SAURASHTRA UNIVERSITY
Academic Section
University Campus, University Road, Rajkot – 360005
Phone No.: (0281) 2578501 Ext. No. 202 & 304 / FAX No.: (0281) 2576347
E-mail Id: academic@sauuni.ac.in, cmkanabar@sauuni.ac.in

Accredited Grade "A" by NAAC
(3rd Cycle)

નં.એકે/બીએસ/ ૪૮૮ /૨૦૨૧

તા ૨૯-૬-૨૦૨૧
ગણિતશાસ્ત્ર

પરિપત્ર:-

આથી સૌરાષ્ટ્ર યુનિવર્સિટીની **વિજ્ઞાન વિદ્યાશાખા** હેઠળની સર્વે સંલગ્ન કોલેજોના આચાર્યશ્રીઓને સવિનય જણાવવાનું કે, ચેરમેનશ્રી, **ગણિતશાસ્ત્ર** વિષયની અભ્યાસ સમિતિ તથા ડીનશ્રી, **વિજ્ઞાન** વિદ્યાશાખાએ અધિકાર મંડળોની બહાલીની અપેક્ષાએ **બી.એસ.સી. ગણિતશાસ્ત્ર**નો **સેમેસ્ટર '૫ અને ૬'**નો સુધારેલ અભ્યાસક્રમ જુન-૨૦૨૧થી અમલમાં આવે તે રીતે મંજુર કરવા માન. કુલપતિશ્રીને ભલામણ કરેલ. તદઅન્વયે ઉક્ત **બી.એસ.સી. ગણિતશાસ્ત્ર** વિષયનો **સેમેસ્ટર '૫ અને ૬'**નો સુધારેલ અભ્યાસક્રમ અધિકાર મંડળોની બહાલીની અપેક્ષાએ જુન-૨૦૨૧થી અમલમાં આવે તે રીતે માન.કુલપતિશ્રીએ મંજુર કરેલ છે. જેથી સર્વે સંબંધિતોને તેનો તે મુજબ અમલ કરવા વિનંતી.

(ઉક્ત અભ્યાસક્રમ **સૌરાષ્ટ્ર યુનિવર્સિટીની website:- saurashtrauniversity.edu → student →ug syllabus**પર ઉપલબ્ધ છે.)

સહી/-
(ડો. જે. એચ. સોની)
I/C. કુલસચિવ

બિડાણ :- ઉક્ત અભ્યાસક્રમ (સોફ્ટ કોપી)

પ્રતિ,

(૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની સર્વે સંલગ્ન કોલેજોના આચાર્યશ્રીઓ તરફ...

<u>નકલ જાણ અર્થે સાદર રવાના:-</u>

૧. માન. કુલપતિશ્રી/ માન. ઉપકુલપતિશ્રી/કુલસચિવશ્રીના અંગત સચિવશ્રી

<u>નકલ રવાના (યોગ્ય કાર્યવાહી અર્થે)</u> :-

૧. ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા
૨. પરીક્ષા નિયામકશ્રી (ઈ-મેઈલનાં માધ્યમથી)
૩. પી.જી.ટી.આર.વિભાગ
૪. ડાયરેક્ટરશ્રી, કોમ્પ્યુટર સેન્ટર(વેબસાઈટ ઉપર પ્રસિધ્ધ કરવા અર્થે)

SAURASHTRA UNIVERSITY
RAJKOT

MATHEMATICS

Syllabus
B.Sc. Semester-5 & 6

According to Choice Based Credit System
Effective from June – 2021

(*Updated on 01-01-2020 and updataion implemented from June-2021*)

Syllabus of B.Sc. Semester-5
According to Choice Based Credit System

Effective from June – 2021

(Updated on date:- 01-01-2020

and updation implemented from June - 2021)

• Programme	B.Sc.
• Semester	5
• Subject	MATHEMATICS
• Course Codes	05(A) Theory 06(A) Theory 07(A) Theory 05(B) Practical 06(B) Practical 07(B) Practical 1 Project
• Total Credit of Semester 5	30 Credit

Sr. No.	Subject	No. of Theory Lecture Per Week	No. of Practical Lecture Per Week	Total Marks	Credit of Each Paper
1	No. of Theory Lecture Per Week	6		70(External)+ 30 (Internal) = 100 Marks	6
2	PAPER 06 (A) (Theory) Programming in C & Numerical Analysis-1	6		70(External)+ 30 (Internal) = 100 Marks	6
3	PAPER 06 (A) (Theory) Programming in C & Numerical Analysis-1	6		70(External)+ 30 (Internal) = 100 Marks	6
4	PAPER 05 (B) (Practical) Programming with SCILAB		6	35(External)+ 15 (Internal) = 50 Marks	3
5	PAPER 06 (B) (Practical) Programming in C language		6	35(External)+ 15 (Internal) = 50 Marks	3
6	PAPER 07 (B) (Practical) Numerical Analysis – I		6	35(External)+ 15 (Internal) = 50 Marks	3
7	Project Work & Viva	1 Guidance Lecture. for a group of 3 to 5 students per week. Evaluation of project will be in Sixth semester.		The title of the project work to be decided and data will be collected in this semester	3
				Total Credit of semester	**30**

THEORY		
Total Marks of Each Theory Paper [External Examination]	**70 Marks**	
Total Marks of Each Theory Paper [Internal Examination]	10 Marks	Internal Exam
	10 Marks	Assignment
	05 Marks	Quiz
	05 Marks	Attendance
	30 Marks	
Total	**100 Marks**	
PRACTICAL		
Total Marks of Each Practical Paper [External Examination]	35 Marks	
Total Marks of Each Practical Paper	15 Marks	[Continuous internal assessment of practical work]
Total	**50 Marks**	

Format of Question Paper

- There shall be one question paper of 70 marks & 2 hours 30 minutes for each Mathematics
- Theory Paper.
- There shall be FIVE questions from each unit of 14 marks each.
- Each Question will be of the following form.

Question:	
(A) Answer any four out of four (Short answer type question)	4 Marks
(B) Answer any one out of two	2 Marks
(C) Answer any one out of two	3 Marks
(D) Answer any one out of two	5 Marks
Total	**14 Marks**

-: Project Work:-

- There will be a project on any topic in Mathematics preferably not covered in the syllabus.
- The project will be assigned in the teams (groups) of at least one and at most five students.
- There will be one lecture per week to guide and motivate for each group of students.
- Topic of the project may be selected based on the following
  1. Demand of mathematics required to cater the need of industries and the society as a whole.
  2. New topic not taught up to final semester.
  3. The topic may be an extension of topic covered in any of the topics/subject taught up to sixth semester.
  4. Innovative teaching methodology of Mathematics may also be selected as a topic of the project work.
  5. Students may also construct innovative models based on mathematical concepts even those taught at secondary or higher secondary level.
  6. Every project or even model must be submitted with proper documentation about the concept and the model.

- **During the fifth semester students will be**
  1. Introduced and assigned title of the project,
  2. Teams will be formed for the same.
  3. Each group will study, search reference, collect data and work-out details for their topic of project-work.

- **During the sixth semester**
  1. Students will finalize, document, submit and get the project work certified in their names.
  2. The project work must be submitted by the student in the fourteenth week of the sixth semester.
  3. Only on the submission of project dissertation the student will be issued hall ticket for the end semester theory and practical examination.

4. The dissertation may be typed or hand-written and be limited to 40 to 70 pages of A4 size.
5. Project work shall be evaluated by an external and one internal examiner which will be followed by presentation of the work and viva-voce.
6. Students will be required to undergo verification, evaluation and viva of the project-work they have done.
7. Certified documentation of the project-work done by each group is mandatory. The certified documentation should be produced while appearing for viva and evaluation of project during final examination of sixth semester.

- The project work will be evaluated for 100 marks of which **60% marks** will be allotted for the **dissertation** and **40% for the presentation** and **viva-voce**
- **The Evaluation of the project work will be done at the end of the sixth semester. For the Evaluation of the project work there shall be three hours duration. There shall be a batch of 15 students for project and viva.**

B.Sc. Semester 5
MATHEMATICS PAPER 05 (A)- Theory
Mathematical Analysis-1 & Abstract Algebra - I

OBJECTIVES

Students will

- have knowledge of Abstract algebra.
- understand Riemann Integral, Metric space and group theory.
- solve problems of Riemann Integral, Metric space and group theory.

COURSE OUTCOMES

Students will be able to-

- remember definitions of Metric space related terminology.
- understand concept of Metric space related terminology.
- recall definitions and theorems of Riemann Integral related terminology.
- prove some results of Riemann Integral.
- solve problem of based on Riemann Integral.
- understand concept of Abstract Algebra.
- remember definitions and theorems of Group Theory.
- understand Subgroups and symmetric group.
- prove some results of Group Theory.
- solve problem of based on Group Theory.
- understand Isomorphism and its properties.

B.Sc. Semester 5
MATHEMATICS PAPER 05 (A)- Theory
Mathematical Analysis-1 & Abstract Algebra - I
Effective from June – 2021

UNIT 1: **Metric Spaces:** [14 Marks] Definition and examples of metric space, neighborhood, limit points, interior points, Open and closed sets, Closure, derived set and interior, boundary points. Dense sets, Cantor sets [**include Cantor set is closed] but [OMIT: - cantor set is compact and complete**.]

UNIT 2: **Riemann Integral:** [14 Marks]
Partitions and Riemann sums, Upper and lower R-integrals, R-integrability, The integral as limit, Some classes of integrable functions , Properties of integrable function, Properties of R-integrable function., Statement of **Darboux's theorem** (without proof)

UNIT 3: [14 Marks]

[a] Riemann Integral
Continuity, Derivability of the integral functions, Fundamental theorem of integral calculus, Mean value theorem of integral calculus.

[b] **Abstract Algebra**
Definition of Binary Operation ,Properties of B.O. & Examples , Group & its Properties, Examples of Group.

UNIT 4: **Subgroups and Symmetric Group** [14 Marks]
Subgroup & Its Properties, Cosets & Its Properties, Lagrange's theorem. Permutation, Transposition, Even & Odd Permutation, Symmetric Group, Inverse of Permutation, Alternative Group & Its Universal Property.

UNIT 5: **Isomorphism and other properties** [14 Marks]
Cyclic Group & Cyclic Subgroup & Its Properties, Deduction Of Lagrange's Theorem. Definition of Isomorphism, Equivalence Relation. Cayley Theorem, Automorphism, Properties of isomorphism, Normal subgroup and quotient group.

Text Book for MATHEMATICS PAPER 05 (A) (Theory)
Unit – 3[b], 4 and 5 Group Theory

Abstract Algebra

By : Dr. I. H. Sheth, Prentice Hall Of

India, New Delhi.

Course of Mathematics PAPER – 05 Abstract Algebra - I

is covered by following Chapters/ Sections of the above mentioned book namely Abstract Algebra

Chapter 4: § 4.1, § 4.2, § 4.3, § 4.4, §4.5 [OMIT: Example 4.1.11]

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Chapter 6: § 6.1, § 6.2[OMIT: Example 6.2.7], § 6.3,

- [**Omit**:- § 6.4], § 6.5

[**Omit:**- Generalized associative law, Theorem: 6.5.2, Theorem: 6.5.3]

§ 6.6, § 6.7

Chapter 7: § 7.1, § 7.2, § 7.3

Chapter 8: § 8.1, § 8.2, § 8.3 [**Omit:**- Theorem: 8.2.2]

Chapter 9: § 9.1, § 9.2, § 9.3

Chapter 10: § 10.1, § 10.2

Chapter 11

- **Omit :-** Chapter 11 Cyclic Groups
- [The whole chapter is to be omitted]

Chapter 12:

- § 12.3, § 12.4 [**Omit:**- § 12.5]

[Remaining sections of this chapter will be covered in 6^{th} semester]

References

(1) Topics in Algebra, 1. N. Herstein, Willey Eastern Ltd. New Delhi

(2) A text Book of Modern Abstract Algebra, by Shantinarayan, S. Chand & Co., New Delhi.

(3) Fundamentals of Abstract Algebra, D. S. Malik, J. N. Mordoson and M. K. Sen, McGraw Hill International Edition - 1997

(4) University Algebra, M. S. Gopalakrishna, Wiley Eastern Ltd.

(5) Abstract Algebra, By Bhattacharya, Yallo Publications.

(6) Modern Algebra, By Kazi zamiudia & Sursit, Vikas Publication. Delhi.

(7) Text Book: Abstract Algebra, Dr. 1. H. Sheth, Nirav Prakashan, Ahmedabad.

(8) Mathematical Analysis (2nd edition) by S. C. Malik & Arora, New Age Inter. Pvt.'

(9) Mathematical Analysis, by T. M. Apostol

(10) Real Analysis, by R. R. Goldberg (Chapel' 4,5,6, 7,9 & 10.1)

(11) A course of Mathematical Analysis, by Shantinarayan, S. Chand & Sons.

(12) Metric space, by E. T. Capson

(13) Metric space, P. K. Jain & Ahmad, Narora Publishing House

(14) Real Analysis by Sharma and Vasishtha Krishna Prakashan, Meerut-2.

(15) Mathematical Analysis, by Dr. Goyal and Gupta, Krishna Prakashan, Meerut-2.

B.Sc. Semester 5
Mathematics Paper No. 06 (A)
Programming in C and Numerical Analysis - I

OBJECTIVES

Students will

- get acquired about a computer language C.
- understand of basic knowledge of Language C.
- acquire knowledge of decision control structure, loop control, user defined function, macro and array.
- apply the knowledge for programming of some mathematical problems.

COURSE OUTCOMES:

Students will be able to-

- understand history and basic knowledge of Language C.
- understand decision structure, control structure, loops array and macro.
- use the knowledge to write some mathematical programs.

B.Sc. Semester -5
MATHEMATICS PAPER 06 (A) (Theory)
Programming in C and Numerical Analysis - I
Effective from June – 2021

UNIT 1: [14 Marks]

History of C, C character set, Constants, Variables, Keywords, Type Declaration, Type Conversion, Hierarchy of operators, printf & scanf functions, if statement, if-else statements, Nested if-else, Logical operators, Conditional operators, including simple programs relevant to this unit.

UNIT 2: [14 Marks]

While loop, for loop, do while loop, break statement, Continue statement goto statement, Introduction to User Defined Functions.**[Omit:- switch case statement, Pointers and Recursion]** Data types in C Integers: long and short types, signed and unsigned characters, Signed and unsigned float and doubles, including simple programs relevant to this unit.

UNIT 3: [14 Marks]

C processors, meaning , Only Macro Expansion, Macros with Arguments,
[OMIT:- File inclusion and various directives Conditional Compilation #if and #elif Directives Miscellaneous Directives #undef Directive #pragma Directive]
Arrays, meaning: one dimensional and two dimensional, only initialization and use in simple programs **[OMIT:- no pointers and no three dimensional array, Arrays and functions.]**, including simple programs relevant to this unit.

UNIT 4: [14 Marks]

Simultaneous linear algebraic equation:
Direct methods: Gauss elimination method, Gauss Jordan method, Method of factorization (L.U. Decomposition), Crout's method. Iterative methods: Jacobi's method, Gauss Seidal's method.
Empirical laws and curve fitting.
The linear law, Laws reducible to linear laws, Principle of least square, Fitting a straight line, a parabola and exponential curve and the curve $y=a^{x^{b}}$

UNIT 5: [14 Marks]

Finite differences:
Finite differences(forward , backward and central),
Differences of polynomials, Factorial polynomial, Reciprocal Factorial polynomial , Polynomial factorial notation, Error propagation in difference table, Other difference operators(Shift, averaging, differential and unit) and relation between them.
Interpolation with equal intervals:
Gregory- Newton forward interpolation formula, Gregory- Newton backward interpolation formula, Equidistance terms with one or more missing values.

Text Book for MATHEMATICS PAPER 06 (A) (Theory) PROGRAMMING IN C is as follows:
'LET US C' By : Yashvant Kanetker 5th Edition, BPB Publications, New Delhi.

Course of PROGRAMMING IN C (THEORY)

i.e. UNIT 1,2 and 3 is covered by following Sections / Chapters of the book "LET US C"

- **Chapter 1**
  Getting Started
  [Omit:- the section of Associativity of Operator]
  Chapter 2
  The decision control Structure [Whole chapter]
- **Chapter 3**
  The loop control Structure [Whole chapter]
  For the topic of "**User Defined Functions"** refer to
  any other standard book
- **Chapter 4**
  The case control Structure
  [Omit: - Switch –Case Statement and related sections]
  Only The goto keyword and its usage.
- **Chapter 5 :-**
  [Omit:- The whole Chapter 5 – namely "Functions and Pointers" of the book "LET US C"]
- **Chapter 6:-**
  Data Types Revisited
  [Omit:- Storage Classes like Automatic Storage Class Register Storage Class, Static Storage Class ,
  External Storage Class, Which to Use When…etc.]
- **Chapter 7:-**
  The C Preprocessor
  Features of C Preprocessor, Macro Expansion, Macros with Arguments, Macros versus Functions
  [OMIT:- File Inclusion Conditional Compilation, #if and #elif Directives, Miscellaneous Directives,
  #undef Directive, #pragma Directive]
- **CHAPTER 8:-**
  Arrays. What are Arrays, A Simple Program Using Array, More on Arrays, Array Initialization, Bounds Checking, Passing Array Elements to a Function, Two Dimensional Arrays, Initializing a 2-Dimensional Array
  [OMIT:-Pointers and Arrays, Passing an Entire Array to a Function, The Real Thing, Memory Map of a 2-Dimensional Array, Pointers and 2-Dimensional Arrays, Pointer to an Array, Passing 2-D array to a Function, array of pointers, three dimensional array, summary.]

The scope of the syllabus of **UNIT 4 & 5** is roughly indicated as under:
"Numerical methods" by Dr. V. N. **Vedamurthy** & Dr. N. Ch. S. N. Iyengar, Vikas Publishing house.
Chap. 1. (Except 1.4,1.5,1.11,1.12), Chap. 4 (Except 4.4,4.7), Chap. 5. (Except 5.12), Chap. 6

Reference Books: (for Unit 4 & 5)

(1) Introduction to Numerical Analysis (2nd Edition) by C.E.Froberg Addision Wasley, 1979
(2) Numerical Mathematical Analysis, by J. B.Scarforough, Oxford & IBH Publi.Co. Pvt. Ltd., 1966
(3) Numerical method, Problems & Solutions, by M. K. Jain, S. R. K.Iyengar, R. K. Jain, New Age International Pvt. Ltd., 1996.

B.Sc. Semester 5
Mathematics Paper No. 07 (A)
Boolean Algebra and Complex Analysis-1

OBJECTIVES:

Students will

- acquire concept of Relation, Boolean algebra, Analytic function, Cauchy integral formula and Fundamental theorem of algebra.
- solve some problems based on them.

COURSE OUTCOMES:

Students will be able to-

- understand the concept of Relation and solve its problem.
- understand the concept of Boolean algebra and solve its problem.
- understand the concept of Cauchy integral and solve its problem.
- understand the concept of Fundamental theorem of algebra and solve its problem.

B.Sc. Semester 5
Mathematics Paper No. 07 (A)
Boolean Algebra and Complex Analysis-1

Effective from June – 2021

UNIT 1: [14 Marks]

Relations:

Relations and different types of relations. Binary relations, Equivalence relations and partitions, partial order relations, Posets, Hasse diagram, Lattices as posets, Properties of
lattices, Lattices as algebraic systems, Sub lattices, Direct product of two lattices, Homomorphism, order isomorphism of two posets, Isomorphic lattices, Complete lattices, Distributive lattices, Complemented lattices.

UNIT 2: [14 Marks]

Boolean algebra:

Definition, Examples BA, Direct product of two BA, homomorphism, Atoms of BA, Anti atoms, Stone's representation theorem, The set A(x) of all atoms of BA and its properties.

Isomorphism of a finite of finite BA and $(P(A), \subseteq)$, Boolean functions expressions, Minterms, Maxterms, Representation of a B. expression as a sum of product Canonical form. Karnaugh map. Minimization of a B. expression by cube array representation and by Karnaugh map.

UNIT 3: [14 Marks]

Analytic functions:

Functions of complex variables, limits, Theorems on limits, Continuity and differentiability, of complex functions, harmonic functions, Entire functions and analytic functions.

UNIT 4: [14 Marks]

Cauchy'sintegral formula:

Cauchy Riemann conditions in Cartesian and polar form. Definite integral contours, line integrals Cauchy-Goursat theorem**(without proof),** Cauchy's integral formula.

UNIT 5: [14 Marks]

Fundamental theorem of algebra:

Higher order derivative of analytic function, Morera's theorem, Cauchy's inequality and Liouville's theorem, Fundamental theorem of algebra, Maximum modulus theorem.

Book of Mathematics PAPER 07 (A) for the UNITs 3, 4 & 5 COMPLEX ANALYSIS-1

" Complex Variables and Applications" Fifth Edition,
Rul V. Churchill and James Ward Brown. Mc Graw Hill Publishing Company.

Chapter 2

- Sections 9 to 21.

Chapter 4

- Sections 30 to 35.
- Sections 36 to 37.
  [Lemma and Cauchy-Goursat theorem (in sections) 36 **without proof),**
- Sections 39 to 43.

References

(1) Complex variables and applications, by R. V. Churchill and J. \ Brown
(2) Theory of functions of a Complex variables, by Shantinarayan, Chand & Co.
(3) Complex variables, Introduction and applications, by Mark Ablowitz and A. S. Fokas, Cambridge University Press.
(4) (4) Graph theory with application to engineering and computer science. by Narsingh Deo. 1993,Prentice Hall of India Pvt. Ltd.
(5) Foundation of Discrete Mathematics, K. D. Joshi, New Age International Ltd. Publishers.
(6) A first look at Graph theory, by Clark.
(7) Discrete Mathematical Structures with applications to computer science,
(8) by Trembley 1.P. and Manohar R.
(9) Elements of Discrete Mathematics (2nd edition) by L. Liu, Me.
(10) GrawHill, International edition, Computer Science series, 1986.
(11) Discrete Mathematics, By Vatsa, Vikas Publications.
(12) Introduction Graph Theory, By R. J. Willsons
(13) Discrete Mathematics Structure, By. Dugragi, Narora Pub.

B.Sc. Semester 5
Mathematics Paper No. 05 (B)
PRACTICAL: Programming with SCILAB

OBJECTIVES

Students will

- acquire knowledge about mathematical software Scilab.
- understand commands and tools of the software

COURSE OUTCOMES

Students will be able to-

- use the software for matrix related operations.
- solve simultaneous equations using various methods.
- draw graphs of cycloid, catenaries and spiral.

B.Sc. Semester 5
Mathematics Paper No. 05 (B)
PRACTICAL: Programming with SCILAB
Effective from June – 2021

- **Total Marks:- 35 Marks (External)+ 15 Marks (Internal)= 50 Marks / 3 hours**

1) To find the inverse of a matrix using **GAUSS-ELIMINATION** method..
2) To find inverse of given matrix using **GAUSS-JORDAN** method
3) To find **Eigen values** and **Eigen vectors** of given matrix
4) To find inverse of given matrix using **CAYLEY-HAMILTON** theorem
5) To solve given system of simultaneous linear algebraic equations using **GAUSS- JORDAN** method.
6) To solve given system of simultaneous linear algebraic equations using **GAUSS- JACOBI** method.
7) To solve given system of simultaneous linear algebraic equations using **GAUSS- SEIDAL'S** method.
8) To draw graphs of **Cycloid**
9) To draw graphs of **Catenaries**
10) To draw graphs of **spiral r = exp(-theta/10).**

Notes :

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-5**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination

  (i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**

B.Sc. Semester 5
Mathematics Paper No. 06 (B)
PRACTICAL: Programming in C Language

OBJECTIVES

Students will

- use theoretical knowledge of language C in programming.
- acquire skill of programming with punctuality.

COURSE OUTCOMES:

Students will be able to-

- understand how to write programs.
- write program using decision control structure.
- write program using loop control structure.
- write program using user defined functions.
- write program using arrays.
- write program using macro.

B.Sc. Semester 5
Mathematics Paper No. 06 (B)
PRACTICAL: Programming in C Language
Effective from June – 2021

- **Total Marks:- 35 Marks (External)+ 15 Marks (Internal) = 50 Marks / 3 hours**

(1) To write a program to find net salary of the employee.
(2) To write a program to solve the quadratic equation,
(3) To write a program to reverse a number,
(4) To write a program to verify a number whether it is palindrome or not.
(5) To write a program to find sum of the digits,
(6) To write a program to print Armstrong numbers,
(7) To write a program to find compound interest for given years,
(8) To write a program to find nPr and nCr.
(9) To write a program to find number of odd number and even numbers.
(10) To write a program to generate arithmetic and geometric progressions.
(11) To write a program to find prime number between two numbers,
(12) To write a program to solve the equation by Bisection method or
(13) To write a program to solve the equation by N-R method.
(14) To write a program to add and multiply two matrices.

Notes :

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-5**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination

(i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**

B.Sc. Semester 5
Mathematics Paper No. 07 (B)
PRACTICAL: Numerical Analysis-1
Effective from June – 2021

OBJECTIVES

Students will

- use theoretical knowledge of Numerical Analysis-1.
- acquire skill of programming with punctuality.

COURSE OUTCOMES

Students will be able to-

- understand fitting of curves.
- fit a straight line and parabola to given data.
- solve simultaneous equations using Gauss elimination, Gauss Jordan method, Jacobi's method and Gauss Seidel's method
- understand finite differences.
- solve problems using Gregory-Newton's forward interpolation formula, Gregory-Newton's backward interpolation formula and Equidistance terms with one or more missing values.

B.Sc. Semester 5
Mathematics Paper No. 07 (B)
PRACTICAL: Numerical Analysis-1
Effective from June – 2021

- **Total Marks:- 35 Marks (External) + 15 Marks (Internal) = 50 Marks / 3 hours**

1) Fitting (1) a straight line and (2) $y = e^{ax}$

2) Fitting (1) a parabola and (2) $y = ax^{b}$

3) Gauss elimination

4) Gauss Jordan method

5) Jacobi's method

6) Gauss Seidel's method

7) Finite differences.

8) Gregory-Newton's forward interpolation formula.

9) Gregory-Newton's backward interpolation formula.

10) Equidistance terms with one or more missing values

Note:

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-5**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination

  (i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**

Syllabus
B.Sc. Semester-6
According to Choice Based Credit System
Effective from June – 2021

(Updated on date:- 01-01-2020
and updation implemented from June - 2021)

- **Program:** **B.Sc.**
- **Semester:** **6**
- **Subject:** **Mathematics**
- **Course codes:** **08 (A) -Theory**
  09 (A) -Theory
  10 (A) -Theory

  08 (B) - Practical
  09 (B) - Practical
  10 (B) - Practical

  1 Project
- **Total Credit Of The Semester** **30 Credit**

B. Sc. MATHEMATICS SEMESTER : VI

- **The Course Design of B. Sc. Sem.- VI (Mathematics) according to choice based credit system (CBCS) comprising of Paper Number, Name, No. of theory lectures per week, No. of practical lectures per week , total marks of the course are as follows :**

SR.NO.	SUBJECT	NO. OF THEORY LECTURE PER WEEK	NO. OF PRACTICAL LECTURE PER	TOTAL MARKS	Credit Of Each Paper.
1	**PAPER 08 (A) (Theory)** **Graph Theory & Complex Analysis-II**	6	-	70(External)+ 30 (Internal) = 100 Marks	6
2	**PAPER 09 (A) (Theory)** **Mathematical Analysis-II & Abstract Algebra-II**	6	-	70(External)+ 30 (Internal) = 100 Marks	6
3	**PAPER 10 (A)** (Theory) **Optimization & Numerical Analysis-II**	6	-	70(External)+ 30 (Internal) = 100 Marks	6
4	**PAPER 08 (B) (Practical)** **Introduction to GeoGebra**	-	6	35(External)+ 15(Internal) = 50 Marks	3
5	**PAPER 09 (B) (Practical)** **Numerical Analysis-II**	-	6	35(External)+ 15(Internal) = 50 Marks	3
6	**PAPER 10 (B) (Practical)** **Optimization**	-	6	35(External)+ 15(Internal) = 50 Marks	3
7	**Project Work & Viva**	1 Guidance Lect. For a group of 2 to 5 students / week	Project work to be finalized and certified and evaluated.	**60Marks (Dissertation) + 40 Marks (Viva) = 100 Marks**	3
				Total credit of the semester	**30**

Marks Distribution of Each Paper
for
Theory and Practical (for SEMESTER-VI)

THEORY		
Total Marks of Each Theory Paper [External Examination]	**70 Marks**	
Total Marks of Each Theory Paper [Internal Examination]	10 Marks	Internal Exam
	10 Marks	Assignment
	05 Marks	Quiz
	05 Marks	Attendance
	30 Marks	
Total	**100 Marks**	
PRACTICAL		
Total Marks of Each Practical Paper [External Examination]	35 Marks	
Total Marks of Each Practical Paper	15 Marks	[Continuous internal assessment of practical work]
Total	**50 Marks**	

Format of Question Paper

- There shall be one question paper of **70 marks & $2\frac{1}{2}$ hours** for each Mathematics Theory Paper**.**
- There shall be FIVE questions from each unit of 14 marks each.
- Each Question will be of the following form.

Question	(A)	Answer any four out of four (Short answer type question)	4 Marks
	(B)	Answer any one out of two	2 Marks
	(C)	Answer any one out of two	3 Marks
	(D)	Answer any one out of two	5 Marks
		TOTAL	**14 MARKS**

B.Sc. Semester 6
MATHEMATICS Paper No. 08 (A)
Graph Theory & Complex Analysis-II

OBJECTIVES

Students will

- have knowledge of Graph Theory.
- have knowledge of Complex Analysis-2.
- understand Graph theory and Complex analysis-2
- solve problems of graph theory and complex analysis-2.

COURSE OUTCOMES

Students will be able to-

- remember definitions and result of graph theory.
- understand theorems of graph theory.
- prove some results of graph theory.
- solve problem of based on graph theory.
- understand concept of complex analysis-2.
- remember definitions and theorems of complex analysis.
- understand proof of theorems.
- solve problem of based on theorems.

B.Sc. Semester 6
MATHEMATICS Paper No. 08 (A)
Graph Theory & Complex Analysis-II
Effective from June – 2021

UNIT 1: [14 Marks]

Graph theory:

Basic definitions and simple examples, Directed, Undirected, multi-graph, mixed graph. Incidence relation and degree of the graph. Empty, complete, regular graphs. Sub graph, connected and disconnected graphs.

Walk and unilateral components, Euler graphs, Unicursal graph, Operation of graph circuit & tree. Hamiltonian path and cycles, tree, Binary and Spanning trees.

UNIT 2: [14 Marks]

Cut-set, connectivity and separability

[OMIT:-1-isomorphism, 2-isomorphism]

planner graphs and their different representation, Dual of a planner graph, Euler's formula, Kuratowski's first and second non-planner graph, vector space associated with a graph, Circuit subspace and cut sets subspace, Orthogonal space.

Vertex coloring, Chromatic number, Index number and partition, Cyclic graph and demyelization of cyclic graphs, Matrix representation of a graph, Adjacency matrix, Incidence matrix, Path matrix,

[OMIT :- Circuit matrix, Fundamental circuit matrix and cut set matrix, Relation ship of these matrices]

Rank of the adjacency matrix.

UNIT 3: [14 Marks]

Mapping and Conformal mapping:

Elementary functions, mapping by elementary functions, Mobious mapping, linear function, Bilinear mapping $w=(az+b)/(cz+d)$, $w = z^2$, $w = 1/z$, $w = \exp(z)$,

[OMIT: w = sin z, w = cos z, w = cosh z ,w = sinh z]

Transformations, Conformal mappings and their examples.

UNIT 4: [14 Marks]

Power series:

Definition of complex sequence, Complex series and power series Expansion of a complex function in Taylor's series and Laurent's series.

UNIT 5: [14 Marks]

Residues and poles:

Definition of a singular point, Isolated singular points, Zeros of complex functions, Poles and residues of complex function, Cauchy's residue's theorem, Evaluation of improper real integrals by residue theorem and evolution of definite integral of trigonometric functions by residue theorem.

Text book for Mathematics PAPER – 08 (Unit 1 & 2)

Graph theory

Graph theory with application to engineering and computer science

By: - Narsingh Deo,

Prentice Hall of India Private Limited, New Delhi.

Chapter: 1

- § 1.1, § 1.3, § 1.4, § 1.5
- **[OMIT : - § 1.2 and § 1.6]**

Chapter: 2

- § 2.1, § 2.2, § 2.3, § 2.4, § 2.5, § 2.6, § 2.7, § 2.8, §2.9
- **[OMIT: - §2.10**]

Chapter: 3

- § 3.1, § 3.2, § 3.3, § 3.5, § 3.6, § 3.7, § 3.8
- **[OMIT: - § 3.4, § 3.9, § 3.10]**

Chapter: 4

- § 4.1, § 4.2, § 4.3, § 4.4, § 4.5,
- **[OMIT: - § 4.6, § 4.7, § 4.8]**

Chapter: 5

- § 5.2, § 5.3, § 5.4, § 5.5, § 5.6
- **[OMIT: - § 5.1, § 5.7, § 5.8, § 5.9]**

Chapter: 6

- § 6.1, § 6.5, § 6.7, § 6.9
- [**OMIT: - § 6.2, § 6.3, § 6.4, § 6.8]**

Chapter: 7

- § 7.1, § 7.8, § 7.9
- [**OMIT: - § 7.2, § 7.3, § 7.4, § 7.5, § 7.6, § 7.7]**

Chapter: 8

- § 8.1, § 8.2, § 8.5
- [**OMIT: - § 8.3, § 8.4, § 8.6**

Chapter: 9

- § 9.1, § 9.11
- [**OMIT: - § 9.2 to § 9.10]**

Text Book of Mathematics Paper 08 Unit 3, 4 & 5 is as follows

"Complex Variables and Applications"
Fifth Edition,
Ruel V. Churchill and James Ward Brown.
Mc Graw – Hill Publishing Company

Chapter 5

- Sections 44, 45, 46, 47, 48 [Omit Sections: -49, 50, 51],

Chapter 6

- Sections 53 to 58, 60 [**OMIT:**- Sections 59]

Chapter 7

- Sections 64, 65, 66, 67, 68, 70
  [**OMIT** Sections**:** - 63, 71, 72]
  [**OMIT: - Chapter 8**]

References

(1) Complex variables and applications, by R. V. Churchill and J. \ Brown
(2) Theory of functions of a Complex variables, by Shantinarayan, Chand & Co.
(3) Complex variables, Introduction and applications, by Mark Ablowitz and A. S. Fokas, Cambridge University Press.
(4) Graph theory with application to engineering and computer science.by Narsingh Deo. 1993,Prentice Hall of India Pvt. Ltd.
(5) Foundation of Discrete Mathematics, K. D. Joshi, New Age International Ltd. Publishers.
(6) A first look at Graph theory, by Clark.
(7) Discrete Mathematical Structures with applications to computer science, by Trembley 1.P. and Manohar R.
(8) Elements of Discrete Mathematics (2nd edition) by L. Liu, Me. GrawHill, International edition, Computer Science series, 1986.
(9) Discrete Mathematics, By Vatsa, Vikas Publications.
(10) Introduction Graph Theory, By R. J. Willsons
(11) Discrete Mathematics Structure, By. Dugragi, N

B.Sc. Semester 6
MATHEMATICS Paper No. 09 (A)
MATHEMATICAL ANALYSIS - II and ABSTRACT ALGEBRA - II

OBJECTIVES

Students will

- have knowledge of Compactness in Metric Space
- have knowledge of Laplace Transforms and its application to differential equations.
- have knowledge of First fundamental theorem of homomorphism of groups and Rings.
- solve problems based on the knowledge.

COURSE OUTCOMES:

Students will be able to-

- remember definitions and result of metric space.
- understand theorems of metric space.
- understand concept of Laplace transforms and application to differential equations.
- understand concept of First fundamental theorem of homomorphism of groups and Rings.
- remember definitions and results First fundamental theorem of homomorphism of groups and Rings.
- understand proof of theorems.
- solve problem of based on theorems.

B.Sc. Semester 6
MATHEMATICS Paper No. 09 (A)
MATHEMATICAL ANALYSIS - II and ABSTRACT ALGEBRA - II
Effective from June – 2021

UNIT 1: [14 Marks]

Compactness in Metric Spaces

Cover, Open cover, Finite sub cover, Compact set, Properties of compact sets **Connected sets, Separated sets, Bolzano-Weirstrass theorem, Countable set.** Homeomorphism of two metrics, Sequential compactness, totally bounded space.

UNIT 2: [14 Marks]

Laplace Transforms

Definition of Laplace Transforms, Laplace Transforms of elementary Function Inverse Laplace Transforms, Laplace Transforms of Derivative

UNIT 3: [14 Marks]

Application of Laplace Transforms to Differential Equations.

Laplace Transforms of Integrals, Laplace Transforms Differentiation and integration of Laplace Transforms, Convolution theorem, Application to Differential Equations.

UNIT 4: [14 Marks]

First fundamental theorem of homomorphism of groups and Rings

Homomorphism of groups, Kernel of homomorphism, First fundamental theorem of homomorphism of groups. Ring and its properties, Subring, **[OMIT:- Boolean ring, Euclidean ring]**

Field, Zero divisor, Integral domain, Characteristics of ring, Cancellation law, Ideals, Principal ideal, ,Polynomial ring, **[OMIT:- Quotient ring. Maximal ideal]** Polynomial, Degree of polynomial, Factor and remainder theorem of polynomial, Product, sum and division of polynomials.

UNIT 5: [14 Marks]

Polynomial Rings

Reducible and irreducible polynomials, Factorization of polynomials(unique Factorization theorem **(without proof), [OMIT:- Eisenstein's criterion**]
Division algorithm theorem of polynomial
G.C.D. of polynomials, Quaternion **[OMIT:- Ring homomorphism, Euler and Fermat's theorem]**

Text book for Mathematics PAPER – 09 (A)
MATHEMATICAL ANALYSIS - II (Unit 2 and 3)
For Laplace Transforms
'Advanced Mathematics for Pharmacy'
By: - Dr. M. M. Patel, Atul Prakashan, Ahmedabad
Chapter: - 17 Laplace Transforms
§ 16.1 to 16.9 **,** § 16.11, § 16.12 **[OMIT :- § 16.10]**

Text Book for MATHEMATICS PAPER 09 (A)
"Abstract Algebra" By: Dr. I. H. Sheth, Prentice Hall Of India, New Delhi.

Course of Mathematics PAPER – 09 (A) (Unit 4 & 5) are covered by following Chapters/ Sections of the above mentioned book Abstract Algebra

Chapter 12: § 12.1, § 12.2, § 12.6
Chapter 13: § 13.1, § 13.2, § 13.3, § 13.4
Chapter 14: § 14.1, § 14.2, § 14.3, § 14.4
Chapter 15: § 15.1, § 15.2, § 15.4 **[OMIT:- § 15.3]**
Chapter 18: § 18.1, § 18.2, § 18.3,
§ 18.4 [**Omit: Theorem: 18.4.8**
i. e. unique Factorization theorem **(without proof)**],
§ 18.5**[OMIT: - § 18.6 - Eisenstein's criterion]**
§ 18.7.

References:

(1) Topics in Algebra, I. N. Herstein, Willey Eastern Ltd. New Delhi

(2) A text Book of Modern Abstract Algebra, by Shantinarayan, S. Chand & Co., New Delhi.

(3) Fundamentals of Abstract Algebra, D. S. Malik, J. N. Mordoson

and M. K. Sen, McGraw Hill International Edition - 1997

(4) University Algebra, M. S. Gopalakrishna, Wiley Eastern Ltd.

(5) Abstract Algebra, By Bhattacharya, Yallo Publications.

(6) Modern Algera, By Kazi zamiudia & Sursit, Vikas Publication. Delhi.

(7) Text Book: Abstract Algebra, Dr. 1. H. Sheth, Nirav Prakashan, Ahmedabad.

(8) Mathematical Analysis (2nd edition) by S. C. Malik & Arora, New Age Inter. Pvt.'

(9) Mathematical Analysis, by T. M. Apostol

(10) Real Analysis, by R. R. Goldberg (Chapel' 4,5,6, 7,9 & 10.1)

(11) A course of Mathematical Analysis, by Shantinarayan, S. Chand & Sons.

(12) Metric space, by E. T. Capson

(13) Metric space, P. K. Jain & Ahmad, Narora Publishing House

(14) Real Analysis by Sharma and Vasishtha Krishna Prakashan, Meerut-2.

(15) Mathematical Analysis, by Dr. Goyal and Gupta, Krishna Prakashan, Meerut-2.

SAURASHTRA UNIVERSITY, RAJKOT

B.Sc. Semester 6
MATHEMATICS Paper No. 10 (A)
OPTIMIZATION and NUMERICAL ANALYSIS - II

OBJECTIVES

Students will

- have knowledge of Linear Programming Problems.
- have knowledge of Transportation and Assignment Problems.
- have knowledge of Central difference interpolation & interpolation with unequal intervals and solve problems based on the knowledge
- have knowledge of Numerical Differentiation & Integration and Numerical solution of ordinary differential equations.

COURSE OUTCOMES:

Students will be able to-

- solve Linear Programming Problems.
- solve Transportation Problems.
- solve Assignment Problems.
- derive formula of Central difference interpolation & interpolation with unequal intervals.
- integrate and differentiate using numerical methods.
- solve ordinary differential equations using numerical methods.

B.Sc. Semester 6
MATHEMATICS Paper No. 10 (A)
OPTIMIZATION and NUMERICAL ANALYSIS - II
Effective from June – 2021

UNIT 1: [14 Marks]

Linear Programming Problems

The linear programming problems, Formulation of LPP, Matrix form of the LPP, general form, Canonical form , Standard form of the LPP, Graphical method to solve LPP, Some definitions and basic properties of convex sets convex functions and concave function. Basic definitions to use Simplex method, Simplex method, Big-M method (Penalty method), Two phase method to solve LPP(without alternative solution and unbounded solution)

UNIT 2: [14 Marks]

Transportation and Assignment Problems

Principle of duality in LPP, Primal LPP and method to find its dual LPP (Simple problems of above articles). The transportation problems: Mathematical and matrix form of TP. Initial solution of TP by NWCM, LCM and VAM, Optimum solution of TP by Modi method (u-v method) (except degenerate solution), Balanced and unbalanced TP(Simple problem), Assignment problem: Mathematical and matrix form of AP, Hungarian method to solve method(simple method).

UNIT 3: [14 Marks]

Central difference interpolation & interpolation with unequal intervals:

Gauss's forward, Gauss's backward, Sterling's, Bessel's and Laplace- Everett's interpolation formulae.

Divided differences, Properties of divided difference, Relation between divided differences and forward difference, Newton's divided difference formula, Lagrange's interpolation formula, Inverse interpolation, Lagrange's inverse interpolation formula,

UNIT 4: [14 Marks]

Numerical Differentiation & Integration::

Numerical Differentiation, Derivatives using Gregory-Newton's forward difference formula, Derivatives using Gregory-Newton's backward difference formula, Derivative using Sterling's formula. Numerical Integration, General quadrature formula, Trapezoidal rule, Simpson 's 1/3 rule, Simpson's 3/8 rule.

UNIT 5: [14 Marks]

Numerical solution of ordinary differential equations

Solution by Taylor's series method, Taylor's series method for simultaneous first order differential equations, Picard's method, Picard's method for simultaneous first order differential equations, Euler's method, Improved Euler's method, Modified Euler's method.

Runge's method, Runge-Kutta methods, Higher order Runge-Kutta methods, Runge-Kutta methods for simultaneous first order differential equations, R-K methods for simultaneous first order differential equations, Predictor-Connector methods, Milne's method.

Text Book for Mathematics PAPER – 10 (A) (Theory) OPTIMIZATION (Unit - 1 & 2)

Operation Research Theory and Applications',
J. K. Sharma, Second Edition,
MACMILLAN INDIA LTD

Course of Mathematics PAPER – 10 (A) OPTIMIZATION
is covered by following Chapters/ Sections of the above mentioned book

Chapter 2:-
- § 2.6 [Only]

Chapter 3:-
- § 3.1, § 3.2, § 3.3 **[Omit:- § 3.4]**

Chapter 4
- § 4.1, § 4.2, § 4.3, § 4.4 **[Omit:- § 4.5 and § 4.6]**

Chapter 5
- § 5.1, § 5.2, § 5.3 **[Omit:- § 5.4, § 5.5]**

Chapter 9
- § 9.1 to § 9.5 § 9.6
- **[Only § 9.6.1 Unbalanced Supply and Demand]**
- **[Omit: - § 9.6.2, § 9.6.3, § 9.6.4… etc in § 9.6]**
- **[Omit: - § 9.7, § 9.8]**

Chapter 10 § 10.1 to § 10.3
- **Appendix A** A.10 and A.12
- **[Omit: - § 10.4 to § 10.6]**
- **[Omit: - the rest]**

The scope of the syllabus of **UNIT – 3, 4 & 5** is roughly indicated as under:

"Numerical methods" by Dr. V. . Vedamurthy & Dr. N. Ch. S. N. Iyengar, Vikas Publishing house.

Chap.7 (Except 7.7,7.8), Chap. 8. (Except 8.8), Chap. 9. (Except 9.5, 9.13), Chap. 11. (Except 11.1, 11.2,11.3, 11.6, 11.9, 11.17, 11.20)

Reference Books:

(1) Introduction to Numerical Analysis (2nd Edition) by C.E.Froberg Addision Wasley, 1979

(2) Numerical Mathematical Analysis, by J. B.Scarforough, Oxford & IBH Publi.Co. Pvt. Ltd., 1966

(3) Numerical method, Problems & Solutions, by M. K. Jain, S. R. K.Iyengar, R. K. Jain, New Age International Pvt. Ltd., 1996.

B.Sc. Semester 6
MATHEMATICS Paper No. 08 (B)
PRACTICAL: Introduction to GeoGebra

OBJECTIVES

Students will

- acquire knowledge about mathematical software GeoGebra.
- understand commands and tools of the software.
- use the commands and tools of the software.

COURSE OUTCOMES:

Students will be able to-

- understand interface of GeoGebra.
- Use of tool bars to draw various Geometric Shapes including lines, line
- segments, triangles, polygons, circles and conics.
- draw graphs of any function of one variable for Cartesian equation using menu bar and to analyze the function using function inspector tool from tool menu and find its properties like maximum and minimum values .
- draw graphs of curves using menu bar, when equation of the curves are given.
- draw various types of triangles including equilateral triangles, isosceles triangles, right angle triangles, acute triangle, obtuse triangle, and finding its various important centers including centroid, in-center, circum --enter and ortho-center.
- understand various circles and compass tools and practice of drawing construction of various geometric shapes including triangles, polygons, squares, rectangle ..etc.
- verify important theorems of geometry, algebra and calculus using GeoGebra.
- draw and measure various geometric shape using angle, distance, area and slop tools from tool bar.
- understand reflect, rotate and translate by a vector tools.
- understand the usage of slider and basic animation.

B.Sc. Semester 6
MATHEMATICS Paper No. 08 (B)
PRACTICAL: Introduction to GeoGebra
Effective from June – 2021

1) Introduction to the interface of GeoGebra.
2) Use of tool bars to draw various Geometric Shapes including lines, line segments, triangles, polygons, circles and conics.
3) Drawing of graphs of any function of one variable for Cartesian equation using menu bar and to analyze the function using function inspector tool from tool menu and find its properties like maximum and minimum values .
4) Drawing of graph of curves using menu bar, when equation of the curves are given.
5) Drawing of various types of triangles including equilateral triangles, isosceles triangles, right angle triangles, acute triangle, obtuse triangle, and finding its various important centers including centroid, in-center, circum -- enter and ortho-center.
6) Introduction of various circle and compass tools and practice of drawing construction of various geometric shapes including triangles, polygons, squares, rectangle ..etc.
7) Verification of important theorems of geometry, algebra and calculus using GeoGebra.
8) Drawing and measuring various geometric shape using angle, distance, area and slop tools from tool bar.
9) Introduction and usage of reflect, rotate and translate by a vector tools.
10) Introduction to the usage of slider and basic animation.

Notes :

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-6**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination (i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**

B.Sc. Semester 6
MATHEMATICS Paper No. 09 (B)
PRACTICAL: Numerical Analysis-2

OBJECTIVES

Students will

- use theoretical concept to solve given problems,.

COURSE OUTCOMES:

Students will be able to-

- solve given problems using Gauss forward interpolation formula.
- solve given problems using Gauss backward interpolation formula.
- solve given problems using Sterling's or Bessel's formula.
- solve given problems using Laplace-Everett's formula.
- solve given problems using Interpolation with unequal intervals.
- solve given problems using Numerical differentiation.
- solve given problems using Numerical integration.
- solve given problems using Taylor's or Picard's.
- solve given problems using Euler's method.
- solve given problems using Runge's method.
- solve given problems using Runge-Kutta's method.
- solve given problems using Milne's method.

B.Sc. Semester 6
MATHEMATICS Paper No. 09 (B)
PRACTICAL: Numerical Analysis-II
Effective from June – 2021

1) Gauss forward interpolation formula.
2) Gauss backward interpolation formula.
3) Sterling's or Bessel's formula
4) Laplace-Everett's formula
5) Interpolation with unequal intervals.
6) Numerical differentiation.
7) Numerical integration.
8) Taylor's or Picard's
9) Euler's method.
10) Runge's method
11) Runge-Kutta's method
12) Milne's method

Notes :

Journal and viva.

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-6**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination

  (i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**

B.Sc. Semester 6
MATHEMATICS Paper No. 10 (B)
PRACTICAL: OPTIMIZATION

OBJECTIVES

Students will

- use theoretical concept to solve given problems of optimization.

COURSE OUTCOMES:

Students will be able to-

- solve the given LPP using Graphical method.
- solve the given LPP using Simplex method.
- solve the given LPP using BIG -M method.
- solve the given LPP using TWO-PHASE method.
- obtain DUAL of the given Primal LPP.
- find the initial solution of given transportation problem using NWCM method.
- find the optimum solution of given transportation problem using LCM method.
- find the optimum solution of given transportation problem using VAM method.
- find the optimum solution of given transportation problem using MODI method.
- find the optimum solution of given assignment problem.

B.Sc. Semester 6
MATHEMATICS Paper No. 10 (B)
PRACTICAL: OPTIMIZATION
Effective from June – 2021

) Solve the given LPP using Graphical method.
2) Solve the given LPP using Simplex method.
3) Solve the given LPP using BIG -M method.
4) Solve the given LPP using TWO-PHASE method.
5) Obtain DUAL of the given Primal LPP;
6) Find the initial solution of given transportation problem using NWCM method.
7) Find the optimum solution of given transportation problem using LCM method.
8) Find the optimum solution of given transportation problem using VAM method.
9) Find the optimum solution of given transportation problem using MODI method.
10) Find the optimum solution of given assignment problem.

Journal and viva.

Notes :

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-6**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination

  (i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**