



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Differential and Integral Calculus SUBJECT CODE: 4SC04MTC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					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, Line 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	Curves, Surfaces, First order partial differential equation, Classification of integrals, Linear equations of first order	9
2	Differentiation along a curve, Applications to geometry: 1. Curvature in Cartesian and polar co-ordinates 2. Singular points for plane curves especially points of inflexion and double points.	9
3	Tangent line and normal plane to curves: 1. Tangent plane and normal line to surfaces 2. Gradient, Divergence and Curl of vectors	9



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4	Double integral, Repeated integral, integral on a non-rectangular region, Jacobian, only introduction and use for transformation from Cartesian to polar, spherical and cylindrical coordinates and vice-versa.	9
5	Line integral, Surface integral, Green's theorem and Stoke's theorem (Only statements), Examples based on Green's theorem and Stoke's theorem.	9

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

Books Recommended:-

1. 'Advanced Calculus', **David Widder**, *Prentice hall, New Delhi*.
2. 'Advanced Calculus Volume-II', **T. M. Apostol**, *Blaisdell*.
3. 'Differential Calculus', **Shanti Narayan**, *S. Chand*.
4. 'Integral Calculus', **Shanti Narayan**, *S. Chand*.
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



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Linear Algebra-II

SUBJECT CODE: 4SC04MTC2

Teaching & Evaluation Scheme:-

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

Objectives: -

- 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



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4	Rotation of axes of conics, Eigenvalues and eigenvectors, Cayley – Hamilton theorem. 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. Halmose**, *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 Method

SUBJECT CODE: 4SC04MTE1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					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 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



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5	Euler's method, Euler's modified method, Picard's method. Taylor's series method, Runge-Kutta method, Milne's method.	9
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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.

SUBJECT NAME: Statistics-II

SEMESTER: IV

SUBJECT CODE: 4SC04MTE2

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					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 objective of this course is to acquaint students with some basic concerns statistics. They will be introduced to some elementary statistical methods of analysis and Probability.

Prerequisites: -Should have studied Statistics-I.

Course outline:-

Sr. No.	Course Contents	Hours
1	Sample Space and Events: Concepts of experiments and random experiments. Definitions : Sample space, discrete sample space (finite and countably infinite), event, elementary event, compound event. Algebra of events (Union, Intersection, complementation) Definitions of Mutually exclusive events, Exhaustive events, impossible events, certain events. Power set $2^P(\Omega)$ (sample space consisting at most 4 sample points). Symbolic representation of given events and description of events in symbolic form. Illustrative examples.	7



2	Probability: Equally likely outcomes (events), apriori (classical), definition of probability of an event. Equiprobable sample space, simple examples of computation of probability of the events based on Permutations and Combinations. Axiomatic definition of probability with reference to a finite and countably infinite sample space.	8
3	Probability: Proof of the results : i) $P(\Phi) = 0$ ii) $P(A^c) = 1 - P(A)$ iii) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (with proof), extension of this to $P(A \cup B \cup C)$. iv) If $A \subset B$, $P(A) \leq P(B)$. v) $0 \leq P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B)$ vi) $P(A \cap B^c) = P(A) - P(A \cap B)$ Illustrative examples based on the results above.	7
4	Conditional Probability and Independence of Events: Definition of conditional probability of an event. Multiplication theorem for two events $P(A \cap B) = P(A)P(B A)$ Partition of Sample space Idea of Posteriori probability, statement and proof of Bayes theorem, examples on Bayes theorem. Concept of Independence of two events. Proof of the result that if A and B are independent then, i) A and B^c , ii) A^c and B, iii) A^c and B^c are independent. Pairwise and Mutual Independence for three events. Elementary examples.	12
5	Univariate Probability Distribution (Defined on finite and countable infinite sample space): Definition of discrete random variables. Probability mass function (p.m.f.) and cumulative distribution function (c.d.f.), a discrete random variable, properties of c.d.f. (statements only) Probability distribution of function of a random variable. Median and Mode of a univariate discrete probability distribution. Examples	11

Learning Outcomes:-At the end of this course students are expected to be able.

1. To distinguish between random and non-random experiments.
2. To find the probabilities of the events.



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Books Recommended:-

1. 'Statistics :A Beginner's Text Vol. 1', **Bhat B. R., Srivenkatramana, T and Madhava K. S.,***New Age International (P), Ltd.*
2. 'Applied General Statistics', **Croxton F. E., Cowden D. J. and Kelin S.,***Prentice Hall of India.*
3. 'Fundamentals of Statistics Vol. I and II', **Goon, Gupta and Dasgupta,***World Press, Calcutta.*
4. 'Statistical Methods', **Gupta S. P.**
5. 'Statistical Methods', **Snedecor G. W. and Cochran W. G.,***Lowa State University Press.*
6. 'Mathematical Statistics Paper I', **Kumbhojkar G. V.**
7. 'Mathematical Statistics Paper II', **Kumbhojkar G. V.**

E-Resources:-

1. http://en.wikipedia.org/wiki/Sample_space
2. http://people.hofsta.edu/Stefen_Waner/RealWorld/tutorialsf2/frames6_1.html
3. <http://www.stats.gla.ac.uk/steps/glossary/probability.html>
4. <http://youtube.com/watch?v=t6G8mL0w4xM>
5. http://www.wyzant.com/resources/lessons/math/statistics_and_probability/probability/further_concepts_in_probability



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FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Mathematics Practical-IV

SUBJECT CODE:4SC04MTP1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
0	0	4	4	2	--	--	--	--	10	10	30	50	

Objectives: - The 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	To find divergence & curl of vector in R^3 with its properties.
2	To change of order of double integral
3	To find volume of surface by double integral
4	To find area of region by green's theorem
5	To verify stock's theorem of for function in R^3 over certain surface
6	To find algebraic and transcendental equations by graphical method, method of bisection and method of iteration.
7	To find algebraic and transcendental equations by Newton – Raphson formula, Newton's iterative formula and method of false position.
8	To Find integration by Trapezoidal rule, Simpson's $\frac{1}{3}$ rule, Simpson's $\frac{3}{8}$ rule and Weddle's rule.



9	To find solution of ordinary differential equation by Taylor's series method, Picard's method, Euler's Method.
10	To find solution of ordinary differential equation by Runge – Kutta method and Milne's method.

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. '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)*
6. 'Advanced Calculus', **David Widder**, *Prentice hall, New Delhi*.
7. 'Advanced Calculus Volume-II', **T. M. Apostol**, *Blaisdoll*.
8. 'Differential Calculus', **Shanti Narayan**, *S. Chand*.
9. 'Integral Calculus', **Shanti Narayan**, *S. Chand*.
10. 'Partial Differential Equation', **T. Amarnath**, *Narosa*.
11. 'Calculus', **James Stewart**, *Brooks/Cole publishing company*.
12. 'Applied Calculus', **S. T. Tan**, *Brooks/Cole publishing company*

Notes:-

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



FACULTY OF SCIENCE

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Professional Communication Skills (PCS)

SUBJECT CODE: 4SC04PCS1

Teaching & Evaluation Scheme:-

Teaching Scheme				Credit	Evaluation Scheme						
Th	Tu	Pr	Total		Th	Hrs	Sessional Exam	Hrs	Term Work	Practical / Comprehensive Viva	Total
02	02	--	04	03	70	3	30	1.5	20	30	150

Objectives:

- To give a global competitive edge to the students by way of honing their Professional Communication Skills.
- To make them aware of the societal setting of the professional life.
- To train them in basic fundamentals skills of Communication – LSRW

Prerequisites:

- i) Students should have basic knowledge of English Language and grammar.
- ii) Students should have ability to speak and write correct sentences in their day to day language.
- iii) Students should be familiar with correct usage of language.

Course outline:

Sr. No.	Course Content (Title of the Unit)	Minimum Number of Hours
0	Prerequisites	02
1	Behavioural Communication	08
2	Mastering LSRW Skills	05
3	Presentation Skills	05
4	Reading Skill	03
5	Writing Skill	10
6	Learning Phonetics for Effective Speaking	06
7	Revision of Grammar	06
8	Vocabulary Building	03
	PART-B Prose and Poetry	12
9	One Act Play	
10	Poems	
	Total Hours	60



Detail Course Content:

Unit No.	Content In Details Including Its Sub Topics
	PART – A Professional Communication
1	Behavioural Communication <ul style="list-style-type: none"> Basics of Behavioral Communication Importance of Behavioral Communication in Professional World Types of Behavioral Communication Verbal Communication v/s Non Verbal Communication Grooming and Etiquettes
2	Mastering LSRW Skills <ul style="list-style-type: none"> Story Making and Telling Movie Review (Writing and Speaking) Book Review (Writing and Speaking)
3	Presentation Skills <ul style="list-style-type: none"> What is presentation? Purpose of Presentation Preparatory Steps of Presentation Nuances of Delivery Importance of Audio-Visual Aids in Presentation
4	Business & Technical Letter Writing <ul style="list-style-type: none"> Introduction to Letter Writing Personal Letter Vs Business Letter Style of writing Business Letter Principles of writing Business Letter Layout of Business Letter Types of Letter – Inquiry, Order, Quotation, Claim & Adjustment, Sales Letter Report Writing: <ul style="list-style-type: none"> What is Report? Characteristics of Report Types of Informal Reports
6	Learning Phonetics for Effective Speaking <ul style="list-style-type: none"> Speech Mechanism Sounds, Vowels & Consonants Accents, Tone, Syllable, Intonation Patent & Phonetics Transcription
7	Revision of Grammar Some of the grammatical topics should be revised to strengthen LSRW SKILLS of the students
8	Vocabulary Developing <ul style="list-style-type: none"> Homophones Homonyms One word Substitute
9	PART – B Literature
	Prose (One Act Play) <ul style="list-style-type: none"> “A Marriage Proposal” by Anton Chekhov



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	Poetry <ul style="list-style-type: none">• “The Night of Scorpion ” by NissimEzekeil• “The Lamb” by William Black• “The Pulley ” by George Herbert
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Resources:

- Green Andy, Effective Personal Communication Skills For Public Relations, Kogan Page, Limited, 2006
- Technical Communication, by D.K.Chakradev, Tech-max publication
- Basic Business Communication, by Flatly and Lesicar
- Basic Communication Skills for Technology, by Andrea J. Rutherford, by Pearson Education
- From sentence to paragraph, by William J. Kelly and Deborah L. Lawton, by Longman
- Technical Communication : Principles and Practice, by Meenaxi Raman andSangeeta Sharma, Oxford University Press
- An Intermediate English Grammar, Raymond Murphy, Cambridge University Press
- A High School English Grammar, Wren & Martin, S. Chand Publication
- A Course in Phonetics for Spoken English, Sethi&Dhamija
- Masks: One Act Plays(Ed) D. S. Maini. Macmillan.
- Wing word: A Collection of Poetries.