



KADI SARVA VISHWA VIDYALAYA
B.Sc Mathematics Semester 5 Syllabus (W.E.F. June 2019)

B.Sc Mathematics Semester V

KADI SARVA VISWAVIDYALAYA						
B.Sc. (MATHEMATICS), SEMESTER-5 SCHEME						
Subject Code	Course	Examination				Credit
		Instructions Hrs / week	Internal	University Exam	Total	
CMAT-501	Abstract Algebra-I	3	30	70	100	3
CMAT-502	Mathematical Analysis- I	3	30	70	100	3
CMAT-503	Differential Equations	3	30	70	100	3
CMAT-504	Operations Research- I	3	30	70	100	3
PCMAT-501	Mathematics Practical- III	12	00	200	200	6
SE Math 501-A	(Discipline Specific Specialization) Business Mathematics- III	2	50	00	50	2
SE Math 501-B	(Discipline Specific Specialization) Discrete Mathematics- III					
EGC- 501	(Generic Elective) CYBER SECURITY	2	50	00	50	2
FCG-501	(University Elective) Basic English- V	2	15	35	50	2
Total		30	235	515	750	24



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CMAT 501- Abstract Algebra-I

RATIONALE: This course is designed to enable students to acquire basic understanding of the basic concepts of algebraic structures.

LEARNING OUTCOMES:

- Understand the concept of various algebraic structures.
- Develop an understanding of cycle groups and quotient groups
- Understand the concept of homomorphism and isomorphism of groups

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CMAT- 501	Abstract Algebra-I	3	48	30	70	100

COURSE CONTENT

Unit I: Basic Concepts of Group

Number of Lectures: 15

Weightage: 34%

Groupoid, Semigroup, Monoid, Group, Elementary properties of a Group, Finite Groups and their tables, Subgroup, Lagrange's theorem and its applications.

UNIT II: Various Groups and its Properties

Number of Lectures: 15

Weightage: 33%

Permutation and Permutation Group, Transposition and cycle, Cyclic Permutation, Cyclic Group, Subgroup, Normal subgroup, Quotient group.

UNIT III: Homomorphism and Isomorphism of Group

Number of Lectures: 18

Weightage: 33%

Homomorphism, Kernel of Homomorphism, Cayley's Theorem, Isomorphism of group, Groups of order four and six.



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REFERENCES:

1. Abstract Algebra, I.H. Sheth, Prentice Hall of India (PHI) Publication.
2. Topics in Algebra, I.N. Herstein, Wiley Eastern Ltd.
3. Basic Algebra Vol I & II, N. Jacobson, Hindustan Publishing company
4. A text book of Modern Algebra, Shanti Narayan, S. Chand & Co.
5. Basics Abstract Algebra, (2nd Edition), P.B. Bhattacharya, S.K. Jain, S.R. Nagpaul, Cambridge University Press.
6. University Algebra, N.S. Gopalkrishna, Wiley Eastern, New Delhi
7. Advanced Abstract Algebra, S.K Pundir, Krishna Prakashan Media (P) Ltd. , Meerut
8. Algebra, Maclane Saunders and Birkhoff Garrett, MacMillan, New York.

INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & discussing mathematics formulas and derivations.
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

TEACHING AND EXAMINATION

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit I	34	15
Unit II	33	15
Unit III	33	18
Total	100	48



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CMAT 502- Mathematical Analysis-I

RATIONALE: This course is designed to enable students to acquire basic understanding of the basic concepts of number system and topological spaces.

LEARNING OUTCOMES:

- Understand the concept of number system.
- Develop an understanding of basic topology
- Gain knowledge about sequence and series

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CMAT- 502	Mathematical Analysis-I	3	48	30	70	100

COURSE CONTENT

Unit-1 : Boundedness and Completeness of a Set

Number of Lectures: 15

Weightage: 34%

Field structure, order structure, bounded and unbounded sets, supremum & infimum, completeness & order completeness in \mathbb{R} , Archimedean property of real numbers, Dedekind form of completeness property, absolute value of a real number.

Unit-2 : Metric Space

Number of Lectures: 15

Weightage: 33%

Neighborhood of a point, limit point of a set, open and closed sets, dense set, countable & uncountable sets, metric space, compact set, perfect set, connected and convex subsets of metric spaces.



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Unit-3 : Sequences and Series

Number of Lectures: 18

Weightage: 33%

Sequences, convergence of sequence, Cauchy sequence, special sequences and series, infinite series, series of non negative terms, comparison test, root test, ratio test, power series, radius of convergence, absolute convergence, addition and multiplication of series.

Reference books:

1. “Mathematical Analysis”, S.C. Malik, Savita Arora, New Age International (P) Limited, Publishers, 5th Edition
2. “Real Analysis”, N.P. Bali, Golden Maths Series, Laxmi Publications (P) Limited.
3. “Principles of Mathematical Analysis”, Tom M. Apostol, 2nd Edition
4. “Principles of Mathematical Analysis”, Walter Rudin, McGraw Hill (International Student Edition), 3rd Edition.
5. “A First Course in Mathematical Analysis”, D. Somasundaram & B. Choudhary, Narosa Publishing House
6. “Fundamentals of Mathematical Analysis”, G. Das & S. Pattnayak Tata Mcgraw Hill Pub. Co
7. “Fundamental of Real Analysis”, S.L. Gupta & Nisha Rani, Vikas Pub. House Pvt. Ltd. New Delhi-1974.

Teaching Instructions:

1. Interactions with the students to understand the level of students
2. Explaining & discussing mathematics formulas and derivations.
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

TEACHING AND EXAMINATION

UNIT	Examination Scheme % Weightage	Teaching Scheme No. of Lecture
Unit I	34	15
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CMAT 503- Differential Equations

RATIONALE: This course is designed to enable students to acquire basic understanding of the basic concepts of Differential equations.

LEARNING OUTCOMES:

- Understand the formation of differential equations
- Develops an understanding of linear and non-linear differential equation and its solution
- Learns to solve second order differential equation

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CMAT- 503	Differential Equations	3	48	30	70	100

COURSE CONTENT

Unit: 1: Basic Concepts of Differential Equations

Number of Lectures: 15

Weightage: 34%

Formation of Differential Equations, Symbolic Operator, Method of finding C.F., Symbolic Operator $1/f(D)$, Method of finding P.I., Shorter method of finding P.I. To find P.I. when $X=e^{ax}$, where a is constant, To find P.I. when $X= \text{Cos}ax$ or $\text{Sin}ax$, To find the value of $1/f(D).x^m$, where m is positive integer, To find the value of $1/f(D).(e^{ax}V)$, where a is constant and V is a function of x. To evaluate $1/f(D).(XV)$, where V is a function of x.

Unit:2 : Exact Differential Equations and Equations of Special Types

Number of Lectures: 15

Weightage: 33%

Condition of Exactness of the linear differential equations, Equations of the form $y^{(n)} = f(x)$, Equations of the form $y^{(2)} = f(y)$, Equation that do not contain y directly, Equation that do not contain x directly, Equation in which y appears in only two derivatives whose orders differ by two, Equation in which y appears in only two derivatives whose order differ by unit.



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Unit: 3: Linear Equations of Second Order

Number of Lectures: 18

Weightage: 33%

Method of solving $y^{(2)} + Py^{(1)} + Qy = R$ when an integral included in the C.F. is known, Method of solving $y^{(2)} + Py^{(1)} + Qy = R$ by changing the dependent variable, $y^{(2)} + Py^{(1)} + Qy = R$ by changing the independent variable, Solution by factorization of the Operator, Method of variation of Parameters.

REFERENCE BOOKS:

1. A text book of Differential Equation, by N.M. Kapoor, Pitamber publication, New Delhi.
2. Advanced Engineering mathematics, Erwin Kreyszing, John Wiley & Sons Inc. New York, 1999.
3. Introductory course on Differential Equations, D.A. Murray By. Orient Ongman, (India), 1967.
4. A Treatise on Differential Equations, A.R. Forsyth, Macmillan and Co. Ltd., London.
5. Elements of partial Differential Equations, Ian N. Sneddon, McGraw-Hill Book Compony, 1998.
6. Advanced Calculus for Application, Fracis B. Hilderbrand, Prentice Hall of India Pvt. Ltd., New Delhi, 1977.
7. Differential Equations, Jane Cronin, Marcel Dekkar, 1994.
8. Theory and Problems of Differential Equations, Frank Ayres, McGraw-Hill Book Company, 1972.

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CMAT 504- Operations Research- I

RATIONALE: This course is designed to enable students to acquire basic understanding of the basic concepts of Operations Research.

LEARNING OUTCOMES:

- Understand the concept of Linear Programming Problems and its formulation
- Develop an understanding of the solution method of LPP
- Develop an understanding for Integer Programming and its solution

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Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CMAT- 504	Operations Research- I	3	48	30	70	100

COURSE CONTENT

Unit-1: Linear Programming Problems

Number of Lectures: 18

Weightage: 34%

Introduction: Nature and scope of Operations Research. **Linear programming** problems, its formulation, Solution methods- Graphical method, Slack-Surplus and unrestricted variables, Simplex Algorithm.

Unit-2 : Simplex and Big-M Method

Number of Lectures: 18

Weightage: 33%

Artificial Slack variables, Two phase method, Big-M / Penalty method, Special cases in simplex method - unbounded, infeasible solutions and concept of degeneracy.

Unit-3: Duality Theory and Integer Programming

Number of Lectures: 18

Weightage: 33%

- (a) **Duality Theory** - The essence of duality theory, primal-dual relationships, Duality Theorems, Dual simplex method.



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- (b) **Integer Programming**- The need of integer solutions, Concept of the Cutting – Plane, Gomory’s Cutting Plane Algorithm, Branch and Bound Method (sums of B & B not to be asked in the exam.)

REFERENCES BOOKS:

1. Operations Research, J.K. Sharma, Macmillan Publishers India Ltd.
2. Operations Research: An Introduction, Hamdy A. Taha
3. Operations Research (Principles and Practice), Pradeep Prabhakar Pai, Oxford University Press.

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PCMAT-501: Practicals on Mathematics -III

Subject Code	Subject Title	Credits	Practical		Total Marks
			Hrs.	Max Marks	
PCMAT-501	Mathematics Practical -III	6	12	200	200

Objectives:

- Understand the SCILAB Desktop, Command window and the Graph Window
 - Be able to do simple and complex calculation using SCILAB
 - Understand the graphics capability of SCILAB
 - Be able to carry out mathematical computations using SCILAB Symbolic Toolbox
-

UNIT-1: Introduction to SCILAB

Starting and ending SCILAB session, SCILAB environment, SCILAB help, types of files, search path, some useful SCILAB commands, data types, constant and variables, operators, built-in functions, assignment statement, illustrative programs.

Vectors and Matrices: Scalars and vectors, entering data in matrices, line continuation, matrix subscripts/indices, multi-dimensional matrices and arrays, matrix manipulations, generation of special matrices, useful commands, matrix and array operations, function with array inputs.

UNIT-2: Polynomials

Entering a polynomial, polynomial evaluation, roots of polynomial, polynomial operations- addition and subtraction, multiplication, division, formulation of polynomial equation, characteristic polynomial of a matrix, polynomial differentiation, integration, and curve fitting, evaluation of polynomial with matrix arguments.

UNIT-3: SCILAB Graphics:

Two-dimensional plots, multiple plots, style options, legend command, subplots, specialized two-dimensional plots, three-dimensional plots.

UNIT-4: Symbolic Processing with SCILAB

Symbolic Expressions and Algebra, Algebraic and Transcendental Equations, Calculus, Symbolic Linear Algebra, ordinary and partial differential equation, Symbolic Tutors.



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Text Book:

1. “SCILAB and its Applications in Engineering”, Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, Pearson.

Additional commands for symbolic toolbox are to be covered from the list given below.

Symbolic Math Toolbox

Functions for Creating and Evaluating Symbolic Expressions	
Class	Returns the class of an expression.
Digits	Sets the number of decimal digits used to do variable precision arithmetic.
Double	Converts an expression to numeric form.
Ezplot	Generates a plot of a symbolic expression.
ezplot3	3-D parametric plot
Ezpolar	plot a 2-D curve in polar coordinates
Findsym	Finds the symbolic variables in a symbolic expression.
Numden	Returns the numerator and denominator of an expression.
Sym	Creates a symbolic variable.
Syms	Creates one or more symbolic variables.
Vpa	Sets the number of digits used to evaluate expressions.
Functions for Manipulating Symbolic Expressions	
Collect	Collects coefficients of like powers in an expression.
Expand	Expands an expression by carrying out jpowers.
Factor	Factors an expression.
poly2sym	Converts a polynomial coefficient vector to a symbolic polynomial.
Pretty	Displays an expression in a form that resembles typeset mathematics.
Simple	Searches for the shortest form of an expression.
simplify	Simplifies an expression using Maple’s simplification rules.
Subs	Substitutes variables or expressions.
sym2poly	Converts an expression to a polynomial coefficient vector.
Symbolic Calculus Functions	
Diff	Returns the derivative of an expression.
jacobian	Compute the Jacobian matrix.
Dirac	Dirac delta function (unit impulse).
Heaviside	Heaviside function (unit step).
Int	Returns the integral of an expression.
Limit	Returns the limit of an expression.



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Symsum	Returns the symbolic summation of an expression.
Taylor	Returns the Taylor series of a function.
Symbolic Linear Algebra Functions	
Det	Returns the determinant of a matrix.
Eig	Returns the eigenvalues (characteristic roots) of a matrix.
Inv	Returns the inverse of a matrix.
Poly	Returns the characteristic polynomial of a matrix.
Symbolic Tutors	
Arclen	Find the arclength of the curve.
composefun	compose two functions
dirdifftool	plot or animate directional derivatives
Eigtool	interactive matrix eigenvalues
gradtool	plot or animate gradient(s)
linsys	plot a system of 2-D or 3-D linear equations
ratfun	demonstrate the graphing of rational functions
rsums	Riemann sum approximate integration tutor
taylorltool	taylor approximation tutor



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Subject Elective: EMAT- 501 A Business Mathematics- III

RATIONALE: This course is designed to enable students to acquire understanding about the basic concepts of business mathematics applied to real life mathematical problems.

LEARNING OUTCOMES:

- Understand the concept of random variables and mathematical expectation
- Understand the concept of Probability distributions

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term Examination (Theory and Viva) for 50 marks.

Subject Code	Subject Title	Credits	Theory				Total Marks
			Hrs.	Max Marks			
				Mid Term Theory	Mid Term Viva	End Term	
EMAT- 501 A	Business Mathematics- III	2	24	20	30	...	50

COURSE CONTENT

Unit: 1 : Mathematical Expectation and Probability Distribution

Number of Lectures: 12

Weightage: 50%

Random Variables, Mathematical Expectation, Addition and multiplication laws of expectation, use of Geometric Progression series in Probability, Probability distribution of a random variable, Usefulness of theoretical distributions

Unit: 2: Binomial Distribution

Number of Lectures: 12

Weightage: 50%

Probability distributions: Binomial distribution, Characteristics and properties of binomial distribution, Conditions for Binomial distribution, Standard deviation and variance of binomial distribution



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Reference books:

1. Business Statistics, Dr. P.C. Tulsian & Bharat Jhunjhunwala, S.Chand Publication
2. Business Mathematics, D.C. Sancheti & V.K. Kapoor, Sultan Chand & Sons Publication, New Delhi.
3. Business Mathematics, B.S. Shah Prakashan, Ahmedabad.
4. Business Mathematics and Statistics, Andre Francis, Published by Thomson Learning

Teaching Instructions:

1. Interactions with the students to understand the level of students
2. Explaining & discussing mathematics formulas and derivations.
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP/ LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

TEACHING AND EXAMINATION

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit I	50	12
Unit II	50	12
Total	100	24



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Subjective Elective: EMAT- 501 B Discrete Mathematics- III

- **RATIONALE:** This course is designed to enable students to acquire understanding of the fundamentals of logic gates and its use in implementing basic Boolean functions.

Subject Code	Subject Title	Credits	Theory				Total Marks
			Hrs.	Max Marks			
				Mid Term Theory	Mid Term Viva	End Term	
EMAT- 501 B	Discrete Mathematics-III	2	24	20	30	50

COURSE CONTENT

Unit-I Number of lectures: 12 Logic Gates and Circuits Weightage: 50%
Unit-II Number of lectures: 12 Applications of Boolean Algebra: Boolean expressions and their equivalence, Minterms and Maxterms, Values of Boolean expression, Boolean functions, representation of Boolean function, Karnaugh maps, minimization of Boolean function Weightage: 50%

REFERENCES:

- (1) Shoenfield- "Mathematical Logic", Addison Wesley.
- (2) Change, C. L and Lee, R.T.C – "Symbolic Logic and Mechanical Theorem Proving", Academic Press
- (3) Discrete mathematics and its applications - Kenneth H. Rosen, 6th edition, Mc Graw Hill International Edition
- (4) Schaum's Outline of Theory and Problems of Discrete Mathematics, Marc Lipson and Seymour Lipschutz
- (5) Discrete Mathematical Structures, D.S Malik, M.K Sen, Cengage Learning



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Generic Elective: EGC- 501 CYBER SECURITY

RATIONALE: This course is designed to enable students to acquire understanding about the basic concepts of Cyber Security and Cyber Law of India.

LEARNING OUTCOMES:

- Understand the concept of Cyber Security
- Develop an understanding of Cyber Law of India

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term Examination (Theory and Viva) for 50 marks.

Subject Code	Subject Title	Credits	Theory				Total Marks
			Hrs.	Max Marks			
				Mid Term Theory	Mid Term Viva	End Term	
EGC- 501	Cyber Security	2	24	20	30	...	50

Unit - I : Introduction to Computer and Cyber Security

No. of Lectures: 12

Weightage: 50%

Types of Threats: Malware, Viruses, Trojan Horses, Spyware ,Denial of Service Attacks Web Attacks ,Networks and the Internet How the Internet works IP Addresses,Cyber Stalking, Fraud, and Abuse Industrial Espionage in Cyberspace, Cryptography Basics ,Computer Security Software,Virus Scanners ,Firewalls, Antispyware Intrusion-Detection Software Website Security Email Mobile Devices Employees Facility Security Operational Security Payment Cards Incident Response and Reporting.

Unit-II: Cyber Law of India

No. of Lectures: 12

Weightage: 50%

Introduction, Categorization of Cybercrimes,Technical aspects of cybercrimes: Unauthorized access & Hacking, Trojan Attack, Virus and Worm attack, E-mail & IRC related crimes, Denial of Service attacks, Pornography, Forgery, IPR Violations, Cyber Terrorism, Banking/Credit card Related crimes, E-commerce/ Investment Frauds, Sale of illegal articles, Online gambling, Defamation,Pedophiles,Identity Theft, Data diddling, Theft of Internet Hours, Theft of computer system (Hardware), Physically damaging a computer system, Breach of Privacy and Confidentiality.

Reference Books :

1. Computer Security Fundamentals, by Chuck Easttom, Pearson Education
2. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.
3. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication Wiley



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TEACHING AND EXAMINATION

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit I	50	12
Unit II	50	12
Total	100	24



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FCG 501- Basic English – V

RATIONALE: This course is designed to enable students to acquire basic understanding of English grammar. The course would help students to fortify their knowledge of English and strengthen their basic communication abilities.

LEARNING OUTCOMES:

- Develop language skills of reading through filling in appropriate words in blanks, correcting errors, choosing correct forms out of alternative choices, etc.
- Acquire interest in English language and literature through text book lessons.
- Acquire translation skill through translate from English to Gujarati / Hindi exercises
- Acquire the knowledge of different kinds of dialogue writing.

TEACHING AND EVALUATION SCHEME: The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 15 marks and End Term. Examination conducted by University examination for 35 marks.

Subject Code	Subject Title	Credit s	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
FCG - 501	Basic English – V	2	24	15	35	50

Course Content

Unit 1	Number of lectures: 8	Weightage: 33%
Lesson1:AnAstrologer’sDay byR.K.Narayan Lesson 6 :Education: India and America by Anurag Mathur Poem11:WherethemindiswithoutFear byRabindranathTagore Poem12:StoppingbyWoodsonaSnowyEvening byRobertFrost Poem13:Sonnet29 byWilliamShakespeare		
Unit 2	Numberoflectures:4	Weightage: 17%
Text Based Vocabulary Enhancing English Reading Skills <ul style="list-style-type: none">• Importance of Reading Skill• Structure of paragraph• Skimming and Scanning• Reasons For poor Reading Skills		



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Unit 3	Number of lectures: 8	Weightage: 33%
Translation from English to Gujarati / Hindi		
Unit 4	Number of lectures: 4	Weightage: 17%
Capitalization and punctuation Marks in official Correspondence		

REFERENCES

1. High School English Grammar – Wrenn & Martin
2. Contemporary English Grammar – David Green

INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & discussing English language structures.
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Powerpoint presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

TEACHING AND EXAMINATION

UNIT	Examination Scheme % Weightage	Teaching Scheme No. of Lecture
Unit 1	33	8
Unit 2	17	4
Unit 3	33	8
Unit 4	17	4
Total	100	24