

**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY**



**CIRCULAR NO.SU/B.Sc./31/2022**

It is hereby inform to all concerned that, the syllabi prepared by the Ad-hoc Board and recommended by the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted the **following revised syllabi of Bachelor of Science Degrees with Regulation under the scheme of Choice Based Credit & Grading System** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith. Earlier published syllabus vide circular dtd. 19.09.2022 is stand cancelled.


Sr.No.	Courses	Semester
1.	<b>B.Sc. Information Technology (Degree)</b>	<b>Ist semester</b>
2.	<b>B.Sc. Computer Science (Degree)</b>	<b>Ist semester</b>
3.	<b>B.C.A.(Science) (Degree)</b>	<b>Ist semester</b>

This is effective from the Academic Year 2022-23 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,  
Aurangabad-431 004.  
REF.NO.SU/2022/12788-89  
Date:- 19.10.2022.

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**Deputy Registrar**  
**Academic (Syllabus)**

**Copy forwarded with compliments to :-**

- 1] **The Principal of all concerned Colleges,**  
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

**Copy to :-**

- 1] **The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.**
- 2] The Section Officer,[B.Sc.Unit] Examination Branch,Dr.BAMU,A'bad.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
- 6] The Public Relation Officer, Dr.BAMU,A'bad.
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**Dr. Babasaheb Ambedkar Marathwada University**  
Aurangabad- 431004( MS) India



**Three Year Undergraduate Bachelor Degree Program**  
**In Science and Technology**

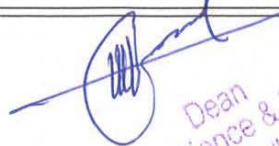
**B. Sc. (Computer Science)**

**Curriculum Structure and Scheme of**  
**Examination**

**Choice Based Credit System**

(Effective from Academic Year 2022-23)

**Dr. Babasaheb Ambedkar Marathwada University**  
Aurangabad – 431004 (MS) India

  
Dean  
Faculty of Science & Technology  
Dr. Babasaheb Ambedkar Marathwada  
University, Aurangabad



## Pattern of Question Paper (Theory)

B.Sc. (Computer Science) Semester -----

Course Code -----

Paper Number -----

Title of Paper -----

Time : 1.30 Hrs.

Max Marks: 40

**N.B.**

1. Attempt All Questions.
2. All questions carry equal marks.
3. Illustrate your answer with suitable labelled diagram.

Q.1. Multiple choice questions / Fill In the Blanks / Terms / Definition / One Line

Answer questions.

(10 Marks)

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)

Q.2. Long answer question.

(10 Marks)

OR

Long Answer question

Q.3. Long answer question

(10 Marks)

OR

Short answer questions

- a)
- b)

Q.4. Short Notes on any TWO of the following:-

(10 Marks)

- a)
- b)
- c)
- d)

*Bhaskar*

## Pattern of Question Paper(Practical)

B.Sc. (Computer Science) Semester -I and II

Course Code -----

Paper Number -----

Title Of Paper -----

Time : 3:00 Hrs.

Max Marks : 100 (UA:80+IA:20)

**I.B.**

- . Attempt All Questions.
- . All questions carry equal marks.
- . Illustrate your answer with suitable labelled diagram

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### Section A

)1 Experiment based on CS-123 P (50 Marks)

- a) Question / Experiment– 35 Marks
- b) Viva / Oral – 05 Marks
- c) Internal Evaluation : 07 Marks
- d) Record book : 03 Marks

### Section B

)2 Experiment based on CS-223 P (50 Marks)

- e) Question / Experiment– 35 Marks
- f) Viva / Oral – 05 Marks
- g) Internal Evaluation : 07 Marks
- h) Record book : 03 Marks

*Bhakt*

**Dr. Babasaheb Ambedkar Marathwada University, Aurangabad**

Choice Based Credit System (CBCS) Curriculum

For

Faculty of Science and Technology

Course Structure (First Year)

**B. Sc. (Computer Science) Science Three Year Undergraduate Degree Program**

**First Year**

Course Type	Semester - I		Course Type	Semester - II	
	Name of Paper	Credit		Name of Paper	Credit
<b>Core Course I DSC-1A</b> 5.5	Computer Fundamentals	2	<b>Core Course IV DSC-1B</b> 5.5	Data Structure	2
	Digital Electronics	2		8086 Microprocessor	2
	Lab Course	1.5		Lab Course	1.5
<b>Core Course II DSC-2A</b> 5.5	Operating System-I	2	<b>Core Course V DSC-2B</b> 5.5	Operating System-II	2
	Programming in C	2		Advanced Programming in C	2
	Lab Course	1.5		Lab Course	1.5
<b>Core Course III DSC-3A</b> 5.5	Mathematical Foundation M-1	2	<b>Core Course VI DSC-3B</b> 5.5	Numerical Methods-M-2	2
	Programming Methodology	2		Database Management System	2
	Lab Course	1.5		Lab Course	1.5
<b>Ability Enhancement Compulsory Courses (AECC), 01 Course, 3 credit each)</b>	English Communication Skills (Linguistic Approach)	3	<b>Ability Enhancement Compulsory Courses (AECC), 01 Course 3, credit each )</b>	English Communication Skills (Soft Skill Development)	3
	Marathi/Hindi/Urdu/Arabic	3		Marathi/Hindi/Urdu/Arabic	3
<b>Non-Credit Course</b>	-----	----	<b>Non-Credit Course</b>	Constitution of India	--
<b>Total Credit</b>	<b>22.5</b>			<b>22.5</b>	

*Bhate*

Structure and Curriculum for  
Bachelor of Science (B.Sc.) Computer Science  
(Choice Based Credit System)  
**Dr. Babasaheb Ambedkar Marathwada University, Aurangabad**  
Choice Based Credit System (CBCS) Curriculum  
For  
Faculty of Science and Technology  
Course Structure and Scheme of Examination  
B. Sc. (Computer Science) Three Year Under Graduate Degree Program

**Semester-I**

Course Type	Course Code	Course Title	Total Periods (Teaching Periods / Week)	Credits	Scheme of Examination			
					UA	IA	Max Marks	Min Marks
<b>Core Course I (DSC-1A)</b>	CS-111T	Computer Fundamentals	45 (3/per week)	2	40	10	50	20
	CS-112T	Digital Electronics	45 (3/per week)	2	40	10	50	20
	CS-121P	Lab Course (based on CS- 111T and CS-112T)	45 (3/per week)	1.5	40	10	50	20
<b>Core Course II (DSC-2A)</b>	CS-113T	Operating System-I	45 (3/per week)	2	40	10	50	20
	CS 114T	Programming in C	45 (3/per week)	2	40	10	50	20
	CS-122P	Lab Course (based on CS- 113T and CS-114T)	45 (3/per week)	1.5	40	10	50	20
<b>Core Course III (DSC-3A)</b>	CS-115T	Mathematical Foundation	45 (3/per week)	2	40	10	50	20
	CS-116T	Programming Methodology	45 (3/per week)	2	40	10	50	20
	CS-123P	Lab Course (based on CS- 115T and CS-116T)	45 (3/per week)	1.5	40	10	50	20
Ability Enhancement Compulsory Courses (AECC-I)	CS-131T	English communication Skills(linguistic Approach)	45 (5/per week)	3	40	10	50	20
	CS-132T	Marathi/Hindi/Urdu/ Arabic	45 (4/per week)	3	40	10	50	20
Non Credit Course								
<b>36 Period Per week</b>				<b>22.5</b>	<b>440</b>	<b>110</b>	<b>550</b>	<b>220</b>
<b>*DCS – discipline Specific core courses Total Credit for Semester I : 22.5 (Theory : 18 : Laboratory : 4.5)</b>								

Structure and Curriculum for  
Bachelor of Science (B.Sc.) Computer Science  
(Choice Based Credit System)

**Dr. Babasaheb Ambedkar Marathwada University, Aurangabad**

**Choice Based Credit System (CBCS) Curriculum**

**For**

**Faculty of Science and Technology**

**Course Structure and Scheme of Examination**

**B. Sc. (Computer Science) Three Year Under Graduate Degree Program**

**Semester-II**

Course Type	Course Code	Course Title	Total Periods (Teaching Periods / Week)	Credits	Scheme of Examination			
					UA	IA	Max Marks	Min Marks
<b>Core Course IV  (DSC-I B)</b>	CS-211T	Data Structure	45 (3/per week)	2	40	10	50	20
	CS-212T	8086 Microprocessor	45 (3/per week)	2	40	10	50	20
	CS-221P	Lab Course (based on CS-211T and CS-212T)	45 (3/per week)	1.5	40	10	50	20
<b>Core Course V  (DSC-II B)</b>	CS-213T	Operating System- II	45 (3/per week)	2	40	10	50	20
	CS-214T	Advanced Programming in C	45 (3/per week)	2	40	10	50	20
	CS-222P	Lab Course (based on CS-213T and CS-214T)	45 (3/per week)	1.5	40	10	50	20
<b>Core Course VI  (DSC-III B)</b>	CS-215T	Numerical Methods M-2	45 (3/per week)	2	40	10	50	20
	CS-216T	Database Management System	45 (3/per week)	2	40	10	50	20
	CS-223P	Lab Course (based on CS-215T and CS-216T)	45 (3/per week)	1.5	40	10	50	20
Ability Enhancement Compulsory Courses (AECC - 2)	CS-231T	English Communication Skills(Soft Skill Development)	45 (5/per week)	3	40	10	50	20
	CS-232T	Marathi/Hindi/Urdu/Arabic	45 (4/per week)	3	40	10	50	20
Non Credit Course	CS-261T	Constitution of India	45 (3/per week)	2*				
			<b>36 Period Per week</b>	<b>22.5</b>	<b>440</b>	<b>110</b>	<b>550</b>	<b>220</b>

\*DCS – discipline Specific core courses **Total Credit for Semester I : 22.5 (Theory : 18 : Laboratory : 4.5)**



# B.Sc. (Computer Science)

## Semester - I

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# Curriculum for semester I

**Coursecode:CS-111 T Course Title:ComputerFundamentals**

Total Credit: 2 Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

## **Prerequisites:**

There are no prerequisites required for attending this course.

## **Learning objects**

To impart basic introduction to computer hardware, components, computer number system. How the CPU works, fundamental about algorithms and flowchart as well as different types of software.

## **Learning outcomes**

- Students who complete this course successfully will acquire:
- Knowledge of computer fundamental, CPU and its functionalities.
- Understanding of block diagram of hardware peripherals.
- Understanding the concepts of software and its types.
- Understanding the number of system and its conversion between different numbers of systems.
- Understanding the computer based application such as email and video conferencing.

## **Course Outline**

### **UNIT – 1**

#### **1. Fundamentals of Computer System**

- Characteristics & features of Computers.
- Components of Computers.
- Organization of Computer.

#### **2. Computer Generation & Classification**

- Generation of Computers : First to Fifth
- Classification of Computers : Distributed & Parallel computers

### **UNIT – II.**

#### **3. Computer Memory**

- Memory Cell & Organization
- Types of Memory (Primary And Secondary) : RAM , ROM , PROM , EPROM, advantages and disadvantages of each.
- Secondary Storage Devices ( FD, CD, HD, Pen drive, DVD, Tape Drive, DAT )

#### **4. I/O Devices**

- Input Devices : Touch screen , OMR, OBR , OCR, Light pen, Scanners
- Output Devices: Digitizers, Plotters, LCD, Plasma Display, Printers

#### **UNIT – III**

##### **5. Processor**

- Structure of Instruction , Description of Processor , Processor Features
- RISC & CISC

#### **UNIT – IV**

##### **6. Internet, World Wide Web:**

Introduction to Internet, Internet Access, Internet Basics, Protocols-TCP/IP, HTTP, FTP, Addressing, World Wide Web (WWW), Web Pages & HTML, Web browsers, Searching for information-search engines. Internet chat. Applications of Internet. Advantages and Disadvantages of Internet.

#### **UNIT – V Test and Tutorial**

##### **Text Books:**

1. Fundamentals of Information Technology; By Chetan Srivastava, Kalyani Publishers
2. Fundamentals of Computers: By V. Rajaraman, PHI Publication , IVth Edition.
3. Fundamentals of Programming: By Raj K. Jain, S. Chand Publication

##### **Reference Books:**

1. Computer Fundamental By B. Ram, BPB Publication.

**Course code : CS-112 T      Course Title : DigitalElectronics**

Total Credit: 2

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

### **UNIT – 1**

#### **1. Number Systems and Arithmetic**

- Number System : Decimal , Octal , Hexadecimal & Binary Number System
- Conversion within Binary, Octal, Hexadecimal & Decimal Number System.
- Binary Arithmetic : Binary addition, subtraction, multiplication & division
- Binary subtraction using 1' complement, 2's complement method.
- Hexadecimal arithmetic: Addition, subtraction, multiplication & division

#### **2. Boolean Algebra and Logic Gates**

- Postulates of Boolean Algebra
- Theorems of Boolean Algebra: Complementation , commutative, AND, OR, Associative, Distributive, Absorption laws , De morgan's theorems
- Reducing Boolean expressions
- Logic Gates : AND, OR, NOT, Ex-OR, Ex-NOR
- NAND as Universal building block
- Logic diagrams of Boolean expressions Boolean expressions for logic diagrams
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### **Unit – II**

#### **3. Minimization Techniques**

- Introduction , Minterms and Maxterms
- K-Map, K-map for 2 variables
- K-map for 3 variables
- K-map for 4 variables

#### **4. Combinational and Arithmetic Logic Circuits**

- Half Adder & Full Adder
- Binary parallel Adder
- Half Subtractor, Full Subtractor
- Adder/Subtractor in 2's complement system
- BCD to Decimal decoder
- 2 : 4 demultiplexer
- 4 line to 1 line multiplexer

### **Unit – III**

#### **5. FlipFlops**

- Introduction : RS FF
- Clocked RS FF, D FF
- Triggering, preset and clear
- JK FF , T FF , Race around condition
- Master slave FF

## 6. Counters

- Introduction : Asynchronous/ ripple counter
- Modulus Counter , MOD-12 counter
- Synchronous counter : Synchronous serial & synch parallel counter
- BCD counter
- Ring counter

### UNIT – V Test and Tutorial

## 7. ShiftRegisters

- Introduction, Buffer register
- Serial- in serial -out Serial-in parallel-out
- Parallel-in serial-out, parallel-in parallel-out

### UNIT – V Test and Tutorial

#### Text Book:

- 1.DigitalElectronicsandMicro-Computers–R.K.Gaur , Dhanpat Rai Publication

#### Reference Book:

- 1.DigitalElectronicsandLogicDesign– N.G.Palan,TechnovaPublication

**Course Code : CS-113 T**

**Course Title : Operating System I**

Total Credit: 2      Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

### **Prerequisites:**

There are no prerequisites for attending this course.

### **Learning Objectives**

- To introduce students the basic functioning of operating systems as resource manager and its salient features.
- To acquaint students about Process States, CPU Scheduling, Inter Process Communication, Synchronization, Deadlocks.

### **Learning Outcomes**

Upon successful completion of the course, the students will:

- Gain knowledge of System Software, Program and Process.
- Understand Types of Operating System, Basic functions of O.S. and Evolution of O.S.
- Understand the concept of Process, Process Control Block and Threads.
- Understand the CPU scheduling Non-Pre-emptive and Pre-emptive Scheduling algorithms
- Understand the concept of Synchronization and Deadlock.

### **Course Outline**

#### **Unit I: Introduction to Operating System:**

**Introduction to Software:** Definition, Classification of software, Operating system as the main component of system software, Program and Process.

**Operating System Fundamental :** O.S. as a resource manager, Structure of O.S., Types of O.S.- Single user and multiuser O.S., Basic functions of O.S., Characteristics of modern O.S.**Evolution of O.S. :** Early systems, Simple batch systems, Multiprogramming batch systems, Time sharing system, Operating system for Personal Computers, workstations and Hand held devices, Parallel systems, Distributed systems, Real time systems, Advantages and Disadvantages of each system.

#### **Unit II: Process Management:**

**Concept of Process:** Process States, Process Control Block, Operations on Processes, Threads.

**CPU Scheduling:** Types of schedulers, Criteria for scheduling, Non-Pre-emptive Scheduling Algorithms – First-come First-served Scheduling and Shortest Job First Scheduling, Pre-emptive Scheduling Algorithms- Priority Scheduling, Round Robin.

#### **Unit III: Inter Process Communication and Synchronization:**

Concurrent and dependent process, need for synchronization, introduction of Critical Section and Semaphores, method of inter process communication, process synchronization, synchronization problem.

#### **UNIT – IV**

**Deadlocks** :Concept of Deadlock, Deadlock Modeling, Methods for Handling Deadlock. Memory management.

#### **UNIT – V Test and Tutorial**

##### **Reference Books:**

1. “Operating System”, By S.R. Sathe & Anil S. Mokhade, MacMillan Publication.
2. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
3. A.S. Tanenbaum, Modern Operating System, 3rd Edition, Pearson Education 2007.
4. G. Nutt, Operating System: A Modern Perspective, 2nd Edition Pearson Edition 1997.
5. W. Stallings, Operating Systems, Internals & Design Principles 2008 5th Edition, Prentice Hall of India.
6. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

**Course code: CS-114 T**

**Course Title: Programming in C**

Total Credit: 2    Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

## UNIT – I

### 1. Introduction:

- An Overview of C , History of C language, C as a Structured Language, Features of C.

### 2. Basic Elements & Operators

- Character set, C Token, Identifier & Keywords, Variables
- Constant and its types. Integer constant, floating point constant, character constant, string constants.
- Operators: Arithmetic, Relational, Logical, Unary operators: Increment & decrement Assignment and Conditional operator.
- Precedence & Associativity of Operators

### 3. Data Types

- Data Types: *int, char, float, double*. Declaration & Initialization.
- Type modifier: long, short, signed & unsigned

## UNIT – II

### 4. C Program & I/O statements

- Structure of C Program, Compilation & Execution of C program
- I/O: Introduction, Formatted Input/Output function: *scanf & printf*, Escape sequence characters.
- Library functions: General & Maths.

## UNIT – III

### 5. Control and Iterative Statements:

- Simple if, nested if, if-else, else if ladder
- Switch-case statement
- The conditional expression (? : operator)
- while and do-while loop, and for loop
- break & continue statement, goto statement

## UNIT – IV

### 6. Arrays:

- Introduction, Declaration and initialization Accessing array elements, Memory representation of array.
- One dimension and multidimensional arrays, character array, Introduction to string.

## UNIT – V Test and Tutorial

### Text Books::

1. Let us C : Y.P. Kanetkar [bpb publication]
2. Programming in C : E. Balaburuswamy [Tata macgraw hill]

3. Programming in C : Goterfried [Shaums' Series]

**Reference Books:**

1. Spirit of "C" : Moolish Kooper.

**Course code : CS-115 T Course Title : Mathematical Foundation**

Total Credit: 2

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

**Prerequisites:**

Basic understanding of mathematical concepts (School or Junior College).

**Learning Objectives**

To expose the students to the following:

- Propositional function, statements, well-formed formulas.
- Set theory concepts like Finite Set, Subset, Empty Set and operations on set.
- Matrices and its various types.
- Binary relations, posets, Functions, and pigeonhole principle.
- Algebraic structures like groups and elementary combinatorics.
- Various concepts in graphs and trees like its representation and its types.

**Learning Outcomes**

After successful completion of course the student should be able to

- Know how to represent various statements using set, relations, functions, permutations and combinations, groups, graphs and trees
- Use logical notations to formulate and reason about fundamental mathematical concepts such as sets, relations, functions and algebraic structures.
- Analyse the growth of functions and real-world problems using various concepts like recurrence relations, graph implementation etc.
- Apply mathematical logic to solve problems, pigeonhole principle to solve real time problems,
- Model and solve real world problems using graphs and trees.

**Course Outline**

**Unit I: Mathematical Logic:**

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Normal Forms.

**Set Theory:**

Types of Set: Finite, Infinite, Singleton, Empty, Subset, Proper Subset, Universal Set, Power Set, Venn Diagram, Operations on Set: Union of Sets, Intersection of Sets, Complement of Set, Cartesian Product, Difference and Symmetric Difference of Set.

**Introduction to Matrices:** Types of Matrices, Matrix, Operations, Adjoint and Inverse of a Matrix, Rank of a Matrix and Special Matrices.

**Unit II Combination:**

B. Sc. Comp. Sci.



Review of Permutation and Combination, Mathematical Induction - Pigeon hole principle, Principle of Inclusion and Exclusion, generating function, Recurrence relations.

### **Unit III: Basics of Graph Theory and Tree:**

Introduction to Graph, Application of Graph, Finite and Infinite Graph, Incidence and Degree, Null Graph, Isolated and Pendent Vertex, Isomorphism, Subgraph, Walks, Path and Circuit, Union and Intersection Operation. Graph, Planner Graph, Trees, Pendant Vertices on Tree, Binary Tree, Spanning Tree.

### **UNIT – IV**

#### **Relation:**

Basic definitions of Relation and types of Relations, Graph of Relations, Properties of Binary Relations, Matrix Representation of Relations, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations.

### **UNIT – V Test and Tutorial**

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#### **Text Books:**

1. Elements of Discrete Mathematics-A Computer Oriented Approach C. L Liu, D.P. Mohapatra, 3rd edition Tata McGraw Hill.
2. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill
3. Foundations of Computer Science, A. Aho and J. Ullman- W. H. Freeman, 1992.
4. Discrete Mathematics-Dr. Bembalkar

#### **Reference Books:**

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernard Kolman, Robert C. Busby, Sharon Cutter Ross, Pearson Education/PHI.
3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

**Course code : CS-116 T Course Title : Programming Methodology**

Total Credit: 2 Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

**Prerequisites:**

There are no prerequisites for attending this course.

**Learning Objectives**

- Learn to develop simple algorithms and flow charts to solve a problem.
- Develop problem solving skills coupled with top down design principles.
- Learn about the strategies of writing efficient and well-structured computer algorithms/programs.
- Develop the skills for formulating iterative solutions to a problem.

**Learning Outcomes**

- Learn the History and types of Programming.
- Learn various approach of writing program.
- Learn to develop simple algorithms and flow charts to solve a problem.

**Unit I Introduction to Programming Environment**

Introduction to Programming, Definition of program and programmer, features of good programming language, Bugs and Debugging,

**Programming Techniques**

Programming approaches: Types of programming methodologies, Procedural Programming, Functional Programming, Structural Programming, Modular Designing, Logical Programming -Top Down Designing, Bottom Up Designing, Object Oriented Programming

**Unit II Programming Languages**

History of languages, Classification of computer language: Types of Programming Languages- Machine Languages , Assembly Languages, High Level Languages, low level language, Structure Language, Object oriented Language, Modular techniques, Modular Programming – advantages, identifying the modules, step-by-step solution, control structures, decision control structures, selection control structures, loop control structures, 4GL, Assembler, Linker, Loader, Interpreter & Compiler, TASM, Debug

**Unit III Algorithm**

Definition, Characteristics , Advantages and disadvantages, Pseudocode or Structured English, Algorithm, basic features and properties of algorithm.

## **UNIT – IV**

### **Flow-Chart**

Definition, Principles of flowcharting, Flowcharting symbols, Data flow diagram, pseudocode. converting algorithms to flowcharts, problem solving through algorithm and flowchart. Advantages and disadvantages.

## **UNIT – V Test and Tutorial**

### **Books :**

1. Fundamentals of Computer V. Rajaraman
2. Programming Logic and Design, Comprehensive By Joyce Farrell
3. Problem Solving and Program Design in C, J. R. Hanly and E. B. Koffman, Pearson, 2015.

**Course code : CS-131 T      Course Title : English Communication Skill**  
(linguistic approach)

Total Credit: 3      Marks: 50 (UA: 40 + IA: 10)

Periods: 5 per week (50 Minutes each)

**Prerequisites:**

There are no prerequisites for attending this course.

**Learning Objectives**

- Learn fundamentals of Parts of Speech.
- Detailed study of Spellings, Silent letters and Articles.
- Learn Auxiliary verbs, Subject and Object and how to make Questions and Question tags.
- Addressing the Greetings and giving directions.
- To enhance the vocabulary-building, word formation, Synonyms & Antonyms, One-word substitutes and Phrasal verbs.
- To improve listening, oral and reading skills

**Learning Outcomes**

Upon successful completion of the course, the students will be able to:

- Understand the different styles of communication.
- Understand the effective speaking skills and develops effective reading comprehensions.
- Understand how to write a good personal profile and improve one's presentation skills.
- Develop good writing skills.

**Course Outline**

**Unit I: Basics of Communication Skill:**

**Communication Skills:** Introduction, Definition, Nature and Scope of Communication, an Importance and Purpose of Communication, 'C's of good communication, Process of Communication. **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers **Communication Network in Organization:** Personal Communication, Internal Operational Communication, External Operational Communication, Horizontal (Lateral) Communication, Vertical (Downward) Communication, Vertical (Upward) Communication.

**English Grammar:**

**Parts of Speech:** Nouns, Pronouns, Verbs, Adverbs, Adjectives, Conjunctives, Prepositions, Interjections. Using the **Dictionary:** Primary Auxiliaries, Modal Auxiliaries, Subject and Object (Direct/Indirect), Yes or No Questions, Wh-word Questions, Question Tags. **Grammar:** Type of Verbs, Subject- Verb Agreement, Tense (present and past) and Aspect, several possibilities for denoting future Time, vocabulary building, constructing paragraphs

## **Unit II: Elements of Communication & Listening Skills:**

**Elements of Communication:** Introduction, Face to Face Communication – Tone of voice, Body Language (Non-Verbal Communication), Verbal Communication, Physical Communication. **Listening Skills-I:** Introduction, Listening to Conversation (Formal and Informal), Active Listening, Benefits of Listening Skill, Barriers to Listening, Listening to Announcements (Railway stations/Bus stations/ Airports/ Sports Announcements/ Commentaries etc.) **Listening Skills-II:** Academic Listening (Listening to Lectures), Listening to Talks and Presentations, Note Taking Tips.

## **UNIT – III Oral Communication Skills:**

Importance of Spoken English, Status of Spoken English in India, International Phonetic Alphabet (IPA) Symbols, Spelling and Pronunciation, Requesting and responding to requests, Congratulating people on their success, Expressing condolences, Apologizing and forgiving, Giving instructions, Seeking and giving permission, Expressing Opinions (likes and dislikes), Demanding Explanations, Asking for and giving advice and suggestions.

**Reading Skills:** Purpose, Process, Methodologies, Skimming and Scanning, Levels of Reading, Reading Comprehension.

## **Unit IV: Effective Writing Skills:**

Elements of Effective Writing, Sentences, Phrases and Clauses, Types of Sentences. Main Forms of Written Communication, Paragraph Writing (Linkage and Cohesion), Letter Writing (Formal and Informal), Essay Writing, Notices, Summarizing, Precise Writing, Note-Making, Amount of Discussion Required Understanding and Applying Vocabulary: Words Often Confused-Pairs of words, One Word Substitutes, Synonyms and Antonyms, Word Formation: Prefixes, Bases and Suffixes (Derivational & Inflectional).

## **UNIT – V Test and Tutorial**

### **Reference Books:**

1. **Basic communication skills for Technology**, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. **Communication skills**, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011
3. **Organizational Behaviour**, Stephen.P. Robbins, 1st Edition, Pearson, 2013
4. **Brilliant- Communication skills**, Gill Hasson, 1st Edition, Pearson Life, 2011
5. **Business Communication**, By Urmila Rai & S.M. Rai. Himalaya Pub
6. **Business Communication** Anjali Ghanekar
7. **Anderson, Kenneth**. Joan Maclean and Tony Lynch. Study Speaking: A Course in Spoken English for Academic Purposes. Cambridge: CUP, 2004.

**Course code : CS-121 P**      **Course Title :** Practical based on CS-111T and CS-112 T

Total Credit: 1.5

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

Sample List of experiments to be carried out based on the course **CS-111T**.

1. Prepare a report based on computer component such as monitor, printer, CPU, Pen drive, CD –ROM , Hard Disk.
2. Create a partition of computer drive creation, formatting the drive and deleting the partition.
3. Create a user and password of computer user and Reset a computer password using CMOS battery.
4. Practical on office word tool as a creation, edit, insertion of table in the new word file.
5. Practical based on Ms-Excel for creation of student data with name, marks, roll no for sorting and mark sheet creation.
6. Perform practical of DOS internal commands. DIR, TYPE, DEL, MD, CD, COPY, RMDIR, VER, DATE, TIME, CLS EXIT.
7. Write a comparative report of different web browser such as opera, Microsoft edge, chrome and Mozilla Firefox.
8. Create an IP setting and home network setting for the computer.
9. Connect internet using wifi for a computer.
10. Create an email account based on Gmail and send the email using the parameter as CC, BCC and schedule send option.
11. Practical based on online meeting using zoom, Google meet and Skype
12. Practical based on remote desktop using any desk software.

Sample List of experiments to be carried out based on the course **CS-112T**.

13. Study and Testing of measuring instruments: Digital and Analog multimeters, CROs and Signal Generators – measurement of AC & DC voltages, measurement of frequency.
14. Study of Components: Identification and testing of resistors, capacitors, inductors, diodes, LEDs & transistors
15. Study of Logic Gates: Study of truth table of basic gates, realization of Boolean functions
16. Study of Half adder and Full Adder
17. Study of Half Subtractor and Full Subtractor
18. Study of Implementation of a 3:8 decoder,
19. Study of 4-line to 16 bit decoder
20. Study of BCD to 7-segment decoder
21. Study of Generating a Boolean expression with a multiplexer

22. Study of Clocked JK Flip Flop
23. Study of 4-bit ripple counter
24. Study of Parallel-in, serial-out, 4-bit shift register

**Course code : CS-122 P**      **Course Title :** Practical based on CS-113 T and CS-114 T

Total Credit: 1.5

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

Sample List of experiments to be carried out based on the course **CS-113T**.

Note : Implement any three programs from each unit.

Suggestive program list.

1. Write a program to implement scheduling algorithm FCFS.
2. Write a program to accept list of processes arrival time display Giant Chart for FCFS.
3. Write a program to implement SJF Scheduling.
4. Write a program to implement Round Robin Algorithm.
5. Write a program to implement propriety Scheduling.

Sample List of experiments to be carried out based on the course **CS-114T**.

<b>Practical no</b>	<b>Details</b>
1	<b>Implement the following programs</b> a) Write a program to find area of circle b) Write a program to find average of three numbers
2	<b>Implement the following using if-else</b> a) Write a program to find maximum amongst 2 numbers b) Write a program to check entered number is even or odd
3	<b>Implement the following using else-if ladder</b> a) Write a program to find entered number is positive, negative or zero b) Write a program to print grade of students based on percentage
4	<b>Implement the following using switch-case</b> a) Write a program to print weekday based on given number b) Write a program to check entered character is vowel or not
5	<b>Implement the following using while loop</b> a) Write a program to find factorial of given number b) Write a program to find sum of first 10 natural numbers
6	<b>Implement the following using do while loop</b> a) Write a program to print odd numbers from 1 to N b) Write a program to print Fibonacci series
7	<b>Implement the following using for loop</b> a) Write a program to print following series 1 2 3 4 5 6 b) Write a program to print prime numbers from 1 to 100
8	<b>Implement the following using 1-D array</b> a) Write a program to find largest element in an array b) Write a program to sort an array elements in ascending order
9	<b>Implement the following using 2-D array</b> a) Write a program to find sum of two matrices b) Write a program to perform transpose of matrix



**Course code : CS-123 P**    **Course Title :** Practical based on CS-115 T and CS-116 T

Total Credit: 1.5

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

Sample List of experiments to be carried out based on the course **CS-115T**.

<b>Practical No.</b>	<b>Details</b>
1.	Practical based on Mathematical Logic.
2.	Practical based on Set Theory: Algebra of Set Operations
3.	Representation of set using Venn Diagram
4.	Practical based on various Operations on Set. (Union, Intersection, Difference, Complement)
5.	Write an algorithm and draw the Flowchart to find determinant of Square Matrix.
6.	Write an algorithm and draw the Flowchart to find Adjoint of Matrix, Inverse of Matrix.
7.	Write an algorithm and draw the Flowchart to find Rank of Matrix.
8.	Representation of Principle of inclusion and exclusion.
9.	Write an algorithm and draw the Flowchart based on Permutation. (a) Write an algorithm and draw the Flowchart to find permutation of distinguishable objects. (b) Write an algorithm and draw the Flowchart to find $nPr$ with repetitions.
10.	Write an algorithm and draw the Flowchart based on Combination. (a) Write an algorithm and draw the Flowchart to generate all combinations of 1,2 and 3. (b) Write an algorithm and draw the Flowchart to find $nCr$ with repetitions.
11.	Representation of Graph and tree.
12.	Practical based on binary relations and operations on relations.

Sample List of experiments to be carried out based on the course **CS-116 T**. Faculty can add experiments of their choice as well.

Write 10 algorithms on any general problems and draw flowchart of the same.

**Important Notes:**

- i) **Nomenclature:** DSC- Discipline Specific Core course, SEC – Skill Enhancement Course, AECC- Ability Enhancement compulsory course, DSE- Discipline Specific Elective, UA- University Assessment (Semester End), CIA-Continuous Internal Assessment.
- ii) **There shall be one skill enhancement course (SEC) III<sup>rd</sup> to VI<sup>th</sup> Semester (any one SEC course to be chosen (any one from three optional subjects) from the basket of SEC courses for the respective semester.**
- iii) **Code description:** XXX code has to be decided by BoS of the respective subject while designing their respective curriculum ( e.g. for Physics it will be PHY; for Electronics it will be ELE)
  - The codes for first semester courses will start from XXX-111, Second-semester courses will start from XXX-211 and so on
  - XXX-111 : The first digit indicate the Semester Number, the second two digits indicate paper numbers for the first-semester courses and the same analogy is for the remaining semesters
  - The codes for theory courses will start from XXX-111 ( for the first semester and the same analogy is for the remaining semesters)
  - The codes for practical courses will start from XXX-121 ( for the first semester and the same analogy is for the remaining semesters)
  - The codes for Ability Enhancement compulsory courses will start from XXX-131 ( for the first semester and the same analogy is for the remaining semesters)
- iv) **Assessment:** 80% for University Assessment ( Semester End Examination) and 20 % for Continuous Internal Assessment ( CIA)
- v) **Continuous Internal Assessment (CIA): Theory** (10 Marks): Internal Test 05 Marks (Two Internal Tests of 05 marks each and average of the two test will be considered) and 05 Marks for Assignment/tutorials.
- vi) **Continuous Internal Assessment ( CIA): Practical** (10 Marks): 07 Marks for Internal Practical Examination and 03 Marks for record book/submission of collection and field survey report and excursion report
- vii) Practical examination : Annual examination

  
Dean  
Faculty of Science & Technology  
Dr. Babasaheb Ambedkar Marathwada  
University, Aurangabad



**CIRCULAR NO.SU/B.Sc.IT/CS/BCA/55/2023**

It is hereby inform to all concerned that, the syllabi prepared by the Ad-hoc Board and recommended by the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted the **following syllabi of Bachelor of Science with Regulation under the scheme of Choice Based Credit & Grading System** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

Sr.No.	Courses	Semester
1.	BCA (Science) (Degree)	IInd semester
2.	B.Sc. Information Technology (Degree)	IInd semester
3.	B.Sc.Computer Science (Degree)	IInd semester

This is effective from the Academic Year 2022-23 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,  
Aurangabad-431 004.  
REF.NO.SU/2023/19923-35  
Date:- 30.01.2023.

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**Deputy Registrar,**  
**Academic Section**

**Copy forwarded with compliments to :-**

- 1] **The Principal of all concerned Colleges,**  
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

**Copy to :-**

- 1] **The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.**
- 2] The Section Officer,[B.Sc.Unit] Examination Branch,Dr.BAMU,A'bad.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
- 6] The Public Relation Officer, Dr.BAMU,A'bad.
- 7] The Record Keeper, Dr.BAMU,A'bad.

**Dr. Babasaheb Ambedkar Marathwada University**  
Aurangabad- 431004( MS) India



**Three Year Undergraduate Bachelor Degree Program**  
**In Science and Technology**

**B. Sc. (Computer Science)**

**Curriculum Structure and Scheme of**  
**Examination**

**Choice Based Credit System**  
(Effective from Academic Year 2022-23)

**Dr. Babasaheb Ambedkar Marathwada University**  
Aurangabad – 431004 (MS) India

*Bhair.*  
19/1/23

*19/01/23*  
Faculty of Science & Technology  
Dr. Babasaheb Ambedkar Marathwada  
University, Aurangabad

## Pattern of Question Paper (Theory)

B.Sc. (Computer Science) Semester -----

Course Code -----

Paper Number -----

Title of Paper -----

**Time : 1.30 Hrs.**

**Max Marks: 40**

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***N.B.***

1. Attempt All Questions.
2. All questions carry equal marks.
3. Illustrate your answer with suitable labelled diagram.

Q.1. Multiple choice questions / Fill In the Blanks / Terms / Definition / One Line

Answer questions.

(10 Marks)

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)

Q.2. Long answer question.

(10 Marks)

OR

Long Answer question

Q.3. Long answer question

(10 Marks)

OR

Short answer questions

- a)
- b)

Q.4. Short Notes on any TWO of the following:-

(10 Marks)

- a)
- b)
- c)
- d)

## Pattern of Question Paper(Practical)

B.Sc. (Computer Science) Semester -I and II

Course Code -----

Paper Number -----

Title Of Paper -----

Time : 3:00 Hrs.

Max Marks : 100 (UA:80+IA:20)

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### **N.B.**

1. Attempt All Questions.
2. All questions carry equal marks.
3. Illustrate your answer with suitable labelled diagram

### Section A

Q:1 Experiment based on CS-123 P (50 Marks)

- a) Question / Experiment– 35 Marks
- b) Viva / Oral – 05 Marks
- c) Internal Evaluation : 07 Marks
- d) Record book : 03 Marks

### Section B

Q:2 Experiment based on CS-223 P (50 Marks)

- e) Question / Experiment– 35 Marks
- f) Viva / Oral – 05 Marks
- g) Internal Evaluation : 07 Marks
- h) Record book : 03 Marks

**Dr. Babasaheb Ambedkar Marathwada University, Aurangabad**

**Choice Based Credit System (CBCS) Curriculum**

For

Faculty of Science and Technology

Course Structure (First Year)

**B. Sc. (Computer Science) Science Three Year Under Graduate Degree Program**

**First Year**

Course Type	Semester - I		Course Type	Semester - II	
	Name of Paper	Credit		Name of Paper	Credit
<b>Core Course I DSC-1A</b> 5.5	Computer Fundamentals	2	<b>Core Course IV DSC-1B</b> 5.5	Data Structure	2
	Digital Electronics	2		8086 Microprocessor	2
	Lab Course	1.5		Lab Course	1.5
<b>Core Course II DSC-2A</b> 5.5	Operating System-I	2	<b>Core Course V DSC-2B</b> 5.5	Operating System-II	2
	Programming in C	2		Advanced Programming in C	2
	Lab Course	1.5		Lab Course	1.5
<b>Core Course III DSC-3A</b> 5.5	Mathematical Foundation M-1	2	<b>Core Course VI DSC-3B</b> 5.5	Numerical Methods-M-2	2
	Programming Methodology	2		Database Management System	2
	Lab Course	1.5		Lab Course	1.5
<b>Ability Enhancement Compulsory Courses (AECC), 01 Course, 3 credit each)</b>	English Communication Skills (Linguistic Approach)	3	<b>Ability Enhancement Compulsory Courses (AECC), 01 Course, 3 credit each)</b>	English Communication Skills (Soft Skill Development)	3
	Marathi/Hindi/Urdu/Arabic	3		Marathi/Hindi/Urdu/Arabic	3
<b>Non-Credit Course</b>	-----	----	<b>Non-Credit Course</b>	Constitution of India	--
<b>Total Credit</b>	<b>22.5</b>			<b>22.5</b>	

Structure and Curriculum for  
Bachelor of Science in Computer Science  
(Choice Based Credit System)  
**Dr. Babasaheb Ambedkar Marathwada University, Aurangabad**  
Choice Based Credit System (CBCS) Curriculum  
For  
Faculty of Science and Technology  
Course Structure and Scheme of Examination  
B. Sc. (Computer Science) Three Year Under Graduate Degree Program

<b>Semester-I</b>								
Course Type	Course Code	Course Title	Total Periods (Teaching Periods / Week)	Credits	Scheme of Examination			
					UA	IA	Max Marks	Min Marks
<b>Core Course I (DSC-1A)</b>	CS-111T	Computer Fundamentals	45 (3/per week)	2	40	10	50	20
	CS-112T	Digital Electronics	45 (3/per week)	2	40	10	50	20
	CS-121P	Lab Course (based on CS-111T and CS-112T)	45 (3/per week)	1.5	40	10	50	20
<b>Core Course II (DSC-2A))</b>	CS-113T	Operating System-I	45 (3/per week)	2	40	10	50	20
	CS-114T	Programming in C	45 (3/per week)	2	40	10	50	20
	CS-122P	Lab Course (based on CS-113T and CS-114T)	45 (3/per week)	1.5	40	10	50	20
<b>Core Course III (DSC-3A)</b>	CS-115T	Mathematical Foundation	45 (3/per week)	2	40	10	50	20
	CS-116T	Programming Methodology	45 (3/per week)	2	40	10	50	20
	CS-123P	Lab Course (based on CS-115T and CS-116T)	45 (3/per week)	1.5	40	10	50	20
Ability Enhancement Compulsory Courses (AECC-I)	CS-131T	English communication Skills(linguistic Approach)	45 (3/per week)	3	40	10	50	20
	CS-132T	Marathi/Hindi/Urdu/Sanskrit SL-I	45 (4/per week)	3	40	10	50	20
Non Credit Course								
<b>36 Period Per week</b>				<b>22.5</b>	<b>440</b>	<b>110</b>	<b>550</b>	<b>220</b>

\*DCS – discipline Specific core courses

**Total Credit for Semester I : 22.5 (Theory : 18 : Laboratory : 4.5)**



Structure and Curriculum for  
Bachelor of Science in Computer Science  
(Choice Based Credit System)

**Dr. Babasaheb Ambedkar Marathwada University, Aurangabad**  
Choice Based Credit System (CBCS) Curriculum

For  
Faculty of Science and Technology  
Course Structure and Scheme of Examination  
B. Sc. (Computer Science) Three Year Under Graduate Degree Program

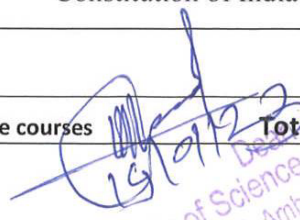

Semester-II								
Course Type	Course Code	Course Title	Total Periods (Teaching Periods / Week)	Credits	Scheme of Examination			
					UA	IA	Max Marks	Min Marks
<b>Core Course IV (DSC-I B)</b>	CS-211T	Data Structure	45 (3/per week)	2	40	10	50	20
	CS-212T	8086 Microprocessor	45 (3/per week)	2	40	10	50	20
	CS-221P	Lab Course (based on CS-211T and CS-212T)	45 (3/per week)	1.5	40	10	50	20
<b>Core Course V (DSC-II B)</b>	CS-213T	Operating System- II	45 (3/per week)	2	40	10	50	20
	CS-214T	Advanced Programming in C	45 (3/per week)	2	40	10	50	20
	CS-222P	Lab Course (based on CS-213T and CS-214T)	45 (3/per week)	1.5	40	10	50	20
<b>Core Course VI (DSC-III B)</b>	CS-215T	Numerical Methods M-2	45 (3/per week)	2	40	10	50	20
	CS-216T	Database Management System	45 (3/per week)	2	40	10	50	20
	CS-223P	Lab Course (based on CS-215T and CS-216T)	45 (3/per week)	1.5	40	10	50	20
Ability Enhancement Compulsory Courses (AECC - 2)	CS-231T	English Communication Skills(Soft Skill Development)	45 (3/per week)	3	40	10	50	20
	CS-232T	Marathi/Hindi/Urdu/Sanskrit	45 (4/per week)	3	40	10	50	20
Non Credit Course	CS-261T	Constitution of India	45 (3/per week)					
			<b>36 Period Per week</b>	<b>22.5</b>	<b>440</b>	<b>110</b>	<b>550</b>	<b>220</b>

\*DCS – discipline Specific core courses

**Total Credit for Semester I : 22.5 (Theory : 18 : Laboratory : 4.5)**

B. Sc. Comp. Sci.

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 Faculty of Science & Technology  
 Babasaheb Ambedkar Marathwada University, Aurangabad  




# B.Sc. (Computer Science)

## Semester - I

# Curriculum for semester I

**Coursecode:CS-111 T Course Title:ComputerFundamentals**

Total Credit: 2 Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

## Prerequisites:

There are no prerequisites required for attending this course.

## Learning objects

To impart basic introduction to computer hardware, components, computer number system. How the CPU works, fundamental about algorithms and flowchart as well as different types of software.

## Learning outcomes

- Students who complete this course successfully will acquire:
- Knowledge of computer fundamental, CPU and its functionalities.
- Understanding of block diagram of hardware peripherals.
- Understanding the concepts of software and its types.
- Understanding the number of system and its conversion between different numbers of systems.
- Understanding the computer based application such as email and video conferencing.

## Course Outline

### UNIT – 1

#### 1. Fundamentals of Computer System

- Characteristics & features of Computers.
- Components of Computers.
- Organization of Computer.

#### 2. Computer Generation & Classification

- Generation of Computers : First to Fifth
- Classification of Computers : Distributed & Parallel computers

### UNIT – II.

#### 3. Computer Memory

- Memory Cell & Organization
- Types of Memory (Primary And Secondary) : RAM , ROM , PROM , EPROM, advantages and disadvantages of each.
- Secondary Storage Devices ( FD, CD, HD, Pen drive, DVD, Tape Drive, DAT )

#### 4. I/O Devices

- Input Devices : Touch screen , OMR, OBR , OCR, Light pen, Scanners
- Output Devices: Digitizers, Plotters, LCD, Plasma Display, Printers

### **UNIT – III**

#### **5. Processor**

- Structure of Instruction , Description of Processor , ProcessorFeatures
- RISC & CISC

### **UNIT – IV**

#### **6. Internet, World Wide Web:**

Introduction to Internet, Internet Access, Internet Basics, Protocols-TCP/IP, HTTP, FTP, Addressing, World Wide Web (WWW), Web Pages & HTML, Web browsers, Searching for information-search engines. Internet chat. Applications of Internet. Advantages and Disadvantages of Internet.

### **UNIT – V Test and Tutorial**

#### **Text Books:**

1. Fundamentals of Information Technology; By Chetan Srivastava, Kalyani Publishers
2. Fundamentals of Computers: By V.Rajaraman, PHI Publication , IVth Edition.
3. Fundamentals of Programming: By Raj K.Jain, S.Chand Publication

#### **Reference Books:**

1. Computer Fundamental By B.Ram, BPB Publication.

**Course Code: CS-112 T      Course Title : Digital Electronics**

Total Credit: 2

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

**UNIT – 1**

**1. Number Systems and Arithmetic**

- Number System : Decimal , Octal , Hexadecimal & Binary Number System
- Conversion within Binary, Octal, Hexadecimal & Decimal Number System.
- Binary Arithmetic : Binary addition, subtraction, multiplication & division
- Binary subtraction using 1' complement, 2's complement method.
- Hexadecimal arithmetic: Addition, subtraction, multiplication & division

**2. Boolean Algebra and Logic Gates**

- Postulates of Boolean Algebra
- Theorems of Boolean Algebra: Complementation , commutative, AND, OR, Associative, Distributive, Absorption laws , De Morgan's theorems
- Reducing Boolean expressions
- Logic Gates : AND, OR, NOT, Ex-OR, Ex-NOR
- NAND as Universal building block
- Logic diagrams of Boolean expressions Boolean expressions for logic diagrams
- 

**Unit – II**

**3. Minimization Techniques**

- Introduction , Minterms and Maxterms
- K-Map, K-map for 2 variables
- K-map for 3 variables
- K-map for 4 variables

**4. Combinational and Arithmetic Logic Circuits**

- Half Adder & Full Adder
- Binary parallel Adder
- Half Subtractor, Full Subtractor
- Adder/Subtractor in 2's complement system
- BCD to Decimal decoder
- 2 : 4 demultiplexer
- 4 line to 1 line multiplexer

**Unit – III**

**5. FlipFlops**

- Introduction : RS FF
- Clocked RS FF, D FF
- Triggering, preset and clear
- JK FF , T FF , Race around condition
- Master slave FF

## **6. Counters**

- Introduction : Asynchronous/ ripple counter
- Modulus Counter , MOD-12 counter
- Synchronous counter : Synchronous serial & synch parallel counter
- BCD counter
- Ring counter

## **UNIT – IV**

## **7. ShiftRegisters**

- Introduction, Buffer register
- Serial- in serial -out Serial-in parallel-out
- Parallel-in serial-out, parallel-in parallel-out

## **UNIT – V Test and Tutorial**

### **Text Book:**

1. Digital Electronics and Micro-Computers – R.K. Gaur , Dhanpat Rai Publication

### **Reference Book:**

1. Digital Electronics and Logic Design – N.G. Palan, Technova Publication

**Course Code: CS-113 T**

**Course Title : Operating System I**

Total Credit: 2      Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

### **Prerequisites:**

There are no prerequisites for attending this course.

### **Learning Objectives**

- To introduce students the basic functioning of operating systems as resource manager and its salient features.
- To acquaint students about Process States, CPU Scheduling, Inter Process Communication, Synchronization, Deadlocks.

### **Learning Outcomes**

Upon successful completion of the course, the students will:

- Gain knowledge of System Software, Program and Process.
- Understand Types of Operating System, Basic functions of O.S. and Evolution of O.S.
- Understand the concept of Process, Process Control Block and Threads.
- Understand the CPU scheduling Non-Pre-emptive and Pre-emptive Scheduling algorithms
- Understand the concept of Synchronization and Deadlock.

### **Course Outline**

#### **Unit I: Introduction to Operating System:**

**Introduction to Software:** Definition, Classification of software, Operating system as the main component of system software, Program and Process.

**Operating System Fundamental :** O.S. as a resource manager, Structure of O.S., Types of O.S.- Single user and multiuser O.S., Basic functions of O.S., Characteristics of modern O.S.**Evolution of O.S. :** Early systems, Simple batch systems, Multiprogramming batch systems, Time sharing system, Operating system for Personal Computers, workstations and Hand held devices, Parallel systems, Distributed systems, Real time systems, Advantages and Disadvantages of each system.

#### **Unit II: Process Management:**

**Concept of Process:** Process States, Process Control Block, Operations on Processes, Threads.

**CPU Scheduling:** Types of schedulers, Criteria for scheduling, Non-Pre-emptive Scheduling Algorithms – First-come First-served Scheduling and Shortest Job First Scheduling, Pre-emptive Scheduling Algorithms- Priority Scheduling, Round Robin.

#### **Unit III: Inter Process Communication and Synchronization:**

Concurrent and dependent process, need for synchronization, introduction of Critical Section and Semaphores, method of inter process communication, process synchronization,

synchronization problem.

#### **UNIT – IV**

**Deadlocks** :Concept of Deadlock, Deadlock Modeling, Methods for Handling Deadlock. Memory management.

#### **UNIT – V Test and Tutorial**

##### **Reference Books:**

1. “Operating System”, By S.R. Sathe & Anil S. Mokhade, MacMillan Publication.
2. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
3. A.S. Tanenbaum, Modern Operating System, 3rd Edition, Pearson Education 2007.
4. G. Nutt, Operating System: A Modern Perspective, 2nd Edition Pearson Edition 1997.
5. W. Stallings, Operating Systems, Internals & Design Principles 2008 5th Edition, Prentice Hall of India.
6. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.



**Course code: CS-114 T**

**Course Title: Programming in C**

Total Credit: 2    Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

### UNIT – I

#### 1. Introduction:

- An Overview of C , History of C language, C as a Structured Language, Features of C.

#### 2. Basic Elements & Operators

- Character set, C Token, Identifier & Keywords, Variables
- Constant and its types. Integer constant, floating point constant, character constant, string constants.
- Operators: Arithmetic, Relational, Logical, Unary operators: Increment & decrement Assignment and Conditional operator.
- Precedence & Associativity of Operators

#### 3. Data Types

- Data Types: *int, char, float, double*. Declaration & Initialization.
- Type modifier: long, short, signed & unsigned

### UNIT – II

#### 4. C Program & I/O statements

- Structure of C Program, Compilation & Execution of C program
- I/O: Introduction, Formatted Input/Output function: *scanf & printf*, Escape sequence characters.
- Library functions: General & Maths.

### UNIT – III

#### 5. Control and Iterative Statements:

- Simple if, nested if, if-else, else if ladder
- Switch-case statement
- The conditional expression (?: operator)
- while and do-while loop, and for loop
- break & continue statement, goto statement

### UNIT – IV

#### 6. Arrays:

- Introduction, Declaration and initialization Accessing array elements, Memory representation of array.
- One dimension and multidimensional arrays, character array, Introduction to string.

### UNIT – V Test and Tutorial

#### Text Books:

1. Let us C : Y.P. Kanetkar [bpb publication]
2. Programming in C : E. Balaburuswamy [Tata macgraw hill]
3. Programming in C : Goterfried [Shaums' Series]

#### Reference Books:

1. Spirit of "C" : Moolish Kooper.

**Course Code: CS-115 T Course Title : Mathematical Foundation**

Total Credit: 2

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

**Prerequisites:**

Basic understanding of mathematical concepts (School or Junior College).

**Learning Objectives**

To expose the students to the following:

- Propositional function, statements, well-formed formulas.
- Set theory concepts like Finite Set, Subset, Empty Set and operations on set.
- Matrices and its various types.
- Binary relations, posets, Functions, and pigeonhole principle.
- Algebraic structures like groups and elementary combinatorics.
- Various concepts in graphs and trees like its representation and its types.

**Learning Outcomes**

After successful completion of course the student should be able to

- Know how to represent various statements using set, relations, functions, permutations and combinations, groups, graphs and trees
- Use logical notations to formulate and reason about fundamental mathematical concepts such as sets, relations, functions and algebraic structures.
- Analyse the growth of functions and real-world problems using various concepts like recurrence relations, graph implementation etc.
- Apply mathematical logic to solve problems, pigeonhole principle to solve real time problems,
- Model and solve real world problems using graphs and trees.

**Course Outline**

**Unit I: Mathematical Logic:**

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Normal Forms.

**Set Theory:**

Types of Set: Finite, Infinite, Singleton, Empty, Subset, Proper Subset, Universal Set, Power Set, Venn Diagram, Operations on Set: Union of Sets, Intersection of Sets, Complement of Set, Cartesian Product, Difference and Symmetric Difference of Set.

**Introduction to Matrices:** Types of Matrices, Matrix, Operations, Adjoint and Inverse of a Matrix, Rank of a Matrix and Special Matrices.

**Unit II Combination:**

Review of Permutation and Combination, Mathematical Induction - Pigeon hole principle, Principle of Inclusion and Exclusion, generating function, Recurrence relations.

### **Unit III: Basics of Graph Theory and Tree:**

Introduction to Graph, Application of Graph, Finite and Infinite Graph, Incidence and Degree, Null Graph, Isolated and Pendent Vertex, Isomorphism, Subgraph, Walks, Path and Circuit, Union and Intersection Operation. Graph, Planner Graph, Trees, Pendant Vertices on Tree, Binary Tree, Spanning Tree.

### **UNIT – IV**

#### **Relation:**

Basic definitions of Relation and types of Relations, Graph of Relations, Properties of Binary Relations, Matrix Representation of Relations, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations.

### **UNIT – V Test and Tutorial**

#### **Text Books:**

1. Elements of Discrete Mathematics-A Computer Oriented Approach C. L. Liu, D.P. Mohapatra, 3rd edition Tata McGraw Hill.
2. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill
3. Foundations of Computer Science, A. Aho and J. Ullman- W. H. Freeman, 1992.
4. Discrete Mathematics-Dr. Bembalkar

#### **Reference Books:**

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernard Kolman, Roberty C. Busby, Sharn Cutter Ross, Pearson Education/PHI.
3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

**Course Code: CS-116 T Course Title : Programming Methodology**

Total Credit: 2 Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

**Prerequisites:**

There are no prerequisites for attending this course.

**Learning Objectives**

- Learn to develop simple algorithms and flow charts to solve a problem.
- Develop problem solving skills coupled with top down design principles.
- Learn about the strategies of writing efficient and well-structured computer algorithms/programs.
- Develop the skills for formulating iterative solutions to a problem.

**Learning Outcomes**

- Learn the History and types of Programming.
- Learn various approach of writing program.
- Learn to develop simple algorithms and flow charts to solve a problem.

**Unit I Introduction to Programming Environment**

Introduction to Programming, Definition of program and programmer, features of good programming language, Bugs and Debugging,

**Programming Techniques**

Programming approaches: Types of programming methodologies, Procedural Programming, Functional Programming, Structural Programming, Modular Designing, Logical Programming -Top Down Designing, Bottom Up Designing, Object Oriented Programming

**Unit II Programming Languages**

History of languages, Classification of computer language: Types of Programming Languages- Machine Languages , Assembly Languages, High Level Languages, low level language, Structure Language, Object oriented Language, Modular techniques, Modular Programming – advantages, identifying the modules, step-by-step solution, control structures, decision control structures, selection control structures, loop control structures, 4GL, Assembler, Linker, Loader, Interpreter & Compiler, TASM, Debug

**Unit III Algorithm**

Definition, Characteristics , Advantages and disadvantages, Pseudocode or Structured English, Algorithm, basic features and properties of algorithm.

## **UNIT – IV**

### **Flow-Chart**

Definition, Principles of flowcharting, Flowcharting symbols, Data flow diagram, pseudocode. converting algorithms to flowcharts, problem solving through algorithm and flowchart. Advantages and disadvantages.

## **UNIT – V Test and Tutorial**

### **Books :**

1. Fundamentals of Computer V. Rajaraman
2. Programming Logic and Design, Comprehensive By Joyce Farrell
3. Problem Solving and Program Design in C, J. R. Hanly and E. B. Koffman, Pearson, 2015.

**Course Code: CS-131 T**      **Course Title : English Communication Skill**  
(linguistic approach)

Total Credit: 3      Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

**Prerequisites:**

There are no prerequisites for attending this course.

**Learning Objectives**

- Learn fundamentals of Parts of Speech.
- Detailed study of Spellings, Silent letters and Articles.
- Learn Auxiliary verbs, Subject and Object and how to make Questions and Question tags.
- Addressing the Greetings and giving directions.
- To enhance the vocabulary-building, word formation, Synonyms & Antonyms, One-word substitutes and Phrasal verbs.
- To improve listening, oral and reading skills

**Learning Outcomes**

Upon successful completion of the course, the students will be able to:

- Understand the different styles of communication.
- Understand the effective speaking skills and develops effective reading comprehensions.
- Understand how to write a good personal profile and improve one's presentation skills.
- Develop good writing skills.

**Course Outline**

**Unit I: Basics of Communication Skill:**

**Communication Skills:** Introduction, Definition, Nature and Scope of Communication, an Importance and Purpose of Communication, 'C's of good communication, Process of Communication. **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers **Communication Network in Organization:** Personal Communication, Internal Operational Communication, External Operational Communication, Horizontal (Lateral) Communication, Vertical (Downward) Communication, Vertical (Upward) Communication.

**English Grammar:**

**Parts of Speech:** Nouns, Pronouns, Verbs, Adverbs, Adjectives, Conjunctives, Prepositions, Interjections. Using the **Dictionary:** Primary Auxiliaries, Modal Auxiliaries, Subject and Object (Direct/Indirect), Yes or No Questions, Wh-word Questions, Question Tags. **Grammar:** Type of Verbs, Subject- Verb Agreement, Tense (present and past) and Aspect, several possibilities for denoting future Time, vocabulary building, constructing paragraphs

## **Unit II: Elements of Communication&Listening Skills:**

**Elements of Communication:** Introduction, Face to Face Communication – Tone of voice, Body Language (Non-Verbal Communication), Verbal Communication, Physical Communication.**Listening Skills-I:** Introduction, Listening to Conversation (Formal and Informal), Active Listening, Benefits of Listening Skill, Barriers to Listening, Listening to Announcements (Railway stations/Bus stations/ Airports/ Sports Announcements/ Commentaries etc.)**Listening Skills-II:** Academic Listening (Listening to Lectures), Listening to Talks and Presentations, Note Taking Tips.

## **UNIT – III Oral Communication Skills:**

Importance of Spoken English, Status of Spoken English in India, International Phonetic Alphabet (IPA) Symbols, Spelling and Pronunciation, Requesting and responding to requests, Congratulating people on their success, Expressing condolences, Apologizing and forgiving, Giving instructions, Seeking and giving permission, Expressing Opinions (likes and dislikes), Demanding Explanations, Asking for and giving advice and suggestions.  
**Reading Skills:** Purpose, Process, Methodologies, Skimming and Scanning, Levels of Reading, Reading Comprehension.

## **Unit IV: Effective Writing Skills:**

Elements of Effective Writing, Sentences, Phrases and Clauses, Types of Sentences. Main Forms of Written Communication, Paragraph Writing (Linkage and Cohesion), Letter Writing (Formal and Informal), Essay Writing, Notices, Summarizing, Precise Writing, Note-Making, Amount of Discussion Required Understanding and Applying Vocabulary: Words Often Confused-Pairs of words, One Word Substitutes, Synonyms and Antonyms, Word Formation: Prefixes, Bases and Suffixes (Derivational & Inflectional).

## **UNIT – V Test and Tutorial**

### **Reference Books:**

1. **Basic communication skills for Technology**, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. **Communication skills**, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011
3. **Organizational Behaviour**, Stephen.P. Robbins, 1st Edition, Pearson, 2013
4. **Brilliant- Communication skills**, Gill Hasson, 1st Edition, Pearson Life, 2011
5. **Business Communication**, By Urmila Rai & S.M. Rai. Himalaya Pub
6. **Business Communication** Anjali Ghanekar
7. **Anderson, Kenneth**. Joan Maclean and Tony Lynch. Study Speaking: A Course in Spoken English for Academic Purposes. Cambridge: CUP, 2004.

**Course Code: CS-121 P**    **Course Title :** Practical based on CS-111T and CS-112 T

Total Credit: 1.5

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

Sample List of experiments to be carried out based on the course **CS-111T**.

- 1.
2. Prepare a report based on computer component such as monitor, printer, CPU, Pen drive, CD –ROM , Hard Disk.
3. Create a partition of computer drive creation, formatting the drive and deleting the partition.
4. Create a user and password of computer user and Reset a computer password using CMOS battery.
5. Practical on office word tool as a creation, edit, insertion of table in the new word file.
6. Practical based on Ms-Excel for creation of student data with name, marks, roll no for sorting and mark sheet creation.
7. Perform practical of DOS internal commands. DIR, TYPE, DEL, MD, CD, COPY, RMDIR, VER, DATE, TIME, CLS EXIT.
8. Write a comparative report of different web browser such as opera, Microsoft edge, chrome and Mozilla Firefox.
9. Create an IP setting and home network setting for the computer.
10. Connect internet using wifi for a computer.
11. Create an email account based on Gmail and send the email using the parameter as CC, BCC and schedule send option.
12. Practical based on online meeting using zoom, Google meet and Skype
13. Practical based on remote desktop using any desk software.

Sample List of experiments to be carried out based on the course **CS-112T**.

14. Study and Testing of measuring instruments: Digital and Analog multimeters, CROs and Signal Generators – measurement of AC & DC voltages, measurement of frequency.
15. Study of Components: Identification and testing of resistors, capacitors, inductors, diodes, LEDs & transistors
16. Study of Logic Gates: Study of truth table of basic gates, realization of Boolean functions
17. Study of Half adder and Full Adder
18. Study of Half Subtractor and Full Subtractor
19. Study of Implementation of a 3:8 decoder,
20. Study of 4-line to 16 bit decoder
21. Study of BCD to 7-segment decoder



22. Study of Generating a Boolean expression with a multiplexer
23. Study of Clocked JK Flip Flop
24. Study of 4-bit ripple counter
25. Study of Parallel-in, serial-out, 4-bit shift register

**Course Code: CS-122 P**    **Course Title :** Practical based on CS-113 T and CS-114 T

Total Credit: 1.5

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

Sample List of experiments to be carried out based on the course **CS-113T**.

Note : Implement any three programs from each unit.

Suggestive program list.

1. Write a program to implement scheduling algorithm FCFS.
2. Write a program to accept list of processes arrival time display Giant Chart for FCFS.
3. Write a program to implement SJF Scheduling.
4. Write a program to implement Round Robin Algorithm.
5. Write a program to implement propriety Scheduling.

Sample List of experiments to be carried out based on the course **CS-114T**.

<b>Practical no</b>	<b>Details</b>
1	<b>Implement the following programs</b> a) Write a program to find area of circle b) Write a program to find average of three numbers
2	<b>Implement the following using if-else</b> a) Write a program to find maximum amongst 2 numbers b) Write a program to check entered number is even or odd
3	<b>Implement the following using else-if ladder</b> a) Write a program to find entered number is positive, negative or zero b) Write a program to print grade of students based on percentage
4	<b>Implement the following using switch-case</b> a) Write a program to print weekday based on given number b) Write a program to check entered character is vowel or not
5	<b>Implement the following using while loop</b> a) Write a program to find factorial of given number b) Write a program to find sum of first 10 natural numbers
6	<b>Implement the following using do while loop</b> a) Write a program to print odd numbers from 1 to N b) Write a program to print Fibonacci series
7	<b>Implement the following using for loop</b> a) Write a program to print following series 1 2 3 4 5 6 b) Write a program to print prime numbers from 1 to 100
8	<b>Implement the following using 1-D array</b> a) Write a program to find largest element in an array b) Write a program to sort an array elements in ascending order
9	<b>Implement the following using 2-D array</b> a) Write a program to find sum of two matrices b) Write a program to perform transpose of matrix

**Course Code: CS-123 P**    **Course Title :** Practical based on CS-115 T and CS-116 T

Total Credit: 1.5

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

Sample List of experiments to be carried out based on the course **CS-115T**.

<b>Practical No.</b>	<b>Details</b>
1.	Practical based on Mathematical Logic.
2.	Practical based on Set Theory: Algebra of Set Operations
3.	Representation of set using Venn Diagram
4.	Practical based on various Operations on Set. (Union, Intersection, Difference, Complement)
5.	Write an algorithm and draw the Flowchart to find determinant of Square Matrix.
6.	Write an algorithm and draw the Flowchart to find Adjoint of Matrix, Inverse of Matrix.
7.	Write an algorithm and draw the Flowchart to find Rank of Matrix.
8.	Representation of Principle of inclusion and exclusion.
9.	Write an algorithm and draw the Flowchart based on Permutation. (a) Write an algorithm and draw the Flowchart to find permutation of distinguishable objects. (b) Write an algorithm and draw the Flowchart to find $nPr$ with repetitions.
10.	Write an algorithm and draw the Flowchart based on Combination. (a) Write an algorithm and draw the Flowchart to generate all combinations of 1,2 and 3. (b) Write an algorithm and draw the Flowchart to find $nCr$ with repetitions.
11.	Representation of Graph and tree.
12.	Practical based on binary relations and operations on relations.

Sample List of experiments to be carried out based on the course **CS-116 T**. Faculty can add experiments of their choice as well.

Write 10 algorithms on any general problems and draw flowchart of the same.



# B.Sc. (Computer Science)

## Semester - II

**Course code: CS-211 T    Course Title: Data Structures**

Total Credit: 2    Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

### **Prerequisites:**

Basic understanding of C programs & arrays, hands on experience in decision making and looping constructs of C programming language will be a huge benefit.

### **Learning Objectives**

- To provide fundamental knowledge of data structures and how they are organized/arranged in computer memory.
- To provide knowledge on how data structures are implemented and processed.
- To familiarize with basic techniques of algorithm analysis.
- To equip with the implementation techniques of complex algorithms of insertion, deletion and modification of data stored in various data structures.
- To provide knowledge of the basic functioning of searching and sorting algorithms.

### **Learning Outcomes**

Students who complete this course successfully will acquire:

- Ability to understand fundamental data structures like arrays, linked-lists, stack, queues, trees, graphs.
- Ability to understand abstract data types.
- Ability to program data structures and use them in implementations of abstract data types.
- Understanding of basic algorithmic complexity.
- Ability to sensibly select appropriate data structures and algorithms for problems and to justify that choice.
- Ability to understand searching and sorting algorithms, their implementation and suitable applications.

### **Course Outline**

#### **Unit I: Data Structures & Algorithm Analysis:**

**Data Structures:** Introduction to linear and non-linear data structures. **Algorithm Analysis,** Growth rates, Estimating the growth rate, Big O notation.

#### **Unit II: Arrays:**

Need for Arrays, Linear Arrays, representation of linear arrays (row-major order, column-major order), Traversing, insertion, modification, deletion in linear array, merging linear arrays. 2-dimensional arrays introduction, representation of 2-dimensional array, sparse matrices.

#### **Unit III Searching & Sorting:**

Need for Searching and sorting, Linear search, binary search, bubble sort, selection sort, insertion sort.

**Unit IV: Stack & Queue:**

Introduction, Operations on stack, stack implementation using arrays., Applications of Stack (Expression representation and evaluation), Expression notations (prefix, infix, postfix), Conversion of expression (prefix to infix, infix to postfix). **Queue:** Introduction, Types of queues (Circular Queue, Dequeue), Queue Implementation using arrays, Operations on Queue (Traversing, Insertion, deletion, and modification), Application of Queue (priority queue).

**Unit V: Test & Tutorials****Reference Books:**

1. Data Structures using C, by Seema Threja, 2<sup>nd</sup> Edition, Oxford Press.
2. Lipschutz: Schaum's outline series Data structures Tata McGraw-Hill

**E-Books:**

1. Fundamentals of Data Structures in C, by Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed
2. Design & Analysis of computer Algorithms by Alfred Aho, John Hopcroft and Jeffery Ullman ([Link](#))
3. Introduction to Algorithms by Thomas Corman et.al ([Link](#))

**Course Code: CS-212T**

**Course Title: 8086 Microprocessor**

Total Credit: 2

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

**Prerequisites:**

Course CS-112T Digital Electronics.

**Learning Objectives**

- To get knowledge of internal architecture of 8086 microprocessor
- Understand different addressing modes.
- Learn assembly language instructions to construct an ALP.

**Learning Outcomes**

Upon successful completion of the course, the students will be able to:

- Functional block diagram of 8086 microprocessor
- Functions of each pin of 8086 microprocessor
- Use of instructions in different addressing modes
- Write an assembly language program.

**UNIT – I**

**Introduction to Microprocessor and Microcomputer:**

Microprocessor based personal computersystem.

Block diagram of microprocessor based computer system.

Modern computer memory map, I/O Space.

The Microprocessor, buses.

Computer Data formats, ASCII Unicode, BCD.

**UNIT – II**

**Microprocessor and its architecture:**

8086 internal architecture.

Real Mode & Protected Mode Memory Addressing.

Memory Paging.

Pinout and Pin function of 8086 microprocessor.

**UNIT – III**

**Addressing Modes:**

Data addressingmodes.

Program memory addressingmodes.

Stack memory addressingmodes.

**UNIT – IV**

**MOV revisited:**

Machine language. The op-code, PUSH, POP, stack initialization.

Miscellaneous data transfer instructions: XCHG, LAHF &SAHF.

**Arithmeticinstructions:**

Addition, subtraction and comparison.

Multiplication anddivision.

BCD and ASCIIarithmetic.

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## **UNIT – V Test and Tutorial**

### **Text Books:**

2. The Intel Microprocessors: Architecture, programming and interfacing–  
By Barry B. Brey
3. Microprocessors and Interfacing: DouglasHall.



**Course Code: CS-213T**

**Course Title: Operating System-II**

Total Credit: 2

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

**Prerequisites:**

Student must possess fundamental skills of operating system.

**Learning Objectives**

- To introduce students the Memory management, Disk management, Device management, Security Policy Mechanism and Introduction to Android Operating System.

**Learning Outcomes**

Upon successful completion of the course, the students will:

- Gain knowledge of Memory Management, Paging and Segmentation.
- Understand concept of File, Operation of file, File allocation methods.
- Understand Disk fundamental, Disk Scheduling, Disk management.
- Understand Dedicated devices, Shared devices, I/O Devices, I/O Hardware, Interrupts
- Understand Security Policy Mechanism- Protection and Authentication.
- Understand the basic introduction to Android Operating System.

**Course Outline**

**Unit I: Memory Management:**

Address Binding, Logical Vs. Physical address space, Memory Allocation Strategies- Fixed and Variable Partitions, Paging, Segmentation, Virtual Memory.

**Unit II: Disk Management:**

Concept of File, File Operation, Directory Structure, File Allocation Methods- Contiguous and Non-Contiguous allocation method, **Secondary Storage Structure:** Disk fundamental, Disk Scheduling – FCFS Scheduling, SSTF Scheduling, SCAN Scheduling, Disk management.

**Unit III: Device Management:**

Introduction: Dedicated devices, Shared devices and Virtual devices, Pipes, Buffer, I/O System Components : I/O Devices, I/O Hardware, Interrupts, Application I/O Interface.

**Unit IV: Security Policy Mechanism:**

**Protection:** Need of Protection in O.S., Goals of Protection, Domain of Protection.  
**Authentication-** Password, Encrypted Password and Encryption. Introduction to Android Operating System:

Introduction to Android Operating System, Android Development Framework, Android Application Architecture.

**Unit V: Test & Tutorials**

**Reference Books:**

1. "Operating System", By S.R. Sathe & Anil S. Mokhade, MacMillan Publication.
2. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
3. A.S. Tanenbaum, Modern Operating System, 3rd Edition, Pearson Education 2007.
4. G. Nutt, Operating System: A Modern Perspective, 2nd Edition Pearson Edition 1997.
5. W. Stallings, Operating Systems, Internals & Design Principles 2008 5th Edition, Prentice Hall of India.
6. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

**Course Code: CS-214T**

**Course Title: Advance Programming in C**

Total Credit: 2

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

### **Prerequisites:**

Basic concepts of C language, Course CS-104T.

### **Learning Objectives**

- To develop modular applications in C using functions
- To develop applications in C using pointers and structures
- To do input/output and file handling in C.

### **Learning Outcomes**

Upon successful completion of the course, the students will be able to:

- Develop and implement modular applications in C using functions
- Develop applications in C using structures and pointers
- Design applications using sequential and random-access file processing
- Identify the difference between call by value and call by reference

### **Course Outline**

#### **Unit I: Functions:**

Introduction, Types of functions, defining functions, Arguments, Function prototype, actual parameters and formal parameters, calling function, Returning function results. Parameter Passing Mechanism: Call by Value & Call by Reference, Recursion.

#### **Unit II: Structure, Union & Pointers:**

**Structure:** Introduction, Declaration and initializing structure, Accessing structure members, Nested structures, Arrays of structure, typedef statement and Enumerated data types. **Unions:** Declaration, Difference between structure and union. **Pointers:** Introduction, The Address (&) and Indirection (\*) Operators, Declaration and initialization of pointers. Pointer expression and pointer arithmetic, Pointer to pointer. Dynamic Memory Allocation in C using malloc(), calloc(), free() and realloc()

#### **Unit III: Storage classes, Preprocessors & String handling Functions:**

**Storage classes,** Scope, visibility and lifetime of variable, block and file scope, auto, extern, static and register storage classes. **String handling functions:** strcpy(), strcmp(), strcat(), strlen(),strupr(), strlwr(), gets(), puts(), **Preprocessor Directives:** File inclusion and conditional compiler directives, Macro substitution, #define, #if, #ifdef, #else, #elif, #endif

#### **Unit IV: File Handling:**

File handling: Introduction, Opening & closing a file, Input/output operations on files, text and binary files, getc(), putc() function. fprintf() and fscanf() function. fread() and fwrite() function. Writing and reading records from text file and binary file, Appending, modifying and deleting a record from file, Random access functions fseek(), rewind(),flushall(), remove(), rename() functions.

#### **Unit V: Test & Tutorials**

**Reference Books:**

1. Let us C: Y. P. Kanetkar [bpb publication]
2. Programming in C: E. Balagurusamy [Tata McGraw hill]
3. Programming in C: Gottfried [Shaums Series]

**Course code: CS-215 T**

**Course Title: Numerical Methods M-2**

Total Credit: 2

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

### **Prerequisites:**

Basic knowledge of Mathematics.

### **Learning Objectives**

- A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology, state important facts resulting from their studies..
- A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical Sciences.
- Students get familiar with numerical analysis.

### **Learning Outcomes**

Upon successful completion of the course, the students will be able to:

- Different number theory algorithms.
- Calculate approximate value for using approximation techniques.
- Solve numerical problems using different numerical methods.
- Write algorithms of different numerical techniques.

### **Unit – I**

Introduction: Mathematical Modeling, Characteristics, Error in Calculatio, Significant Error , Absolute, Percentage Relative Error, Chopping off and Rounding off Error, Truncation Error, Propagation Error.

#### **Divisibility Theory in the Integer:**

- Early Number Theory.
- The division Algorithm.
- Greatest Common divisor.
- The Euclidean Algorithm.

### **Unit- II**

#### **Numerical Solutions of Transcendental Equations:**

- Introduction and Matrix Notation of set of Equations
- Gauss Elimination Method
- Gauss Seidal Method
- Matrix Inversion Method

### **Unit-III**

- Introduction and Polynomial Interpolation
- Newton-Gregory Forward Difference Interpolation Formula
- Newton-Gregory Backward Difference Interpolation Formula

## **Unit- IV**

- Newton's divided Difference Interpolation
- Lagrange's Interpolation

## **UNIT – V Test and Tutorial**

### **Reference Books:**

1. "Numerical Computational Methods" - Dr. P.B.Patil, Narosa Publication Hous.
2. Introductory Methods of Numerical Analysis by S. S. Sastry
3. Elementary Number Theory by David M. Burton
4. Numerical methods -S.C.Chapra, R.P.Canale-McGraw Hill
5. Numerical methods-E.Balguruswamy

**Course code: CS-216 T**

**Course Title: Database Management System**

Total Credit: 2

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

**Prerequisites:**

Basic knowledge of set theory and set operations, computer file management.

**Learning Objectives**

- Learn what is data, database and DBMS
- Understand the basics of database designing.
- Learn different SQL statements

**Learning Outcomes**

Upon successful completion of the course, the students will be able to:

- Design a database.
- Normalize a database.
- Create a database perform various operations on database.

**Unit – I**

Introduction to Databases, Types of Data, Record and Files, File based System, What is database system, application and purpose of database system, Three-Level of data abstraction, instance and schema, data independence, database users, structure of a DBMS, Advantages and disadvantages of DBMS.

**Unit- II**

Entity, attributes and data association relation between entities, The importance of data models, The evolution of data models, Type of Data Model, Advantages and disadvantages of each model.

**Unit-III**

Database Design, Design Phases, Normal Forms 1NF,2NF, 3NF and BCNF. ER-Model entity set, relationship set, attributes, constraints, ER-Diagram basic structure, mapping cardinality, Roles, weak entity set. Symbols used in ER-notations. ERD Issues, 12 Codd's rules,

**Unit- IV**

SQL: SQL Languages DDL, DML, DCL, TCL, DDL Statements to Create and Manage Tables using Create & Alter, Manipulating Data using Insert, Update & Delete Statement., Retrieving Data Using SQL Select, Restricting and Sorting Data, Using SingleRow functions, Conversion Functions and Conditional Expressions, Aggregated Data Using Group Function, Displaying data from Multiple tables, Sub queries, Set Operators

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**References:**

1. Database system concepts( 6<sup>th</sup> edition) AviSilverschatz, Henry F. Korth, S.Sudarshan
2. An introduction to database systems by Bipin C. Desai

**Course Code: CS-231 T** **Course Title:** English Communication Skill (Soft Skill Development)

Total Credit: 3                      Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

### **Prerequisites:**

There are no prerequisites for attending this course.

### **Learning Objectives**

- To understand the fundamental soft skills and their practical social and workplace usage.
- It helps participants to communicate effectively and to carry themselves confidently and in harmony with the surroundings.
- To identify and overcome the barriers in interpersonal relationships.
- To employ oral and written communication, teamwork, leadership, problem-solving and decision-making skills, to gain best results.

### **Learning Outcomes**

Upon successful completion of the course, the students will be able to:

- Understand the significance and essence of a wide range of soft skills.
- Learn how to apply soft skills in a wide range of routine social and professional settings.
- Learn how to employ soft skills to improve interpersonal relationships
- Learn how to employ soft skills to enhance employ ability and ensure workplace and career success.

### **Course Outline**

#### **Unit I:**

**Soft Skills:** An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. **Self-Discovery:** Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue. **Positivity and Motivation:** Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels.

#### **Unit II:**

**Public Speaking:** Skills, Methods, Strategies and Essential tips for effective public speaking. **Group Discussion: Importance,** Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective, Do's and Don'ts of Group Discussion. **Non-Verbal Communication:** Importance and Elements; Body Language.

#### **Unit III:**

**Role Play:** Introduction, Basics of Role Playing, Role Play Script (Teacher-Student Script, Short Drama Script, Any Short Plays and etc.), **Interview Skills:** Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success, Do's and Don'ts of Interview. **Presentation Skills:** Types, Content, Audience



Analysis, Essential Tips – Before, During and After, Overcoming Nervousness, Planning and Structuring your Presentation, Techniques of Delivery.

#### **Unit IV:**

**Etiquette and Manners:** Social and Business. **Stress Management:** Stress, Sources of Stress, Ways to Cope with Stress, **Time Management:** Concept, Essentials, Tips. **Leadership and Assertiveness Skills:** A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertiveness Skills. **Decision Making and Negotiation:** Introduction to Decision Making, Steps for Decision Making, Decision Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts, Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

#### **Unit V: Test & Tutorials**

#### **Reference Books:**

1. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India
2. Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
3. English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.

**Course Code: CS-221 P**    **Course Title :** Practical based on CS-211 T and CS-212 T

Total Credit: 1.5

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

Sample List of experiments to be carried out based on the course **CS-211 T**.

<b>Practical No</b>	<b>Details</b>
	<b>Implement Arrays</b>
1	Write a program to store the elements in 1-D array and display the array in reverse
2	Write a program to read the two arrays from the user and merge them and display the elements.
3	Write a program to insert an element in already existing array.
4	Write a program to delete an element from an array.
	<b>Implement Searching</b>
5	Write a program to implement linear searching technique.
6	Write a program to implement binary searching technique.
	<b>Implement Sorting</b>
7	Write a program to sort a list using bubble sort technique and display the list before and after sorting.
8	Write a program to sort a list using selection sort technique and display the list before and after sorting.
9	Write a program to sort a list using insertion sort technique and display the list before and after sorting.
	<b>Implement Stack:</b>
10	Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations.
11	Write a program to convert an infix expression to postfix conversion.
12	Write a program to convert an infix expression to prefix conversion.
13	Write a program to evaluate a postfix expression.
	<b>Implement Queue:</b>
14	Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations.
15	Write a program to implement the concept of Circular Queue

Sample List of experiments to be carried out based on the course **CS-212 T**.

1. Addition and subtraction of two 8-bit numbers with programs based on different Addressing modes of 8086.
2. Addition and subtraction of two 16-bit numbers. (Using 2's complement method, also programs which access numbers from specified memory locations)
3. Multiplication of two 8-bit numbers using the method of successive addition and Shift & add.
4. Division of two 8-bit numbers using the method of successive subtraction and shift

- &subtract.
5. Block transfer and block exchange of databytes.

**Course Code: CS-222 P**    **Course Title :** Practical based on CS-213 T and CS-214 T

Total Credit: 1.5

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

Sample List of experiments to be carried out based on the course **CS-213 T**.

1. Program to implement memory management first-fit,best-fit,worst-fit.
2. Program to implement file allocation technique linked list.
3. Program to implement FIFO page replacement algorithm.
4. Program to implement page replacement LRU algorithm.
5. Program to implement optimal page replacement algorithm.
6. Program to implement SSTF (Shortest Seek Time First ) disk scheduling algorithm,
7. Setting user password at operating system level.
8. Installation of any two peripheral devices.
9. Study of Android development Framework.
10. Study of Android Program development Architecture.

Sample List of experiments to be carried out based on the course **CS-214 T**.

## **Practical**

**no**

## **Details**

- 1**    **Implement the following using functions**
  - a) Write a program to exchange two numbers
  - b) Write a program to find factorial of a given number
- 2**    **Implement the following using structure**
  - a) Write a program to create structure student
  - b) Write a program to demonstrate array of structure
- 3**    **Implement the following using union**
  - a) Write a program to create union employee
  - b) Write a program to find sizeof() structure and sizeof() union
- 4**    **Implement the following using pointer**
  - a) Write a program to demonstrate double pointer
  - b) Write a program to exchange two numbers
- 5**    **Implement the following storage classes**
  - a) Write a program to demonstrate auto and static
  - b) Write a program to demonstrate extern and register
- 6**    **Implement the following using preprocessor directives**
  - a) Write a program to find area of circle
  - b) Write a program to demonstrate #ifdef,#if and #elif
- 7**    **Implement the following using string handling functions**
  - a) Write a program to calculate length of string and compare two strings
  - b) Write a program for string copy and string concatenation
- 8**    **Implement the following using recursion and enum**
  - a) Write a program to find factorial of a given number using recursion
  - b) Write a program to demonstrate enum data type
- 9**    **Implement the following using file handling**

- a) Write a program for reading/writing text file.
- b) Write a program for reading/writing binary file

**10 Implement the following programs**

- a) Write a program to demonstrate rename() and remove() functions
- b) Write a program to demonstrate fseek() function

**Course Code: CS-223 P**    **Course Title :** Practical based on CS-215T and CS-216 T

Total Credit: 1.5

Marks: 50 (UA: 40 + IA: 10)

Periods: 3 per week (50 Minutes each)

Sample List of experiments to be carried out based on the course **CS-215 T**.

1. Program in C for representation of, Bisection Method
2. Program in C for representation of, False Position Method
3. Program in C for representation of, Newton-Raphson Method
4. Program in C for representation of, Gauss Elimination Method
5. Program in C for representation of, Matrix Inverse Method
6. Program in C for representation of, Newton-Gregory Forward Difference Interpolation Formula
7. Program in C for representation of, Newton-Gregory Backward Difference Interpolation Formula
8. Program in C for representation of Newton's divided Difference Interpolation
9. Program in C for representation of Lagrange's Interpolation

Sample List of experiments to be carried out based on the course **CS-216 T**.

1. Design 10 schemas for any organization like : School, College, Hospital, Travel Agency, Bank, Company, Library, Shop etc
2. Draw the Entity Relationship Diagram for above organization.
3. Normalize the above selected schemas as per 1NF, 2NF, and 3NF
4. Solve at least 10 Relational Algebraic Queries.

