C. U. SHAH UNIVERSITY

WADHWAN CITY

FACULTY OF SCIENCES

B.Sc.

SEM - III

Syllabi (CBCS) of Mathematics

C. U. SHAH UNIVERSITY

FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: III**

SUBJECT NAME: Advanced Calculus **SUBJECT CODE: 4SC03ADC1**

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
					Theory				Practical			Total Marks
Th	Tu	Pr	Total		Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
3	0	0	3	3	30	1.5	70	3	--	--	--	100

Objectives: -The main objectives of this course are

- To identify Concave upwards and concave downwards functions
- To calculate Improper Integral using Beta – Gamma Functions.
- To learn partial differentiation.
- To identify maximum and minimum values using partial differentiation.
- To learn expansion of function using Taylor's and Maclaurin's series.

Prerequisites:-

Students must be familiar with the properties of functions, the algebra of functions, and the graphs of functions. Students should have basic knowledge of limit, differentiation and integration.

Course outline:-

Sr. No.	Course Contents	Hours
1	Increasing and decreasing functions, Concave upwards and concave downwards functions, Points of inflexion, Asymptotes.	9
2	Beta and Gamma functions, relation between Beta and Gamma functions, Duplication formula, Properties of Beta and Gamma functions.	9

3	Real functions of several variables, Their limit and continuity, (Repeated limits and limits in R^2 to be explained), Partial derivatives of functions of n variable (For special case $n = 2$ notation, D_{12} and D_{21} to be explained)	9
4	Differentiability, Chain rule, Partial derivatives of higher order, Condition for commutative property of variables in higher order partial derivatives, Derivatives of implicit functions.	9
5	Euler's theorem on partial derives of homogenous functions. Extremum of functions of several variables, Lagrange's method of undetermined multipliers, Taylor's and Maclaurin's expansions for functions of several variables (Proof for cases of two variables only)	9

Learning Outcomes:-

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

- Identify Concave upwards and concave downwards functions
- Calculate Improper Integral and partial differentiation
- Use partial differentiation in daily life.
- Identify maximum and minimum value of function.
- Apply Taylor's and Maclaurin's expansions in function of two variable.

Books Recommended:-

1. 'Differential Calculus', **Shanti Narayan & P. K. Mittal,** *S. Chand.*
2. 'Integral Calculus', **Shanti Narayan & P. K. Mittal,** *S. Chand.*
3. 'Advanced Calculus', **David Widder**, *Prentice hall, New Delhi.*
4. 'Advanced Calculus Volume-II, **T. M. Apostol**, *Blaisdoll.*
5. 'Partial Differential Equation', **T. Amarnath,** *Narosa.*
6. 'Calculus', **James Stewart,** *Brooks/Cole publishing company.*
7. 'Applied Calculus', **S. T. Tan**, *Brooks/Cole publishing company.*

E-Resources:-

1. http://en.wikipedia.org/wiki/Partial_derivative
2. http://math.feld.cvut.cz/mt/txtd/5/txe3da5h.htm
3. http://mathworld.wolfram.com/BetaFunction.html
4. http://www.millersville.edu/~bikenaga/calculus/graph/graph.html
5. http://calculus.nipissingu.ca/tutorials/curves.html

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FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: III**

SUBJECT NAME: Linear Algebra-I **SUBJECT CODE: 4SC03LIA1**

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
					Theory				Practical			Total Marks
Th	Tu	Pr	Total		Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
3	0	0	3	3	30	1.5	70	3	--	--	--	100

Objectives: - The main objectives of this course are

- To use and understand matrix and vector notation.
- Construct visualizations of matrices related to vector.
- To provide students with a good understanding of the concepts and methods of linear algebra
- To help the students develop the ability to solve problems using linear algebra.
- To connect linear algebra to other fields both within and without mathematics.

Prerequisites:-

Students must be familiar with the properties of set theory, function, Determinant and Matrices. Students should have basic knowledge of vector calculus.

Course outline:-

Sr. No.	Course Contents	Hours
1	Vector space, Definition and examples, Vector Subspaces, Linear dependence and independence.	9
2	Span of a set, Basis and dimension of a vector space.	9

3	Linear transformation, Representation of linear transformation by a matrix, Kernel and image of a linear transformation.	9
4	Linear isomorphism, Geometric ideas and rank, Identity, Stretch along axes, Reflection with respect to axes, Rotation, Shear, Projection, Their Combinations.	9
5	Inner product spaces, the Euclidean plane and the dot product, general inner product spaces.	9

Learning Outcomes:-

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

- Analyze real world scenarios to recognize when vectors, matrices, or linear systems are appropriate, formulate problems about the scenarios, creatively model these scenarios
- Work with vectors, matrices, or linear systems symbolically and geometrically in various situations
- Give examples and non-examples of linear transformations, evaluate the matrix representations of a linear transformation

Books Recommended:-

1. 'Linear Algebra – A Geometric Approach', **S. Kumaresan,***Prentice Hall, New Delhi.*
2. 'Finite Dimensional Vector spaces',**P. Halmos,***Literary Licensing, LLC.*
3. 'Elementary linear algebra with applications', H.Anton & C. Rorres.
4. 'Matrix and Linear algebra',**K. B. Dutta,***Prentice Hall, New Delhi.*
5. 'Linear Algebra-A problem book', **P. R. Halmose,***Cambrigeuniversity Press.*
6. 'Linear Algebra', **G. Paria,***New central book agency-Calcutta.*
7. 'Linear algebra and applications',**Gilbert Strang Thomson,** *Cole publishing company.*

E-Resources:-

1. http://www.math.clarku.edu/~djoyce/ma130/vectorspace.pdf
2. http://www.saylor.org/courses/ma211/
3. http://en.wikipedia.org/wiki/Linear_algebra
4. https://www.khanacademy.org/math/linear-algebra

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DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: III**

SUBJECT NAME: Numerical Analysis **SUBJECT CODE: 4SC03NUA1**

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
					Theory				Practical			Total Marks
Th	Tu	Pr	Total		Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
3	0	0	3	3	30	1.5	70	3	--	--	--	100

Objectives: -The main objectives of this course are

- Find the Lagrange Interpolation Polynomial for any given set of points.
- Use finite differences for interpolation, differentiation, etc.

Prerequisites:-

Basic knowledge of Linear Algebra and differential equations.

Course outline:-

Sr. No.	Course Contents	Hours
1	Error in calculation and calculus of finite differences, interpolation. Significant error, Relative error, Estimation of error, Application of error formula.	9
2	Forward differences, Backward differences, Shift operator, Polynomial in factorial notation.	9
3	Interpolation: error in interpolation, Newton's forward and backward formula, Central difference, Gauss's forward and backward formula.	9
4	Stirling's interpolation formula, Bessel's and Everett's formulae, Lagrange's formula.	9

5	Divided difference, Newton's divided difference formula, inverse interpolation, its application.	9

Learning Outcomes:-

After successful completion of this course students will be able to

- Analyze errors and have an understanding of error estimation.
- Be able to use polynomials in several ways to approximate both functions and data, and to match the type of polynomial approximation to a given type of problem.
- Be able to solve equations in one unknown real variable using iterative methods and to understand how long these methods take to converge to a solution.
- Derive formulas to approximate the derivative of a function at a point, and formulas to compute the definite integral of a function of one or more variables.
- Choose and apply any of several modern methods for solving systems of initial value problems based on properties of the problem.

Books Recommended:-

1. 'Numerical Analysis and Computational Procedures', **S. A. Moolah,***New Central Book Agency (P) Ltd., Calcutta.*
2. 'Elementary Numerical analysis', **S. S. Sastry,** *Prentice Hall, New Delhi.*
3. 'Numerical mathematical analysis 6th edition', **Scarborough,** *Oxford & IBH.*
4. 'Numerical analysis', **S. Kunz,** *Mcgraw Hill Book New York.*
5. 'Numerical Analysis', **Richard Burden and J. Douglas Thomson,** *Cole Pub Co; 6th edition (December 24, 1996)*

E-Resources:-

1. http://mathfaculty.fullerton.edu/mathews/numerical.html
2. http://en.wikipedia.org/wiki/Numerical_analysis
3. http://ocw.mit.edu/courses/mathematics/18-330-introduction-to-numerical-analysis-spring-2012/
4. http://math.mercyhurst.edu/~platte/syllabi/numerical_analysis_spring_09_10.html

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DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: III**

SUBJECT NAME: Logic and Sets **SUBJECT CODE: 4SC03LAS1**

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
					Theory				Practical			Total Marks
Th	Tu	Pr	Total		Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
3	0	0	3	3	30	1.5	70	3	--	--	--	100

Objectives: - The main objectives of this course are

- To understand the importance of truth based thinking.
- To analysis and predicate about the future scenario via truth table.
- To understand day to day problem in mathematical form.
- To formulate thought of truth in mathematical form.

Course outline:-

Sr. No.	Course Contents	Hours
1	Introduction, propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators.	9
2	Propositional equivalence: Logical equivalences. Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.	9
3	Sets, subsets, Set operations, the laws of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle. Empty set, properties of empty set.	9

4	Standard set operations. Classes of sets. Power set of a set. Difference and Symmetric difference of two sets. Set identities, Generalized union and intersections.	9
5	Relation: Product set, Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation.	9

Learning Outcomes:-

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

- Understsnd the importance of truth baised thinking.
- Analysis and predicate about the future scenario via truth table.
- Understand day to day problem in mathematical form.
- Formulate thought of truth in mathematical form.

Books Recommended:-

1. 'Discrete Mathematics and Combinatorial Mathematics', **R. P. Grimaldi**, *Pearson Education, 1998.*
2. 'Naive Set Theory ', **P. R. Halmos**, *Springer, 1974*
3. 'Theory of Sets', **E. Kamke**, *Dover Publishers, 1950.*

E-Resources:-

1. https://www.whitman.edu/mathematics/higher_math.../section01.05.html
2. www.maths.manchester.ac.uk/~mdc/old/1K1/DiscreteMaths.html
3. math.boisestate.edu/~holmes/indstudy/proofsetslogic.pdf

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DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: III**

SUBJECT NAME: Mathematics Practical-III **SUBJECT CODE: 4SC03MAP1**

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
					Theory				Practical			
Th	Tu	Pr	Total		Sessional Exam		University Exam		Internal		University	Total Marks
					Marks	Hrs	Marks	Hrs	Pr	TW		
0	0	6	6	3	--	--	--	--	20	10	70	100

Objectives:- The main objectives of this course are

- To find the Lagrange's interpolation polynomial for any given set of points.
- To use finite differences for interpolation, differentiation etc.

Prerequisites:-Basic knowledge of linear algebra and differential equations.

Course outline:-

Sr. No.	Course Contents
1	Problems based on real functions of several variable, limit, continuity, Partial derivative.
2	Problems based on Euler's theorem on homogeneous function, Change of variable.
3	Problems based on Taylor's expansion and Maxima-Minima for a function of two variable.
4	Problems based on Beta, Gamma functions, concave downwards, upwards, points of inflection, asymptotes.
5	Problems based on Iterative method of solution of simultaneous linear system by Gauss-seidel and Gauss – Jacobi. Determination of Eigen values by power method.
6	Problems based on vector space, subspace.
7	Problems based on linearly independent, linearly dependent, basis, span.

8	Problems based on linear transformation, inner product.
9	Problems based on errors, Newton's forward, backward, Gauss's forward, backward interpolation formula.
10	Problems based on Sterling's formula, Bessel's formula, Laplace Everest's formula, Lagrange's formula, Newton's divided difference formula.
	OR
9	Problems based on sets, subsets, set operations, the laws of set theory and venn diagrams, finite and infinite sets, counting principle, Empty set, properties of empty set, standard set operations, classes of sets, power set of a set, difference and symmetric difference of two sets, set identities, generalized union and intersections.
10	Problems based on product set, composition of relations, types of relations, partitions, equivalence relations, congruence modulo relation, logical equivalences, predicates and quantifiers, introduction, quantifiers, binding variables and negations.

Learning Outcomes:-

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

- Analyze errors and have an understanding of error estimation.
- Be able to use polynomials in several ways to approximate both functions and data, and to match the type of polynomial approximation to a given type of problem.
- Be able to solve equations in one unknown real variable using iterative methods and to understand how long these methods take to converge to a solution.
- Derive formulas to approximate the derivative of a function at a point, and formulas to compute the definite integral of a function of one or more variables.
- Choose and apply any of several modern methods for solving systems of initial value problems based on properties of the problem.

Books Recommended:-

1. 'Numerical Analysis and computational Procedures', **S. A. Moolah**, *New Central Book Agency (p) Ltd., Calcutta.*
2. 'Elementary Numerical analysis'**, S. S. Sastry**, *Prentice Hall, New Delhi.*
3. 'Numerical mathematical analysis 6th edition', **Scarborough**, *Oxford & IBH*.
4. 'Numerical analysis', **S. Kunz**, *McGraw Hill Book New York.*
5. 'Numerical Analysis', **Richard Burden and J. Dougals Thomson**, *Cole Pub co.*
6. 'Advanced Calculus', **David Widder**, *Prentice hall, New Delhi.*
7. 'Advanced Calculus Volume-II, **T. M. Apostol**, *Blaisdoll.*
8. 'Differential Calculus', **Shanti Narayan & P. K. Mittal,** *S. Chand.*

9. 'Integral Calculus', **Shanti Narayan & P. K. Mittal**, *S. Chand.*
10. 'Discrete Mathematics and Combinatorial Mathematics', **R.P. Grimaldi**, *Pearson Education, 1998.*
11. 'Naive Set Theory ', **P. R. Halmos**, , *Springer, 1974*
12. 'Theory of Sets'**, E. Kamke**, *Dover Publishers, 1950.*
13. 'Linear Algebra – A Geometric Approach', **S. Kumaresan,** *Prentice Hall, New Delhi.*
14. 'Finite Dimensional Vector spaces', **P. Halmos,** *Literary Licensing, LLC.*

Notes:-

1. Problem solving skill in mathematics is an important aspect in the teaching of mathematics.
2. There would be problem solving session of six hours per week and they will be conducted in batches.