

## **Bhavan's Sheth R. A. College of Science**

*B. Sc. Semester – I, III & V.*

*Subject : Mathematics*

*Syllabus distribution for Academic year 2020-21.*

<b>Semester</b>	<b>Paper</b>	<b>Unit</b>	<b>Faculty Name</b>
<i>SEM. 1</i>	<i>MAT101 Calculus and Matrix Algebra</i>	<i>Unit: 1 and Unit: 2. Calculus</i>	<i>Mr. Nutan Patel</i>
		<i>Unit: 3 and Unit: 4. Matrix Algebra</i>	<i>Dr. Ravi Borana</i>
<i>SEM. 3</i>	<i>MAT201 Advanced Calculus-1</i>	<i>Unit 1 to 4.</i>	<i>Dr. H. M. Patel</i>
	<i>MAT202 Linear Algebra-1</i>	<i>Unit: 1 to 4.</i>	<i>Dr. Ravi Borana</i>
<i>SEM. 5</i>	<i>MAT301 Linear Algebra-2</i>	<i>Unit:1 &amp; 2.</i>	<i>Dr. Ravi Borana</i>
		<i>Unit: 3 &amp; 4</i>	<i>Mr. Nutan Patel</i>
	<i>MAT302 Analysis-1</i>	<i>Unit: 1 &amp; 4</i>	<i>Mr. Nutan Patel</i>
		<i>Unit: 2 &amp; 3</i>	<i>Dr. Ravi Borana</i>
	<i>MAT303 Complex analysis and Fourier series.</i>	<i>Unit: 1 to 3. Complex Analysis</i>	<i>Dr. Ravi Borana</i>
		<i>Unit: 4 Fourier Series</i>	<i>Mr. Nutan Patel</i>
	<i>MAT304 Mathematical Programming (Theory)</i>	<i>Unit: 1 to 4. Operation Research</i>	<i>Miss. Dhara Patel ( Visiting Faculty)</i>
<i>MAT305 Number Theory.</i>	<i>Unit: 1 to 3.</i>	<i>Dr. H. M. Patel.</i>	

<i>Faculty name</i>	<i>Contact</i>
<i>Dr. Ravi Borana</i>	<i>ravibhavans20@gmail.com</i>
<i>Dr. H. M. Patel</i>	<i>hmpatel46915@gmail.com</i>
<i>Mr. Nutan Patel</i>	<i>nutan.vp@gmail.com</i>
<i>Miss. Dhara Patel</i>	<i>dhara.181095@gmail.com</i>

**Gujarat University**  
**Choice Based Credit System (CBCS)**

**Syllabus for Semester I (Mathematics)**  
**MAT 101: Calculus and Matrix Algebra(Theory)**

Hours: 4 /week

Credits: 4

**Unit:**

**I** Successive Derivatives, standard results for  $n^{\text{th}}$  derivative, Leibniz's Theorem. Definition of limit of a sequence, Convergence and divergence of an infinite series, Alternating Series (**without proof**). Comparison test, Ratio test and Root test, Power series.

**Unit:**

**II** Rolle's Theorem (**without proof**), Lagrange's and Cauchy's Mean Value Theorems, Increasing and decreasing functions, Taylor's and Maclaurin's Theorems (**both without proof**). Using Taylor's and Maclaurin's Theorem find Maclaurin power series expansion of  $\sin x$ ,  $\cos x$ ,  $\log(1+x)$ ,  $e^x$ ,  $(1+x)^n$  under proper restrictions (if any).  
 Indeterminate forms: all forms of L'Hospital's Rules (**without proof**).

**Unit: III**

Introduction to matrices, different types of matrices, operations on matrices, Theorems on matrices, Elementary operations on matrices and types of matrices, Symmetric and skew-symmetric matrices, Hermitian and Skew-Hermitian matrices. Linear dependence and independence of row and column matrices. Row rank, column rank and rank of a matrix. Row Reduced Echelon (RRE) form of a matrix and matrix inversion using it.

**Unit: IV**

Eigen values, Eigen vectors and the characteristic equation of a matrix. Cayley-Hamilton (CH) theorem (**without proof**) and its use in finding inverse of a matrix. Application of matrices in solving a system of simultaneous linear equations. Cramer's rule. Theorems on consistency of a system of simultaneous linear equations.

**Reference Books:**

1. Calculus and Analytic Geometry – G. B. Thomas and R. L. Finney. Pearson Education. Indian Reprint.
  2. Calculus – James Stewart, Sixth edition, (E-Book).
  3. Calculus – T. M. Apostol. Volume I.
  4. Differential Calculus – Shanti Narayan, P.K. Mittal, S. Chand and Co.
  5. Differential Calculus – Harikishan, Atlantic Publishers.
  6. Calculus – M. Spivak.
  7. An Introduction to Linear Algebra – I. K. Rana, Ane Books Pvt. Ltd.
  8. Linear Algebra Theory and Applications – Ward Cheney, David Kincaid. Jones and Bartlet India Pvt. Ltd.
  9. Introduction to Linear Algebra – Serge Lang. Springer (India).
  10. Matrix and Linear Algebra – K. B. Dutta, Prentice Hall.
  11. A Textbook of Matrices – Shanti Narayan, P K Mittal, S. Chand Group.
  12. Introduction to Linear Algebra – V. Krishnamurthy, Affiliated East-west Press Pvt Ltd.
-

**Gujarat University**  
**Choice Based Credit System (CBCS)**

**Syllabus for Semester I (Mathematics)**  
**MAT 102: Calculus and Matrix Algebra (Practical)**

Hours: 4/week

Credits: 3

Duration: 2 hrs/practical

Number of Practicals: 16

**Unit I**

Practicals based on tracing of curves and Integral. (Practical Number 1- 4).

**Unit**

**II** Practicals based on Integral, successive differentiation and convergence of infinite series. (Practical Number 5 - 8).

**Unit**

**III** Practicals based on Mean value theorems, Expansions of functions L'Hospital's Rules and RRE form of matrix. (Practical Number 9 - 12).

**Unit IV**

Practicals based on Matrices and its applications. (Practical Number 13 - 16)

**List of Practicals:**

1. Graphs of Trigonometric and Inverse trigonometric functions.
  2. Find the limit of sums using the definite integral. (5+5=10 problems)
  3. Find the definite integrals using substitution. (5+5=10 problems)
  4. Find the definite integrals using integration by parts. (5+5=10 problems)
  5. Find the definite integral by method of partial fractions. (5+5=10 problems)
  6. Find the  $n^{\text{th}}$  derivative of the functions at the given points.
  7. Applications of Leibnitz theorem.
  8. Discuss Convergence of the infinite series.
  9. Geometrical Interpretation of M.V.T. Problems on M.V.T.
  10. Expansions of functions in infinite power series using Taylor and Macalurin's formulae
  11. Evaluate limit using L'Hospital's rule.
  12. Find RRE form and rank of a matrix.
  13. Find inverse using Gauss Jordan method (using row operations).
  14. Verify the Cayley-Hamilton (CH) theorem – inverse of matrix using it- problems on Cayley-Hamilton (CH) theorem.
  15. Find Eigen values and Eigen vectors of square matrices of order 2 and 3.
  16. Solution of system of linear equations using row operations and Cramer's rule.
-

**Gujarat University**  
**Choice Based Credit System (CBCS)**  
**Syllabus for Semester III (Mathematics)**  
**MAT 201: Advanced Calculus-I (Theory)**

Hours: 4 /week

Credits: 4

**Unit-I Limit-Continuity of function of several variables and partial derivatives**

Introduction to function of several variables, rectangular and spherical neighbourhood of a point in  $R^n$ , Limit of function of several variables, concept of iterated limits, limit and path, continuity of function of several variables.

**Unit-II Differentiability of function of several variables-I**

Directional derivatives, Introduction to partial derivatives, different notations and its geometric interpretation, higher order partial derivatives and problems. Differentiability of function of two variables, theorems on differentiability conditions and their converses, Schwartz's theorem and Young's theorem.

**Unit-III Differentiability of function of several variables-II**

Differential of function of two variables, Chain rules for differentiability, derivatives of implicit functions. Homogeneous functions, Euler's theorem for homogeneous functions of n-variables, Extreme values of functions of two variables and its theorems, Lagrange's method of undetermined multipliers (only problems to be asked).

**Unit-IV Applications of partial derivatives**

Taylor's Theorem for function of two variables (proof of two variables only), Maclaurin's theorem, problems on Taylor and Maclaurin theorems, Concept of multiple points, double points, different types of double points and examples, radius of curvature for Cartesian-parametric-polar equations of a curve in  $R^2$ .

**Reference Books:**

1. Mathematical Analysis – S. C. Malik and Savita Arora, Second Edition, New Age Int. (P) Ltd.
  2. Differential Calculus – Shanti Narayan.
  3. Calculus - David V. Widder- PHI-second edition.
  4. Advanced Calculus Volume II – T. M. Apostol.
  5. Calculus - James Stewart.
  6. Calculus with Early Transcendental functions - James Stewart, Indian Edition, Engage Learning India PvtLtd.
  7. Calculus & Analytic Geometry - G. B. Thomas & R. L. Finney Addison- Wesley pub. India.
  8. A course in Multivariable Calculus & Analysis – S. R. Ghorpade & B. V. Limaye, Springer India.
  9. All the Mathematics you missed but need to know - Thomas A. Garrity, Cambridge Uni.Press.
-

**Gujarat University**  
**Choice Based Credit System (CBCS)**  
**Syllabus for Semester III (Mathematics)**  
**MAT 202: Linear Algebra-I (Theory)**

**Hours: 4 /week**

**Credits: 4**

**Prerequisites:** Relation, Equivalence Relation, Binary Operation.

**Unit I**

Vector space: Definition, Examples, Properties, Subspaces, Necessary and Sufficient Condition to be a Subspace, Span of a Set, Examples of Subspaces, Intersection, Addition and Direct Sum of Subspaces., Linear Variety.

**Unit**

**II** Finite Linear Combination, Linear Dependence/Independence and their properties (with proof), Examples regarding Linear Dependence/ Independence. Dimension and Basis of a vector space, Dimension Theorem.

**Unit**

**III** Linear Transformations: Definition and Examples. Range and Kernel of a Linear Map and results regarding them. Rank and Nullity of a Linear Map, Rank – Nullity Theorem. Examples for verification of Rank – Nullity Theorem. Inverse of a Linear Map, Consequences of Rank – Nullity Theorem. Isomorphism.

**Unit**

**IV** Matrix associated with a Linear Map, Linear Map associated with a Matrix. Linear operations in  $\mu_{m,n}$ , Only introduction of  $L(U,V)$  and Isomorphism between  $L(U,V)$  and  $\mu_{m,n}$ , Dimension Theorems for  $\mu_{m,n}$  and  $L(U,V)$ . Rank – Nullity of Matrices and verification of the Rank-Nullity Theorem for Matrices.

**Text Book:**

An Introduction to Linear Algebra – V. Krishnamurthy & others. (Affiliated East-West press, New Delhi)

**Reference Books:**

1. Linear Algebra a Geometric Approach - S. Kumaresan, PHI.
2. Linear Algebra with Applications – Otto Bretscher– 3<sup>rd</sup> ed. –Pearson Education.
3. An Introduction to Linear Algebra – I. K. Rana , Ane Books Pvt. Ltd., New Delhi.
4. Theory and Problems of Linear Algebra – R. D. Sharma, I K Int. Publishing House Pvt. Ltd.
5. Matrix and Linear Algebra – K. B. Datta, Prentice Hall, New Delhi.
6. Linear Algebra: Theory & Appl. - Ward Cheney & David Kincaid Viva Books, Jones & Bartlett.
7. Vector Calculus, Linear Algebra & Differential Forms: A unified approach - Hubbard J. & Hubbard B. Prentice Hall 1999
8. Introduction to Linear Algebra - Serge Lang, Springer, India.
9. Finite Dimension Vector Spaces - P. R. Halmos.
10. Linear Algebra Problem Book - P. R. Halmos.
11. Linear Algebra with Applications - Jeanne, L. Agnew & Robert C. Knapp Brooks / Col publishing Co, California.
12. A First Course in Linear Algebra – Dr. Aloknath Chakrabarti. ISBN: 9788182091306. Tata.McGraw-Hill Edu. Pvt. Ltd.

**Gujarat University**  
**Choice Based Credit System (CBCS)**

**Syllabus for Semester III (Mathematics)**

**MAT 203: Practicals (Based on MAT201, MAT202 and Numerical Methods-I)**

**Hours: 6 /week**

**Credits: 2.5**

**List of Practicals:**

**Unit I**

1. Problems on different types of errors.
2. To find missing terms from the given table and to express a polynomial in terms of factorial notations.
3. Newton's forward interpolation and Newton's backward interpolation.
4. Gauss's forward interpolation and Gauss's backward interpolation

**Unit II**

5. Stirling's, Bessel's and Everette's interpolation.
6. Lagrange's interpolation and Newton's divided interpolation
7. Inverse interpolation for equispaced arguments (Only Newton's forward interpolation and Newton's backward interpolation and Gauss's forward interpolation)
8. Inverse interpolation for unequispaced arguments (Newton's divided and Lagrange's inverse interpolation)

**Unit III**

9. Gauss elimination method.
10. Gauss Jacobi iterative method.
11. Gauss Seidel iterative method.
12. Curve Tracing- 1 (Cartesian curves in  $R^2$ ), Catenary,  $y = x^3$ ,  $y^2 = (a + x)x^3$  (Cissoid).  
Curve Tracing-2 (Parametric and Polar curves in  $R^2$ ), Cardioid, Cycloid, Astroid, Spiral.

**Unit IV**

13. Examples on Limit, Continuity and Differentiation of functions of several variables using definition.
14. Examples on Euler's theorem and Examples on Extreme values.
15. Examples on subspace, bases and dimension theory.
16. Matrix Associated with Linear map and linear map associated with matrix.

**Reference Books:**

1. Numerical Analysis and Computational Procedures – S.A. Mollah.
2. Elementary Numerical Analysis - Shastri.
3. Numerical Mathematical Analysis - James Scarborough.
4. Numerical Analysis - S. Kunz.
5. Numerical Methods for Scientific and Engineering Computation- 6<sup>th</sup> Edition, M. K. Jain, S. R. Iyengar, R. K. Jain, New Age International Publishers.

**Gujarat University**  
**Choice Based Credit System (CBCS)**  
**Syllabus for Semester V (Mathematics)**  
**MAT 301: Linear Algebra – II (Theory)**

Hours: 4 /week

Credits: 4

**Unit**

**I** Composition of Linear Maps, The Space  $L(U,V)$ , Operator Equation, Linear Functional, Dual Spaces, Dual of Dual, Dual Basis Existence Theorem, Annihilators, bilinear forms.

**Unit**

**II** Inner Product Space, Norm, Cauchy-Schwarz Inequality, Orthogonalization and orthonormalization of Basis, Gram-Schmidt Orthogonalization Process, Orthogonal complement and its properties, Orthogonal transformations.

**Unit**

**III** Determinants and their properties, Value of determinant, Basic results, Laplace expansion, Cramer's rule.

**Unit**

**IV** Eigen values and eigen vectors of linear operators and square matrices, Caley-Hamilton's Theorem and its verification, Application to reduction of Quadrics, classification of Quadrics, Diagonalization of real and symmetric Matrices, Spectral Theorem.

**Text Book:**

An Introduction to Linear Algebra – V. Krishnamurthy and others, Affiliated East-West press, New Delhi.

**Reference Books:**

1. Linear Algebra a Geometric Approach – S. Kumaresan, PHI.
  2. Linear Algebra with Applications – Otto Bretscher – 3<sup>rd</sup> ed. – Pearson Education.
  3. An Introduction to Linear Algebra – I. K. Rana, Ane Books Pvt. Ltd., New Delhi.
  4. Theory and Problems of Linear Algebra – R. D. Sharma, I. K. Inter. Pub. House Pvt. Ltd.
  5. Matrix and Linear Algebra by – K.B. Datta, Prentice Hall, New Delhi.
  6. Linear Algebra: Theory & Applications - Ward Cheney & David Kincaid Viva Books, Jones & Bartlett.
  7. Vector Calculus, Linear Algebra & Differential Forms: A unified approach - Hubbard J & Hubbard B., Prentice Hall 1999.
  8. Linear Algebra with Applications - Jeanne, L. Agnew & Robert C. Knapp Brooks / Col publishing Co, California.
  9. A First Course in Linear Algebra – Dr. Aloknath Chakrabarti. ISBN: 9788182091306. Tata McGraw-Hill Edu. Pvt. Ltd.
-



**Gujarat University**  
**Choice Based Credit System (CBCS)**  
**Syllabus for Semester V (Mathematics)**  
**MAT 302: Analysis – I (Theory)**

**Hours: 4 /week****Credits: 4****Unit I** The Real Numbers

Sets and Functions  
 Finite and Infinite Sets  
 Algebraic and Order properties of  $\mathbb{R}$   
 Absolute Value and Real Line  
 The completeness Property of  $\mathbb{R}$   
 The Applications of Supremum Property  
 Articles 1.1, 1.3, 2.1 to 2.5 of Text Book (2)

**Unit II** Sequences

Sequences and limits  
 Limit Theorems  
 Monotonic sequences  
 Sequences defined inductively  
 Subsequences (includes  $\limsup$  and  $\liminf$ )  
 Cauchy Sequences  
 Infinite limits  
 Articles 4.2 to 4.7 of Text Book (3); 2.4 of Text book (1).

**Unit III** Functions and continuity

Limit of a function  
 Limit theorems  
 Other limits  
 Continuity. Intermediate values, extreme values  
 Uniform continuity  
 Monotone and Inverse functions  
 Articles 3.1-3.6 of Text Book (1), Article 5.6 of Text Book (2)

**Unit IV** The derivative

Definition  
 Rules for differentiation  
 Mean value theorems  
 Inverse functions  
 Intermediate value Property of Derivatives  
 L'Hospital's Rules

Articles 4.1 to 4.4 of Text Book (1), Sections 6.2.11 and 6.2.12, Article 6.3 of Text Book (2)

**Text Books:**

1. An Introduction to Analysis - Gerald G. Bilodeau, Paul R. Thie and G. E. Keough. Second Edition
2. Introduction to Real Analysis - Robert G. Bartle and Donald R. Sherbert, Wiley Student Edition, 2010.
3. Fundamentals of mathematical analysis- G. Das & S Pattanayak, Tata Mcgraw Hill Pub. Co. Ltd

**Reference Books:**

1. A First course in Mathematical Analysis, D. Somasundaram & B. Choudhary, (Corrected Edition) Narosa Publication.
  2. Elementary Analysis: the theory of calculus - K. Ross, Springer, India.
  3. Numbers to Analysis - I. K. Rana, world scientific.
  4. Calculus - Michael Spivak.
  5. Principles of Mathematical Analysis- W. Rudin, McGraw-Hill
  6. A Course in Calculus & Real Analysis – S. R. Ghorpade & B. V. Limaye
-

**Gujarat University**  
**Choice Based Credit System (CBCS)**

**Syllabus for Semester V (Mathematics)**

**MAT 303: Complex Variables and Fourier Series (Theory)**

**Hours: 4 /week**

**Credits: 4**

**Unit**

**I** Sum and product of complex numbers with properties, moduli and conjugate, triangle inequality, polar coordinates, product and quotients in exponential form, roots of complex numbers, de Moivre's theorem and application, the exponential function, trigonometric functions, hyperbolic functions, convergence of sequence and series.

**Unit**

**II** Functions of complex variables, theorems on limits, continuity, derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient condition for differentiability, polar coordinates, analytic functions and harmonic functions.

**Unit**

**III** Linear transformations, the transformation  $w = \frac{1}{z}$ , linear fractional transformations, an implicit form, preservation of angles, further properties.

**Unit IV**

Fourier series, Bessel's inequality, Riemann-Lebesgue theorem.

**Text Books:**

1. Complex variables and applications - Ruel V. Churchill, Mcgraw-hill inter. 6<sup>th</sup> edition, Articles 1 to 7, 23 to 25 and 43. Chapter 2 (omit art. 13). Articles. 68, 69, 70, 71, 79, 80.
2. A first course in Mathematical analysis – D. Somasundaram, Chapter-10.1 and 10.2 (only first two theorems).

**Reference books:**

1. Fundamentals of Mathematical Analysis- G. Das & S Pattanayak, Tata Mcgraw Hill Pub. Co. Ltd.
2. Analytical Geometry & Real and Complex analysis – T. Veerarajan, Mcgraw Hill.
3. Complex Analysis - V. Karunakaran, Narosa publishers.
4. Higher Engineering Mathematics – B. S. Grewal, Khanna Publishers.
5. Advance engineering Mathematics – H. K. Dass, S. Chand.
6. A First Course in Complex Analysis with Applications - Dennis G. Zill & Patrick S. Shanahan Jones & Bartlett India Pvt Ltd.
7. Complex Analysis - T. W. Gamelin, Springer (India) Ltd.
8. Theory of Complex functions - Marden & Hoffman W. H. Freeman, N.Y.
9. Functions of One Complex Variable – Conway.
10. An Introduction to Complex Analysis - A. R. Shastri, Macmilan India.
11. Fourier Analysis: An Introduction - E. M. Stein & R. Shakarchi, Princeton Uni. Press.
12. Fourier Series - R. Bhatia, Hindustan Book Agency-2010 corrected edition.

**Gujarat University**  
**Choice Based Credit System (CBCS)**

**Syllabus for Semester V (Mathematics)**  
**MAT 304: Mathematical Programming (Theory)**

Hours: 4 /week

Credits: 4

**Unit I Convex Set and Linear Programming Problem**

Convex set, Extreme points of a convex set, convex combination, Examples of Convex sets and Theorems on convexity, Formulation techniques of LP problems (Only Examples).

**Unit II Problem solving techniques for LP problems**

Simplex method for solving LPP, Big-M (Penalty) method, Two-Phase method, Integer programming problem (Only Gomory's cutting plane method).

**Unit III Duality and Dual simplex method**

Introduction, Definition of the dual problem, General rules for converting any primal problem into its dual, How to interpret the solution of the dual from its primal and vice versa, Comparison of the solution of the primal and its dual. Find initial solution for dual simplex table, Mathematical procedure to find solution by dual simplex method.

**Unit IV Transportation and Assignment Problems**

Introduction, Mathematical formulation, Tabular representation, Definitions, Methods for finding initial basic feasible solution (North West Corner Rule, Least Cost Method, Vogel's Approximation Method), Optimality test (MODI method), Degeneracy in Transportation Problem, Unbalanced Transportation Problem, Introduction of Assignment problem, Mathematical formulation of Assignment problem, Method for solving Assignment problem (Hungarian Method), Unbalanced Assignment problem, Examples.

**Reference books:**

1. Mathematical models in O.R. - J. K. Sharma, Tata-MacGraw Hills book-company.
  2. Operations Research – Nita H Shah, Ravi Gor and Hardik Soni. PHI – Learning.
  3. Optimization method in O.R. & System Analysis - K. V. Mittal, New Age inter. Publishers.
  4. Operation Research - S. D. Sharma, Kedarnath Ramnath & Co.
  5. Operation Research - Kanti Swaroop & Man Mohan, Sultan Chand & Co.
  6. Linear Programming - L. I. Gass, Tata MacGraw Hills book-company.
  7. Linear Programming - G. Hadley, Narosa Publishing house.
  8. Operation Research- A. M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education.
-

**Gujarat University**  
**Choice Based Credit System (CBCS)**

**Syllabus for Semester V (Mathematics)**

**MAT 305 (Elective Course): Number Theory (Theory)**

**Hours: 3 /week**

**Credits: 2**

**Unit I**

Some Preliminary Consideration: Well-Ordering Principle, Mathematical Induction, the Binomial Theorem & binomial coefficients.

Divisibility Theory: the division algorithm, divisor, remainder, prime, relatively prime, the greatest common divisor, the Euclidean algorithm (Without proof), the least common multiple, the linear Diophantine equation & its solution.

**Unit II**

Prime Numbers: Prime and composite number, the Fundamental Theorem of Arithmetic (without proof), canonical form of a number, the Sieve of Eratosthenes.

Theory of Congruence: Definition and basic properties of congruence, Residue class & complete system of residues, special divisibility test, linear congruence, Chinese Remainder Theorem. (without proof)

**Unit III**

Fermat's Theorem: Fermat's Factorization method, Fermat's little theorem, Wilson theorem,

Euler's theorem: Euler's Phi-function  $\phi(n)$  and formula for  $\phi(n)$ , Euler's theorem (without proof) and only problems on Euler's theorem.

**Text Book**

Elementary Number Theory - David M. Burton, Sixth Edition, Universal Book stall, New Delhi.

Chapter 1: 1.1 - 1.2	Chapter 4: 4.1 - 4.3
Chapter 2: 2.1 - 2.4	Chapter 5: 5.2 - 5.3
Chapter 3: 3.1 - 3.2	Chapter 7: 7.2 - 7.3

**Reference Books:**

- 1 An introduction to the Theory of numbers - Niven and Zuckerman, Wiley Eastern Ltd.
- 2 Number Theory - S. G. Telang, Tata Mc Graw-Hill Publishing Company Limited, New Delhi
- 3 Elementary Theory of Numbers - C. Y. Hsiung, Allied Publishers Ltd.-India, ISBN 81-7023-464-6.
- 4 Number Theory - George E. Andrews, Hindustan Publishing Corporation- Delhi.
- 5 Elementary Number Theory - Gareth A. Jones & J. Mary Jones, Springer Verlag, ISBN 81-8128-278-7.
- 6 Number Theory - J. Hunter, Oliver and Boyd-London.
- 7 Beginning Number Theory - Neville Robbins, Narosa Pub. House -New Delhi ISBN 978-81-7319-836
- 8 Introduction to the theory of Numbers - G. H. Hardy & E. M. Wright, Oxford Uni. Press
- 9 Higher Algebra - S. Barnard & J. M. Child, Macmillan India Ltd
- 10 Elements of Number Theory - I. M. Vinogradov, Dover Pub INC
- 11 Elementary Number Theory in Nine chapters - James J. Tattersall, Cambridge Uni Press
- 12 A first course in Theory of Numbers - K. C. Chowdhary, Asian Books Pvt Ltd New Delhi
- 13 1001 problems in Classical Number Theory - Jean Marie De Konick Armed Mercier, AMS

**Gujarat University**  
**Choice Based Credit System (CBCS)**  
**Syllabus for Semester V (Mathematics)**  
**MAT 306: Practical-1 (Based on MAT301,**

Hours: 6 /week

Credits: 2.5

**List of Practicals:****Unit I**

- 1 Examples of solving an operator equation,
- 2 Examples of finding dual bases for  $\mathbb{R}^2$  and  $\mathbb{R}^3$  from their given bases through the Dual-Basis-Existence-Theorem.
- 3 Examples of inner product.
- 4 Examples of orthogonalization and orthonormalization of basis through Gram-Schmidt orthogonalization process.

**Unit II**

- 5 Examples of finding value of determinant through the properties.
- 6 Examples of finding eigen values/vector of a square matrix.
- 7 Examples of the verification of Caley-Hamilton Theorem.
- 8 Examples of diagonalization of square matrices.

**Unit III**

- 9 Countable and Uncountable Sets
- 10 Completeness property of  $\mathbb{R}$  - problems related to infimum, supremum of sets,
- 11 Limits of sequences including inductively defined sequences, limit inferior and superior
- 12 Cauchy Sequences

**Unit IV**

- 13 Types of discontinuities-discussion and examples
  - 14 Uniform continuity.
  - 15 Problems based on Mean Value Theorems
  - 16 L'Hospital's Rule –Theorems+problems.
-

**Gujarat University**  
**Choice Based Credit System (CBCS)**  
**Syllabus for Semester V (Mathematics)**  
**MAT 306: Practical-2 (Based on MAT303,**

Hours: 6 /week

Credits: 2.5

**List of Practicals:****Unit I**

1. Application of De-Moivre's theorem (to find the roots of an equation and simplify common statements)
2. Verification of Cauchy-Riemann equations (Cartesian & polar form).
3. Find the harmonic conjugate of a function and hence find corresponding analytic function.
4. If  $f(z) = u + iv$  is an analytic function then find  $f(z)$  when  $u, v, u_x$  or  $u_y$  is given.

**Unit II**

5. Problems on transformation under function  $w = \frac{1}{z}$ .
6. Problems on verification of conformality.
7. Find the Fourier series of functions - I.
8. Find the Fourier of functions-II.

**Unit III**

9. Solve Linear programming problem by graphical method for two variable problem (3 problems)
10. Solve Linear Programming Problem by simplex method-I (3 problems)
11. Solve Linear Programming Problem by big-M method (3 problems)
12. Solve Linear Programming Problem by Two-Phase method (3 problems)

**Unit IV**

13. Using duality solve Linear Programming Problem (3 problems)
  14. Using Modi method to solve Transportation problem (Balanced) (3 problems)
  15. Using Modi method to solve Transportation problem (Unbalanced) (3 problems)
  16. Using "Hungarian method" to solve Assignment problem (Balanced and Unbalanced) (3 Problems)
-