAVIDYALAYA

B.Sc Semester 3 (Mathematics Subject's Syllabus)

Mathematics Major Course-6

MTM231-2C Advanced Calculus

Learning Outcomes:

After completing this course student will be able to

- Understand the concept of curvature of curves and points of inflexion.
- Find radius of curvature of a curve defined by various function.
- Understand the concept of beta and gamma functions.
- Understand the concept of scalar point function and vector point function. Derivative along a curve, directional derivatives.
- Understand the concept of vector integration: line integral, surface integral, volume integral. Theorem of Gauss, Green and Stokes and its applications.

TEACHING AND EVALUATION SCHEME

Subject Code	Subject Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
				Hrs.	Max Marks		
		Theory hrs Per Week			CCE	SEE	
MTM231-2C	Advanced Calculus	4	4	2.5	50	50	100

Unit 1 Curvature & Radius of Curvature **Teaching Hours: 15**

Relation between Cartesian coordinate and arc length, Pedal equation, Curvature of plane curve, Radius of curvature of a curve defined in explicit equation, implicit equation, polar equation and parametric equation, Radius of curvature of a curve at origin, Singular points, Point of inflexion for plane curve, Test of concavity and convexity.

Unit 2 Beta and Gamma Function **Teaching Hours: 15**

Definition of Beta and Gamma function, Properties of Beta and Gamma function, Transformations of Beta and Gamma function, Relation between Beta and Gamma function, , Different forms of Beta function, Duplication formula.

Unit 3 Vector Differential Calculus **Teaching Hours: 15**

Directional derivatives in the plane, Scalar and vector point functions and field, The vector differential operator, Divergence of a vector point function, Curl of a vector point function, Vector identities, Laplacian operator, Classification of vector fields.

KADI SARVA VISHWAVIDYALAYA

B.Sc Semester 3 (Mathematics Subject's Syllabus)

Unit 4 Vector Integral Calculus	**Teaching Hours: 15**
Line integrals, Fundamental theorem of line integral, Green's theorem, Surface Integral,Stoke'stheorem, Volume integrals, Gauss's theorem.	

- *Continuous Evaluation: It consists of Assignments / Seminars / Presentations / Quizzes / Surprise Tests

Reference Books:

1. Integral Calculus, Shantinarayan S. Chand, New Delhi (Course Book)
2. Advanced Calculus, D V Widder , Prentice Hall , New Delhi
3. Advanced Calculus Vol : I & II, T M Apostol, Blaisdoll
4. Advanced Calculus, R C Buck, MacMillan
5. Differential Calculus, Shanti Narayan, S. Chand Publishing.
6. Linear Algebra and Vector Calculus, Ravish R. Singh, Mukul Bhatt, McGraw Hill Education (India) Private Limited.
7. Calculus, Dr. R.C. Shah, Books India Publication.
8. Mathematical Analysis, S C Malik and Savita Arora, New Age International (P) Limited.

KADI SARVA VISHWAVIDYALAYA

B.Sc Semester 3 (Mathematics Subject's Syllabus)

Mathematics Major Course - 7

MTM232-2C Application of Linear Algebra and Calculus

Learning Outcomes:

After completing this course student will be able to

- Check given set is a vector space or not.
- Identify that given set is linearly dependent or independent.
- Verify that given set is a basis of vector space or not.
- Understand the application of linear transformation.
- Understand the application of Gram Schmidt procedure and Least square approximation.
- Find radius of curvature of a curve.
- Understand the applications of Beta and Gamma functions
- Understand the application of Green's theorem, Stokes' theorem and Gauss divergence theorem.

TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Practical hrs Per Week		Hrs.	Max Marks		
					CCE	SEE	
MTM232-2C	Application of Linear Algebra and Calculus	8	4	5	50	50	100

Unit 1 Application of Linear Algebra **Teaching Hours: 60**

1. Examples on Vector Space, subspaces.
2. Check whether a given set is linearly dependent or independent.
3. Examples on span of a set.
4. Check whether given set is a basis of a vector space or not.
5. To Expand linearly independent set up to a basis of a vector space.
6. Check whether the given map is a linear transformation or not.
7. Examples on range and kernel of linear transformation.
8. Verifications on Rank-Nullity theorem
9. To find the inverse of a Linear transformations
10. To find the matrix for the given linear transformation.
11. To find the linear transformation from a given matrix.
12. Examples on dual basis.
13. To check given set is an inner product space or not for a given inner product.
14. Examples on norm and distance of vectors.
15. To check whether the given set of vector will form an orthogonal set for a given inner product.
16. Examples on Gram Schmidt procedure.
17. Examples on Least square approximation.

KADI SARVA VISHWAVIDYALAYA

B.Sc Semester 3 (Mathematics Subject's Syllabus)

Unit 2 Application of Calculus **Teaching Hours:60**

1. Examples based on finding radius of curvature of a curve.
2. Examples based on finding radius of curvature of a curve at origin.
3. Examples to test concavity and convexity.
4. Application of Beta and Gamma functions.
5. Examples based on divergence of a vector point function.
6. Examples based on curl of a vector point function.
7. Calculation of Laplacian operator of a function.
8. Examples on line integral.
9. Problems based on surface integral.
10. Application of Green's theorem
11. Application of Stokes' theorem
12. Application of Gauss divergence theorem.

• *Continuous Evaluation: It consists of Assignments / Seminars / Presentations / Quizzes / Surprise Tests

Reference Books:

1. An Introduction to linear algebra, by V. Krishnamurthy, J.L. Arora, East West Press Pvt Ltd, New Delhi.
2. Linear Algebra, Ramchandra Rao, P. Bhimasankar, Tata McGraw Hill.
3. Linear Algebra, S K Berberion, Oxford University Press.
4. Linear Algebra, Sharma and Vashishtha, Krishna Prakashan, Meerut.
5. Linear Algebra, Gupta KP, PragatiPrakshan, Meerut.
6. Advanced Linear Algebra, Steven Roman, 3rd edition, Springer.
7. Integral Calculus, Shantinarayan S. Chand, New Delhi (Course Book)
8. Advanced Calculus, D V Widder, Prentice Hall, New Delhi
9. Advanced Calculus Vol: I & II, T M Apostol, Blaisdoll
10. Advanced Calculus, R C Buck, MacMillan
11. Differential Calculus, Shanti Narayan, S. Chand Publishing.
12. Calculus, Dr. R.C. Shah, Books India Publication.
13. Mathematical Analysis, S C Malik and Savita Arrora, New Age International (P) Limited.
14. Linear Algebra and Vector Calculus, Ravish R. Singh, Mukul Bhatt, McGraw Hill Education (India) Private Limited.

KADI SARVA VISHWAVIDYALAYA

B.Sc Semester 3 (Mathematics Subject's Syllabus)

Mathematics Multidisciplinary Course

MDC224-2C Database Management System

LearningOutcomes:

After completing this coursestudentwill beableto

- Understand the basic concepts of database management system in particular relational database system.
- Develop the skills to design database system.
- Enhance the skills to develop application programs to manage & retrieve data from different perspective using Structured Query Language (SQL) in ORACLE

TEACHINGANDEVALUATIONSCHEME:

Subject Code	Subject Title	Teaching Scheme Practical's per Week		Credits	Examination Scheme			Total Marks
					Hrs.	Max Marks		
		Theory hrs Per Week	Practical hrs Per Week			CCE	SEE	
MDC224-2C	Database Management System	2	4	4	2(Th.) 2.5(Pr.)	50	50	100

Unit1 **Teaching Hours:15**

Introduction to DBMS and RDBMS: What is Database Management System, Purpose of database system, Advantages and disadvantages of database system, Introduction to RDBMS, The relational model, Introduction to SQL, Working with relations of RDBMS, Advantages and disadvantages of relational database

Data Modelling: Entity types, Entity set, Attribute, Attribute types and key, Relationships, Relation types, ER diagrams, Database design using ER diagrams.

Entity Relationship Model: Entity, Attributes, Relationships, E-R modeling symbols, Connectivity and Cardinality, Aggregation, Generalization.

Relational Database Model: Tables and Characteristics, Keys: Super key, Candidate key, Primary key,Foreign key, Composite key, Relational set operators - Union, Intersection, Difference, Divide, Product.

Relational Database Design: Functional dependency definition, Trivial and non-trivial FD, Closure of FD set, Closure of attributes, Irreducible set of FD, Normalization – 1NF, 2NF, 3NF, BCNF.

KADI SARVA VISHWAVIDYALAYA

B.Sc Semester 3 (Mathematics Subject's Syllabus)

Unit 2 **Teaching Hours:15**

Introduction to SQL: Basics of SQL, DDL, DML, DCL, Structure – creation, Alteration, Defining constraints, Primary key, Foreign key, Unique, Not null, Check in operator.

Functions - aggregate functions, Built-in functions –numeric, date, string functions.

Advanced SQL: Aggregate Functions and GROUP BY clause, retrieving data from multiple tables using Join, SET operators.

Sub-Queries: Single-row, Multiple-row, correlated – Sub-queries, Inline View–EXISTS, NOT EXISTS, IN, ANY, ALL operators. Transaction control commands – Commit, Rollback, Savepoint.

Practical's **TeachingHours:60**

1. Implement SQL queries to perform various DDL Commands.
2. Implement SQL queries to perform various DML Commands.
3. Implement SQL queries using Date functions
4. Retrieve data using SELECT command and various SQL operators.
5. Implement SQL queries using Numeric functions
6. Implement SQL queries using Character Functions
7. Implement SQL queries using Conversion Functions
8. SQL queries using Comparison Operators, Logical Operators in WHERE clause
9. Sorting data using ORDER BY clause
10. Implement SQL queries using Aggregate functions and group by clause
11. Implement SQL queries using Set operators
12. SQL queries based Joins
13. Sub-Queries - Single-row, Multiple-row, correlated – Sub-queries, Inline View, EXISTS, NOT EXISTS, IN, ANY, ALL operators
14. Transaction based queries using COMMIT, ROLLBACK, SAVEPOINT

- *ContinuousEvaluation:ItconsistsofAssignments/Seminars/Presentations/Quizzes/SurpriseTests

Reference Books:

1. Database system concepts, Abraham Silberschatz, Henry Korth, S, Sudarshan, McGraw Hill International.
2. Database systems: Design implementation and management, Rob Coronel, Thomson Learning Press.
3. Database Management Systems, Raghu Ramkrishnan, Johannes Gehrke, McGraw Hill International.
4. Database Management System, Alexis Leaon, Mathews Leon, Leon press.
5. Fundamentals of Database Systems, RemezElmasri,ShamkantNavathe, Pearson.
6. Database Systems – a Practical approach to design, implementation & Management, Thomes M. Colnnolly, Carolyn E. Begg, Pearson.

KADI SARVA VISHWAVIDYALAYA

B.Sc Semester 3 (Mathematics Subject's Syllabus)

Mathematics Skill Enhancement Course

SEC264-2C Quantitative Aptitude-I

Learning Outcomes:

After completing this course student will be able to

- Simplify algebraic expression.
- Find square roots and cube roots of given numbers.
- Solve the examples on average, numbers, ages, surds and indices.
- Calculate percentage, profit and loss.
- Find ratio and proportion.
- Solve examples on partnership, chain rule, time and work, time and distance.
- Develop confidence to appear in competitive exam.

TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme Per Week		Credits	Examination Scheme			Total Marks
						Max Marks		
		Theory hrs Per Week	Practical hrs Per Week		Hrs.	CCE	SEE	
SEC264-2C	Quantitative Aptitude-I	2	0	2	2	25	25	50

Unit1 **Teaching Hours: 15**

Problem solving on simplification, Examples of square roots and cube roots, Problem solving on average, Problems on numbers, Problems on ages, Examples of surds and indices

Unit2 **Teaching Hours: 15**

Problems on percentage, Examples of profit and loss, Problem solving on ratio and proportion, Examples on partnership, Problems on chain rule, Problem solving on time and work, Examples on pipes and cistern, Problems on time and distance

- *Continuous Evaluation: It consists of Assignments / Seminars / Presentations / Quizzes / Surprise Tests

Reference Books:

1. Quantitative Aptitude for Competitive Examinations, Dr. R. S. Aggarwal, S Chand Publishing.
2. The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Dinesh Khattar, Pearson.
3. CSIR-NET General Aptitude - A New Outlook, Christy Varghese, Lilly Publishing.