

**Syllabus**  
of  
**B.Tech.**  
in  
**Mathematics and Computing**



*Department of Engineering Mathematics and Computing*

**Madhav Institute of Technology & Science**  
**Gwalior-474005**

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

## Department of Engineering Mathematics and Computing

### B. Tech. (First Semester)

#### Introduction to Computing

(MAC-3250121)

L	T	P	C
3	0	0	3

#### Course Objectives:

- Explain the needs of hardware and software required for a computation task.
- State typical provisions of cyber law that govern the proper usage of Internet and computing resources.
- Explain the working of important application software and their use to perform any engineering activity.
- Demonstrate the use of Operating system commands and shell script

#### **Unit 1:**

Computer: Definition, Classification, Organization i.e. CPU, register, Instruction set, Memory & Storage Systems, I/O Devices, and System & Application Software. Operating System: Definition, Function, Types, Management of File, Process & Memory, Introduction to Assemblers, Interpreters, Compilers and Debuggers.

#### **Unit 2:**

Computer Networking: Introduction, Introduction to Internet, World Wide Web, E-commerce Computer Security Basics: Introduction to viruses, worms, malware, Trojans, Spyware and Anti-Spyware Software, Different types of attacks like Money Laundering, Information Theft, Email spoofing, Hacking Spamming, Cyber Defamation, phishing Security measures Firewall, Computer Ethics & Good Practices

#### **Unit 3:**

Data base Management System: Introduction, File oriented approach and Database approach, Data Models, Architecture of Database System, Data independence, Data dictionary, DBA, Primary Key, Data definition language and Manipulation Languages.

#### **Unit 4:**

A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin. Text Processing utilities and backup utilities , tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio

#### **Unit 5:**

Career opportunities Entrepreneurship, Start up: Scope, Funding Opportunities, Other career opportunities; Case Studies Success stories of Google, Facebook, Walmart, Uber etc. in socio-economic progress.

#### Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Explain core components of computing and linking
CO2	Explaining ideas of networking aspect of computer engineering and communication
CO3	Apply knowledge of database system
CO4	Summarizing role of operating system
CO5	Implementing the role of computing in real world applications

#### **RECOMMENDED BOOKS:**

1. J. Glenn Brookshear, and Dennis Brylow: Computer Science: An Overview, Pearson, 2010
2. V. Rajaraman, Neeharika and A Dabala: Fundamentals of Computers, PHI, 2011
3. Peter Norton, Introduction to Computers: McGraw Hill Education, 2<sup>nd</sup>, 2012
4. Pradeep Sinha: Introduction to Computer Science: A Textbook for Beginners in Informatics, BPB Publication, 6th Edition, 2015
5. Patt Yale: Introduction to Computing Systems, McGraw Hill Education Ind=ia, 2<sup>nd</sup>, 2014

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## Department of Engineering Mathematics and Computing

### B. Tech. (First Semester)

#### Computer Programming

(MAC – 3250122)

L	T	P	C
3	0	2	4

#### Course Objective:

- Develop ability to write a computer program to solve specified problems.
- Develop skills in algorithmic problem-solving, expressed in a programming language like C.
- Learn what computer science is about, especially hardware, data representations, algorithms, encodings, form of programming.
- Understand fundamentals of programming such as variables, conditional and iterative statement, function and its execution etc.

#### **Unit 1:**

Introduction to Programming, Machine Level Languages, Assembly Level Languages, High Level Languages, Program Execution and Translation Process, Problem solving using Algorithms and Flowcharts. Introduction to Programming: Data Types, Constants, Keywords, Operators & Expressions, Precedence of operators and input/output functions.

#### **Unit 2:**

Control Statements and Decision Making: The go to statement, The if statement, The if-else statement, Nesting of if statements, The conditional expression, The switch statement, The while loop, The do...while loop, The for loop, The nesting of for loops, The break and continue statement.

#### **Unit 3:**

Arrays, Strings & Pointers: One dimensional Arrays, Passing Arrays to Functions, Multidimensional Arrays, Strings, Basics of Pointers & Addresses, Pointer to Pointer, Pointer to Array, Array of Pointers, Types of pointers, Pointer to Strings.

#### **Unit 4:**

Functions & Structures: Function Basics, Function Prototypes, Passing Parameter by value and by reference, Passing string to function, Passing array to function, Function returning address, Recursion, Structures & Union, Pointer to Structure, Self-Referential Structures, Dynamic memory allocation by call of function, Storage Classes.

#### **Unit 5:**

File Handling: Defining and Opening a file, Closing Files, Input/output Operations on Files, Predefined Streams, Error Handling during I/O Operations, Command Line Arguments, Pre-processor, Directives, Formatted I/O.

#### Course Outcomes

CO's	Description of CO's
CO1	Recognizing the concept of programming Languages.
CO2	Testing the principles of imperative and structural programming.
CO3	Apply the concept of Arrays and Pointer in programming
CO4	Illustrate the problems and choose suitable programming techniques to develop solutions
CO5	Implementing input/ output operations and basic commands

#### **Reference Books**

1. E. Balagurusamy: Programming in ANSI C, Tata McGraw Hill,Sevenths Edition, 2017.
2. ReemaThareja: Programming in C, Oxford publication, Second Edition , 2016.
3. W. Kernighan and Dennis M. Ritchie: The C Programming Language, Pearson , 2015.
4. Matthias Felleisen, Robert BruceFindler , Mathew Flatt, ShriramKrishnamurthi: How to Design Programs: An Introduction to Programming and Computing, MIT Press,Second Edition, 2018.
5. E. Balagurusamy: Object Oriented Programming with C++, Tata McGraw Hill, 2009.
6. B.S. Gottfried: Programming with C, Tata McGraw Hill,3rd Edition, 2018.

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## Department of Engineering Mathematics and Computing

B. Tech. (First Semester)

Statistical Methods

(MAC -3250123)

L	T	P	C
3	1	0	4

### Course Objective

- To have knowledge of Data and Central Tendency
- To describe Concept of probability theory and distribution
- To familiarize Correlation and Regression
- To know about the Hypothesis analysis

### **Unit 1:**

Data: quantitative and qualitative, attributes, variables, scales of measurement nominal, ordinal, interval and ratio. Presentation: tabular and graphical, including histogram and ogive, Measures of Central Tendency, Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments and moment generating function, skewness and kurtosis.

### **Unit 2:**

Definition of Bivariate, Correlation and Regression analysis, rank of correlation, Coefficient of correlation, Principle of least squares and Curve fitting (polynomials and exponential curves).

### **Unit 3:**

Basic concept of Probability, Compound probability, Conditional Probability, Bayes' theorem, Definition of random variable, discrete and continuous random variables, functions of random variables, probability mass function and probability density function with illustrations, concepts of expectation, Probability distribution function, discrete and continuous Probability distribution, Binomial, Poisson, Normal, Exponential, uniform distribution

### **Unit 4:**

Sampling Theory, Methods of sampling, sampling distribution of a statistic, types of sampling, test of significance, Weak law of large numbers, Central Limit Theorem, Theory of estimation, types of estimation, interval estimation for large sampling, Maximum likelihood estimator

### **Unit 5:**

Testing of hypothesis, Null and alternative hypothesis, Chi-square  $\chi^2$  distribution, t-distribution, Fisher's Z-distribution, Analysis of variance.

### Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Determine the Central of tendency, Skewness and Kurtosis.
CO2	Interpret the theory of Probability
CO3	Evaluate the Probability distributions
CO4	Acquire the knowledge of correlation and regression analysis
CO5	Analyze the test of hypothesis.

### **Recommended Books:**

1. M Ray and H.S. Sharma:Mathematical Statistics, Ram Prasad Publications, 3<sup>rd</sup> Edition 2017.
2. V. K. Kapoor, S.C. Gupta: Statistical Methods, S. Chand& Company, 11<sup>th</sup> Edition 2018.
3. T. Veerarajan: Probability, Statistics and Random Processes, McGraw Hill, 3<sup>rd</sup> Edition 2008.
4. S. M. Rose: Introduction to Probability Models, Elsevier, 10<sup>th</sup> Edition 2011.

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## Department of Engineering Mathematics and Computing

**B. Tech. (First Semester)**

**Elements of Calculus**

**(MAC-3250124)**

L	T	P	C
3	1	0	4

### Objective of Course

- To understand the basic concepts of differential calculus
- To explore the applications of derivatives
- To familiarize the integral calculus
- To describe multiple integral
- To understand the concepts of Convergence and divergence

### **Unit 1:**

Maclaurin's and Taylor's theorem, Partial differentiation, Euler's theorem, Tangent and Normal, Maxima and Minima of one and two variables.

### **Unit 2:**

Jacobian, Rolle's Theorem, First mean value theorem, Second mean value theorem, Curvature, radius of curvature, Asymptotes of Cartesian and Polar forms.

### **Unit 3:**

Definite integral as limit of a sum, application in summation of series, Improper integral, Beta and Gamma function and its properties, some transformation of Beta function, some transformations of Gamma function, relation between Beta and Gamma function, Legendre's duplication formula.

### **Unit 4:**

Multiple integral and their applications, Double and Triple integral, Change of order of integration, Length of the curves, Volumes and Surfaces of solids of revolution.

### **Unit 5:**

Concept of convergence and divergence, Basic test of convergence for sequence and series, P-Series test, Ratio test, Comparison test, Integral test, Cauchy's root test, Test of convergence and divergence of improper integral.

### Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Applying various theorems to expand the functions of one and two variables.
CO2	Demonstrate the application of derivatives
CO3	Examine the various integrals
CO4	Evaluate the volume and area of surface by using multiple integrals
CO5	Summarising the various convergence test

### **Recommended Books:**

1. E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10<sup>th</sup> Edition (2011).
2. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt.Ltd, 5<sup>th</sup> Edition (2016).
3. F. B. Hildebrand: Advanced Calculus for application, Englewood Cliffs, N. J. Prentice- Hall, 2<sup>nd</sup> Edition (1980).
4. B. S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43<sup>rd</sup> Edition (2015).
5. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill, 1<sup>st</sup> Edition (2017).

## Department of Engineering Mathematics & Computing

B. Tech. (First Semester)

### Programming and Problem Solving (3250122)

#### Experiment List

1. C "Hello, World!" Program
2. C Program to Print an Integer (Entered by the User)
3. C Program to Add Two Integers
4. C Program to Multiply Two Floating-Point Numbers
5. C Program to Find ASCII Value of a Character
6. C Program to Compute Quotient and Remainder
7. C Program to Find the Size of int, float, double and char
8. C Program to Demonstrate the Working of Keyword long
9. C Program to Swap Two Numbers
10. C Program to Check Whether a Number is Even or Odd
11. C Program to Check Whether a Character is a Vowel or Consonant
12. C Program to Find the Largest Number Among Three Numbers
13. C Program to Find the Roots of a Quadratic Equation
14. C Program to Check Leap Year
15. C Program to Check Whether a Number is Positive or Negative
16. C Program to Check Whether a Character is an Alphabet or not
17. C Program to Calculate the Sum of Natural Numbers
18. C Program to Find Factorial of a Number
19. C Program to Generate Multiplication Table
20. C Program to Display Fibonacci Sequence
21. C Program to Find GCD of two Numbers
22. C Program to Find LCM of two Numbers
23. C Program to Display Characters from A to Z Using Loop
24. C Program to Count Number of Digits in an Integer
25. C Program to Reverse a Number
26. C Program to Calculate the Power of a Number
27. C Program to Check Whether a Number is Palindrome or Not
28. C Program to Check Whether a Number is Prime or Not
29. C Program to Display Prime Numbers Between Two Intervals
30. C Program to Check Armstrong Number
31. C Program to Display Armstrong Number Between Two Intervals
32. C Program to Display Factors of a Number
33. C Program to Make a Simple Calculator Using switch...case
34. C Program to Display Prime Numbers Between Intervals Using Function
35. C Program to Check Prime or Armstrong Number Using User-defined Function
36. C Program to Check Whether a Number can be Expressed as Sum of Two Prime Numbers
37. C Program to Find the Sum of Natural Numbers using Recursion
38. C Program to Find Factorial of a Number Using Recursion
39. C Program to Find G.C.D Using Recursion
40. C Program to Convert Binary Number to Decimal and vice-versa
41. C Program to Convert Octal Number to Decimal and vice-versa
42. C Program to Convert Binary Number to Octal and vice-versa

43. C Program to Reverse a Sentence Using Recursion
44. C program to calculate the power using recursion
45. C Program to Calculate Average Using Arrays
46. C Program to Find Largest Element in an Array
47. C Program to Calculate Standard Deviation
48. C Program to Add Two Matrices Using Multi-dimensional Arrays
49. C Program to Multiply Two Matrices Using Multi-dimensional Arrays
50. C Program to Find Transpose of a Matrix
51. C Program to Multiply two Matrices by Passing Matrix to a Function
52. C Program to Access Array Elements Using Pointer
53. C Program Swap Numbers in Cyclic Order Using Call by Reference
54. C Program to Find Largest Number Using Dynamic Memory Allocation
55. C Program to Find the Frequency of Characters in a String
56. C Program to Count the Number of Vowels, Consonants and so on
57. C Program to Remove all Characters in a String Except Alphabets
58. C Program to Find the Length of a String
59. C Program to Concatenate Two Strings
60. C Program to Copy String Without Using strcpy()
61. C Program to Sort Elements in Lexicographical Order (Dictionary Order)
62. C Program to Store Information of a Student Using Structure
63. C Program to Add Two Distances (in inch-feet system) using Structures
64. C Program to Add Two Complex Numbers by Passing Structure to a Function
65. C Program to Calculate Difference Between Two Time Periods
66. C Program to Store Information of Students Using Structure
67. C Program to Store Data in Structures Dynamically
68. C Program to Write a Sentence to a File
69. C Program to Read the First Line From a File
70. C Program to Display its own Source Code as Output
71. C Program to Print Pyramids and Patterns

## Skill Based Mini Projects

1. The mouse pointer can be restricted in particular rectangle. The idea is to create a function called **restrictmouse()** which takes four parameters which containing X coordinate and Y coordinate. First point mention the top of the rectangle and the second point mention the bottom of the rectangle. Below are the functions used for the same:

- **initmouse()**: use to initialize mouse.
- **showmouse()**: shows the mouse pointer on the output screen.
- **restrictmouse()**: used to set Horizontal and vertical limit of the mouse pointer by setting the following parameters. **AX = 7** for horizontal and **AY = 8** for vertical.

2. This following program makes use of some sub function, which were already discussed previously, and shows how they can be used to write useful programs like free-hand drawing. Below are the functions used:

- **initmouse()**: use to initialize mouse.
- **showmouse()**: shows mouse pointer on the output screen.
- **hidemouse()**: used to hide mouse while drawing.
- **getmouseposition()**: Fetches current location of the pointer and draw line accordingly.

**3. (The Sieve of Eratosthenes)** A prime integer is any integer greater than 1 that can be divided evenly only by

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itself and 1. The Sieve of Eratosthenes is a method of finding prime numbers. It works as follows:

a) Create an array with all elements initialized to 1 (true). Array elements with prime subscripts will remain 1. All other array elements will eventually be set to zero.

b) Starting with array subscript 2 (subscript 1 is not prime), every time an array element is found whose value is 1, loop through the remainder of the array and set to zero every element whose subscript is a multiple of the subscript for the element with value 1. For array subscript 2, all elements beyond 2 in the array that are multiples of 2 will be set to zero (subscripts 4, 6, 8, 10, and so on.). For array subscript 3, all elements beyond 3 in the array that are multiples of 3 will be set to zero (subscripts 6, 9, 12, 15, and so on.).

When this process is complete, the array elements that are still set to 1 indicate that the subscript is a prime number. Write a program that uses an array of 1000 elements to determine and print the prime numbers between 1 and 999. Ignore element 0 of the array.

**4. (Airline Reservations System)** A small airline has just purchased a computer for its new automated reservations system. The president has asked you to program the new system. You'll write a program to assign seats on each flight of the airline's only plane (capacity: 10 seats). Your program should display the following menu of alternatives:

Please type 1 for "first class"

Please type 2 for "economy"

If the person types 1, then your program should assign a seat in the first class section (seats 1–5). If the person types 2, then your program should assign a seat in the economy section (seats 6–10). Your program should then print a boarding pass indicating the person's seat number and whether it's in the first class or economy section of the plane.

Use a single-subscripted array to represent the seating chart of the plane. Initialize all the elements of the array to 0 to indicate that all seats are empty. As each seat is assigned, set the corresponding element of the array to 1 to indicate that the seat is no longer available.

Your program should, of course, never assign a seat that has already been assigned. When the first class section is full, your program should ask the person if it's acceptable to be placed in the economy section (and vice versa). If yes, then make the appropriate seat assignment. If no, then print the message "Next flight leaves in 3 hours."

**5. (Total Sales)** Use a double-subscripted array to solve the following problem. A company has four salespeople (1 to 4) who sell five different products (1 to 5). Once a day, each salesperson passes in a slip for each different type of product sold. Each slip contains:

a) The salesperson number

b) The product number

c) The total dollar value of that product sold that day

Thus, each salesperson passes in between 0 and 5 sales slips per day. Assume that the information from all of the slips for last month is available. Write a program that will read all this information for last month's sales and summarize the total sales by salesperson by product. All totals should be stored in the double-subscripted array sales. After processing all the information for last month, print the results in tabular format with each of the columns representing a particular salesperson and each of the rows representing a particular product. Cross total each row to get the total sales of each product for last month; cross total each column to get the total sales by salesperson for last month. Your tabular printout should include these cross totals to the right of the totaled rows and to the bottom of the totaled columns.



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## Department of Engineering Mathematics and Computing

### B. Tech. (First Semester)

### Digital Logic Design

(MAC-250125)

L	T	P	C
3	0	0	3

## COURSE OBJECTIVES

- To understand the fundamental operating components of Digital Computers.
- To learn various number systems, boolean algebra employed in digital computers.
- To understand the concepts of counters, latches and flip-flops.

### Unit I

Introduction to Digital Electronics, Needs and Significance, Different Number System: Binary Numbers, Octal and Hexadecimal Numbers, Conversions, Complement's, Signed Binary Numbers, Binary Arithmetic's, Binary Codes: BCD, ASCII Codes.

### Unit II

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Boolean Relations, Digital Logic Gates, De Morgan's Theorem, Karnaugh Maps and simplifications.

### Unit III

Combinational Circuits, Half Adder, Full Adder, Binary Adder-Subtractor, Binary Multiplier, Comparator, Decoders, Encoders, Multiplexers. Programmable Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL).

### Unit IV

Sequential Circuits, Latches, Flip-Flops: RS Latches, Level Clocking, D Latches, Edge-triggered D Flip-flop, Edge-triggered JK Flip-flop, JK Master-slave Flip-flop; Registers, Shift Registers, Counters, Ripple Counters, Synchronous Counters.

### Unit V

Introduction to Memory, Memory Decoding, Error Detection and Correction, Sequential (or simple) programmable logic device (SPLD), Complex programmable logic device (CPLD), Field-programmable gate array (FPGA), Digital Logic Design: RTL and DTL Circuits, TTL, ECL, MOS, CMOS, Application Specific Integrated Circuits.

## RECOMMENDED BOOKS

- Digital Design, Morris Mano M. and Michael D. Ciletti, IV Edition, Pearson Education.