C. U. SHAH UNIVERSITY

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WADHWAN CITY

FACULTY OF SCIENCES

B.Sc.

SEM - IV

Syllabi (CBCS)
of Mathematics

C. U. SHAH UNIVERSITY

FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: IV**

SUBJECT NAME: Differential and Integral Calculus

SUBJECT CODE: 4SC04DIC1

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 study gradient, divergence curl, lLine integral, surface integral and to study theorems related to them.

Prerequisites:-Knowledge of differentiation, integration and basic calculus.

Course outline:-

Sr. No.	Course Contents	Hours
1	First order partial differential equation, Formation of partial differential equation, Linear equations of first order.	5
2	Curves, Surfaces, Differentiation along a curve, Applications to geometry: Curvature in Cartesian and polar co-ordinates Singular points for plane curves especially points of inflection and double points.	8
3	Equations of Tangent and normal to the curves, Tangent plane and normal line to the surfaces, Gradient, Divergence and Curl of vectors.	8
4	Double integral, Change of order, Triple integral, Change of variable in multiple integral.	12
5	Line integral, Surface integral, Green's theorem, Gauss – Divergence theorem, Stoke's theorem (Without proof), Examples based on theorems	12

Learning Outcomes:-After successful completion of this course students will be able to solve any problem related to differential and integral calculus.

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://math.stackexchange.com/questions/523074/differential-calculus-vs-integral-calculus
2. https://www.khanacademy.org/math/multivariable-calculus/line_integrals_topic/greens_theorem/v/green-s-theorem-example-1
3. http://www.math24.net/greens-formula.html
4. http://www.math24.net/stokes-theorem.html
5. http://youtube.com/watch?v=W0u0AVa-xig
6. http://mathinsight.org/triple_integral_examples
7. http://mathinsight.org/triple_integral_introduction

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FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: IV**

SUBJECT NAME: Linear Algebra-II **SUBJECT CODE: 4SC04LIA1**

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
					Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
Th	Tu	Pr	Total		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 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	Orthogonality, Geometrical application, orthogonal projection onto a line, orthonormal basis, orthogonal complements and projections.	9
2	Linear functionals and hyper-planes, orthogonal transformations, associated co-ordinates, reflections, orthogonal map of the plane.	9
3	Determinants and its properties, Value of a determinant, Basic results-Laplace expansion, Cramer's rule, Application to geometry, orientation and vector product.	9

4	Rotation of axes of conics, Review Eigenvalues and eigenvectors, Diagonalization of symmetric matrices.	9
5	Conics and quadrics, classification of Quadrics, computational examples.	9

Learning Outcomes:-

- 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. 'Matrix and Linear algebra', **K. B. Dutta,** *Prentice Hall, New Delhi.*
4. 'Linear Algebra-A problem book', **P. R. Halmos,** *Cambridge university Press.*
5. 'Linear Algebra', **G. Paria,** *New central book agency-Calcutta.*
6. '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: IV**

SUBJECT NAME: Numerical Methods **SUBJECT CODE: 4SC04NUM1**

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		
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	Estimation of error in differentiation formula based on Newton's forward and backward formulae, and Stirling's formula.	9
2	Differentiation formulae of un-equispaced arguments, General quadrature formula, Trapezoidal rule, Simpson's rule, Weddel's rule.	9
3	Quadrature formula based on Lagrange's formula, Newton-Cotes formula, Numerical integration formula based on central difference formulae, Euler-Maclaurin sum formula.	9
4	Algebraic and transcendental equations, Numerical solution of differential equations of first order; Graphical method, method of bisection, method of iteration, Newton-Raphson formula, Newton's iterative formula, method of false position.	9

5	Euler's method, Euler's modified method, Picard's method. Taylor's series method, Runge-Kutta method, Milne's method.	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: IV**

SUBJECT NAME: Mathematical Finance **SUBJECT CODE: 4SC04MAF1**

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 growth of market value and the variabeles depenging upon .
- To formulate profit and loss as mathematical tool.
- To understand the portfolio diagram with different models like Markowitz model.

Prerequisites:- Students must be familiar with the properties of set function, Derivative ,integration etc. and basic techniques of numerical methods and statistics.

Course outline:-

Sr. No.	Course Contents	Hours
1	Basic principles: Comparison, arbitrage and risk aversion, Interest (simple and compound, discrete and continuous).	9
2	Time value of money, inflation, net present value, internal rate of return (calculation by bisection and Newton-Raphson methods).	9
3	Comparison of NPV and IRR. Bonds, bond prices and yields. Floating-rate bonds, immunization.	9
4	Asset return, short selling, portfolio return, (brief introduction to expectation, variance, covariance and correlation),	9

5	Random returns, portfolio mean return and variance, diversification, portfolio diagram, feasible set, Markowitz model (review of Lagrange multipliers for 1 and 2 constraints).	9

Learning Outcomes:- After the successful completion of the course, students will be able to

- Understand the growth of market value and the variables depending upon.
- Formulate profit and loss as mathematical tool.
- Understand the portfolio diagram with different models like Markowitz mode

Books Recommended:-

1. 'Investment Science', **D. G. Luenberger,** *Oxford University Press, Delhi, 1998.*
2. 'Options, Futures and Other Derivatives', **J. C. Hull**, *Prentice-Hall India, Indian reprint, 2006.*
3. 'An Elementary Introduction to Mathematical Finance', **S. Ross,** *Cambridge University Press, USA, 2003.*

E-Resources:-

1. https://en.wikipedia.org/wiki/Mathematical_finance.
2. onlinelibrary.wiley.com › Mathematics › Business & Finance
3. https://www.coursera.org/course/mathematicalmethods
4. https://plus.maths.org/content/what-financial-mathematics

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DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: IV**

SUBJECT NAME: Mathematics Practical-IV **SUBJECT CODE: 4SC04MAP1**

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 solve algebraic and transcendental equation by using different methods
- Use integration to find area of region and volume of surface.

Prerequisites:-

Basic knowledge of differentiation, integration, calculus and differential equations.

Course outline:-

Sr. No.	Course Contents
1	Problems based on first order partial differential equation, formation of partial differential equation.
2	Problems based on gradient, divergence & curl of vector in R^3.
3	Problems based on double integral, Triple integral, Change of variable in multiple integral.
4	Problems based on line integral, surface integral, Green's theorem, Gauss – Divergence theorem, Stoke's theorem.
5	Problems based on angles between two curves, radius of curvature for Cartesian, parametric and polar equations, arc length of the curves given in Cartesian, parametric and polar forms
6	Problems based on orthogonalization, angles, Gram schmidth orthogonalisation process.

7	Problems based on geometric applications orthogonal linear transformation.
8	Problems based on determinant, diagonalization of symmetric matrices, canonical form of conics and quadratics.
9	Problems based on bisection method, method of iteration, Newton – Raphson formula, Newton's iterative formula and method of false position.
10	Problems based on Trapezoidal rule, Simpson's $\frac{1}{3}$ rule, Simpson's $\frac{3}{8}$ rule, Weddle's rule, Taylor's series method, Picard's method, Euler's Method, Runge – Kutta method.
	OR
9	Problems based on mathematical finance.
10	Problems based on mathematical finance.

Learning Outcomes:-

After successful completion of this course student will be able to

- Solve any problem related to differential or integral calculus.
- Analyze errors and have an understanding of error estimation.
- Be able to use polynomials in several ways to approximate both function and data, and to much 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. 'Advanced Calculus', **David Widder**, *Prentice hall, New Delhi.*
4. 'Advanced Calculus Volume-II, **T. M. Apostol**, *Blaisdoll.*
5. 'Differential Calculus', **Shanti Narayan & P. K. Mittal**, *S. Chand*.
6. 'Integral Calculus', **Shanti Narayan & P. K. Mittal**, *S. Chand.*
7. 'Partial Differential Equation', **T. Amarnath**, *Narosa.*
8. 'Linear Algebra – A Geometric Approach', **S. Kumaresan,** *Prentice Hall, New Delhi.*
9. 'Finite Dimensional Vector spaces', **P. Halmos,** *Literary Licensing, LLC.*
10. 'Matrix and Linear algebra', **K. B. Dutta,** *Prentice Hall, New Delhi.*
11. 'Linear Algebra-A problem book', **P. R. Halmos,** *Cambridge university Press.*

12. 'Investment Science', **D. G. Luenberger,** *Oxford University Press, Delhi, 1998.*
13. 'Options, Futures and Other Derivatives', **J. C. Hull**, *Prentice-Hall India, Indian reprint, 2006.*
14. 'An Elementary Introduction to Mathematical Finance', **S. Ross,** *Cambridge University Press, USA, 2003*

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.