



**OFFICE OF THE REGISTRAR :: DIBRUGARH UNIVERSITY :: DIBRUGARH**

Ref. No. DU/DR-A/135<sup>th</sup> AC/Syll.-BCA-Hons.&Res.(1<sup>st</sup> & 2nd Sem.)-CBCS/2025/1104 Date: 28.11.2025

**NOTIFICATION**

As recommended by the meeting of the **Board of Studies (BoS) in Computer Science** held on 28.10.2025 and 132<sup>nd</sup> Meeting of the Under Graduate Board, Dibrugarh University held on 06.11.2025, the 135<sup>th</sup> meeting of the Academic Council, Dibrugarh University held on 17.11.2025 **vide Resolution No. 08** has approved the **Programme Structure and the Syllabus in BCA Programme (BCA with Honours and BCA Honours with Research)** for **Semesters-I and II of Under Graduate Programmes in CBCS** with effect from 2026-2027 academic session.

The syllabus is attached herewith.

Issued with due approval.

*Approved*  
*28/11/25*  
Deputy Registrar (Academic) i/c  
Dibrugarh University

Copy forwarded for kind information and necessary action to:

1. The Hon'ble Vice-Chancellor, Dibrugarh University.
2. The Deans, Dibrugarh University.
3. The Registrar, Dibrugarh University.
4. The Controller of Examinations i/c, Dibrugarh University.
5. The Inspector of Colleges, Dibrugarh University.
6. The Heads / Chairpersons of the Teaching Departments / Centres of Studies, Dibrugarh University.
7. All the Principals / Directors of the Colleges / Institutions affiliated to / permitted by Dibrugarh University.
8. The Joint / Deputy Controller of Examinations – 'B', 'C' & 'A', Dibrugarh University.
9. The Senior Programmer, Dibrugarh University with a request to upload the Notification along with attached Programme Structure and syllabus on the DU website.
10. File.

*Approved*  
*28/11/25*  
Deputy Registrar (Academic) i/c  
Dibrugarh University

**Syllabus for Undergraduate Degree in  
Bachelor of Computer Applications (BCA),  
Bachelor of Computer Applications (Honours) &  
Bachelor of Computer Applications (Honours with  
Research)  
in  
Choice-Based Credit System (CBCS)  
(With effect from the session 2026-2027)**



**DIBRUGARH UNIVERSITY  
DIBRUGARH -786004  
ASSAM**

(Recommended by the BoS in Computer Science in its  
meeting held on 28/10/2025)

## Course Preamble

The Bachelor of Computer Application programme is designed to provide students with a comprehensive understanding of computer science and its various subfields. The programme aims to equip students with the necessary skills to design, develop and maintain computer systems and software applications, and to prepare them for careers in the rapidly evolving field of computer science. The programme focuses on developing problem-solving skills using computer programs, database management systems, computer networks, algorithms and data structures, cloud computing, artificial intelligence, and related areas. The programme also emphasizes the development of communication, analytical, and critical thinking skills.

## Introduction

The Bachelor of Computer Applications programme is a four-year undergraduate programme designed to provide students with a strong foundation in computer science and its applications. The programme is structured to ensure that students develop a comprehensive understanding of the principles and practices of computer science and its various subfields. The programme comprises of eight semesters, and students are allowed different exit points with the following certification/diploma/degree:

- i.** Students on exit after one year of the course shall be awarded Undergraduate Certificate (in Computer Applications) after securing the requisite **40** Credits in Semesters I and II.
- ii.** Students on exit after second years of the course shall be awarded Undergraduate Diploma (in Computer Applications) after securing the requisite **80** Credits on completion of Semester IV.
- iii.** Students on exit after three years of the course shall be awarded Bachelor of Computer Applications, BCA (3years) after securing the requisite **120** Credits on completion of Semester VI.
- iv.** Students on exit after four years of the course shall be awarded BCA (Honours) or BCA (Honours with Research) after securing the requisite **160** Credits on completion of Semester VIII.

## **Aim**

The aim of the Bachelor of Computer Application programme is to provide students with a comprehensive understanding of computer science and its various subfields. The programme aims to equip students with the necessary skills to design, develop and maintain computer systems and software applications, and to prepare them for careers in the rapidly evolving field of computer science and applications. The programme also aims to develop communication, analytical, and critical thinking skills

## **Graduate Attributes**

Upon completion of the programme, graduates will possess the following attributes:

- An in-depth understanding of computer science and its various subfields.
- The ability to design, develop, and maintain computer systems and software applications.
- Strong problem-solving and analytical skills.
- Effective communication and teamwork skills.
- The ability to think critically and creatively.
- An understanding of ethical and professional issues related to computer science

## **Programme Educational Objectives (PEOs)**

After completion of this programme, the graduates will be able to

**PEO1:** Compete on a global platform to pursue their professional career in Computer Science and Applications.

**PEO2:** Pursue higher education and/or engage in continuous up gradation of their professional skills.

**PEO3:** Communicate effectively and will demonstrate professional behavior while working in diverse team.

**PEO4:** Demonstrate concern for society and environment.

## **Programme Outcomes (POs)**

### **P01. Critical Thinking and Problem Solving**

Demonstrate the ability to think critically and analytically by identifying problems, formulating appropriate solutions, and evaluating assumptions through logical reasoning and computational thinking within diverse computing and societal contexts.

### **P02. Effective Communication**

Communicate effectively through oral, written, and digital means, including documentation, presentations, and software specifications. Express ideas clearly in English and one Indian language across professional and social contexts using appropriate tools and media.

### **P03. Teamwork and Social Interaction**

Function effectively as a member or leader in diverse teams, respecting viewpoints, resolving conflicts constructively, and contributing to collaborative computing projects and interdisciplinary tasks.

### **P04. Responsible Citizenship and Digital Ethics**

Exhibit civic responsibility, digital citizenship, and commitment to inclusive and equitable national development. Participate in community and professional engagements with awareness of ethical, legal, and social issues in the digital era.

### **P05. Ethical and Professional Values**

Recognize and uphold ethical principles and professional responsibilities in computing practices, including data privacy, intellectual property rights, and responsible AI use.

### **P06. Environmental and Social Sustainability**

Understand environmental and societal impacts of computing technologies and demonstrate a commitment to sustainable and inclusive development using IT solutions.

### **P07. Self-Directed and Life-long Learning**

Pursue continuous learning and professional development in computing and related fields through online platforms, certifications, research, and engagement with evolving technological landscapes.

### **P08. Innovation, Creativity, and Entrepreneurship**

Identify opportunities for innovation and apply creative approaches and emerging technologies to develop entrepreneurial ventures, software solutions, and digital services that generate economic and societal value.

## **Programme Specific Outcomes (PSOs)**

After the successful completion of BCA programme, the learners are expected to

**PSO1:** Impart the fundamental principles and methods of computer science to a wide range of applications.

**PSO2:** Develop and deploy applications of varying complexity using the acquired knowledge in various programming languages, data structures and algorithms, database, networking and artificial intelligence skills.

**PSO3:** To investigate, analyze complex problems by the application of suitable mathematical and research tools, to design Information Technology products and solutions.

**PSO4:** To identify and utilize the state-of-the-art tools and techniques in the design and development of software products and solutions.

**PSO5:** Ability to identify, interpret, analyze and design solutions using appropriate algorithms of varying complexities in the field of communication technology.

**GENERAL PROGRAMME  
STRUCTURE**

**AND**

**CREDIT DISTRIBUTION**

## SEMESTER WISE CREDIT DISTRIBUTION

SEMESTER WISE CREDIT DISTRIBUTION OF BCA [BCA (HONOURS) AND BCA (HONOURS WITH RESEARCH)] PROGRAMME:

Semester	Core Courses	Ability Enhancement Courses	Multi-Disciplinary Elective course	Value added Courses	Skill Enhancement courses	Discipline Specific Elective	Total
<b>BCA</b>							
I	9	2	2	2	5	-	<b>20</b>
II	12	-	-	2	<b>6</b>	-	<b>20</b>
III	11	0	0	2	4	3	20
IV	15	0	0	0	2	3	20
V	0	0	0	0	5	15	20
VI	4	2	0	0	4	10	20
<b>BCA(Honours)</b>							
VII	4	0	3	0	5	8	20
VIII					8	12	20
<b>BCA(Honours with Research)</b>							
VII	12					8	20
VIII	20						20

## CATEGORY-WISE DISTRIBUTION

Description	Core Courses	Ability Enhancement Courses	Multi-Disciplinary Elective course	Value added Courses	Skill Enhancement courses	Discipline Specific Elective	Total
BCA	51	4	2	6	26	31	120
BCA (Honours)	55	4	5	6	39	51	160
BCA (Honours with Research)	83	4	2	6	26	39	160

<b>3 Years BCA Programme</b>	<b>Total Credits=120</b>
<b>4 Years BCA (Honours) and (BCA Honours with Research)</b>	<b>Total Credits=160</b>

## Semester wise Structure and Curriculum for UG Course in BCA

### SEMESTER I

S. No.	Course Code	Course Title	L	T	P	Credit
3 WEEKS COMPULSORY INDUCTION PROGRAM (UHV-I)						
1	CC101	Mathematics Foundations to Computer Science- I	3	1	0	4
2	CC102	Computer Fundamentals and Architecture	3	0	4	5
3	AEC101	General English	1	1	0	2
4	VAC101	Environmental Science and sustainability	2	0	0	2
5	SEC101	Problem Solving Techniques	3	0	4	5
6	MDE101	Indian Knowledge System	2	0	0	2
7	BCA-Audit-I	Foundation of Mathematics-I**	Audit Course			
TOTAL						20

### SEMESTER II

S. No.	Course Code	Course Title	L	T	P	Credit
1	CC103	Mathematics Foundations to Computer Science-II	3	1	0	4
2	CC104	Data Structures	3	0	2	4
3	CC105	Operating Systems	3	0	2	4
4	VAC102	Indian Constitution	2	0	0	2
5	SEC102	Object Oriented Programming using Java	3	0	2	4
6	SEC103	Web Technologies	1	0	2	2
7	BCA-Audit-II	Foundation of Mathematics-II**	Audit Course			
TOTAL						20

\*\* The candidates without Mathematics/ Commercial Arithmetic/ Statistics shall have to complete two Audit Courses in Mathematics in the first two Semesters of the BCA Programme.

Students on exit after one year of the course shall be awarded Undergraduate Certificate (in Computer Applications) after securing the requisite 40 Credits in Semesters I and II

Students can choose their specialization i.e. Stream with Discipline Specific Elective [DSE] from Second year onwards as indicated in Annexure –I

### SEMESTER III

S. No.	Course Code	Course Title	L	T	P	Credit
1	CC201	Probability and Statistics	2	0	2	3
2	CC202	Database Management System	3	0	4	5
3	CC203	Software Engineering	2	0	2	3
4	VAC201	Yoga/Sports/NCC/NSS/Disaster Management	0	0	4	2
5	SEC201	Python Programming	2	0	4	4
6	DSE201*	Professional Elective–I	-	-	-	3
TOTAL						20

\*L-T-P for Discipline Electives shall be as mentioned in the respective papers (Annexure I).

### SEMESTER IV

S. No.	Course Code	Course Title	L	T	P	Credit
1	CC204	Entrepreneurship and Startup Ecosystem	1	1	0	2
2	CC205	Computer Networks	3	0	2	4
3	CC206	Design and Analysis of Algorithm	3	0	2	4
4	CC207	Artificial Intelligence	3	0	4	5
5	SEC202	Design Thinking and Innovation	1	1	0	2
6	DSE202*	Professional Elective–II	-	-	-	3
TOTAL						20

\*L-T-P for Discipline Electives shall be as mentioned in the respective papers (Annexure I).

Students on exit after second years of the course shall be awarded Undergraduate Diploma (in Computer Applications) after securing the requisite 80 Credits on completion of Semester IV

### SEMESTER V

S. No.	Course Code	Course Title	L	T	P	Credit
1	DSE301*	Professional Elective–III	-	-	-	5
2	DSE302*	Professional Elective–IV	-	-	-	5
3	DSE303*	Professional Elective–V	-	-	-	5
4	SEC301	Internship I/capstone Project	0	0	10	5
5	SEC302	Major Project [ evaluation in sixth semester]	-	-	-	0
TOTAL						20

\*L-T-P for Discipline Electives shall be as mentioned in the respective papers (Annexure I).

### SEMESTER VI

S. No.	Course Code	Course Title	L	T	P	Credit
1	CC301	Generative AI	2	0	4	4
2	DSE304*	Professional Elective–V	-	-	-	5
3	DSE305*	Professional Elective–VII	-	-	-	5
4	AEC301	Soft Skills	1	1	0	2
5	SEC302	Major Project [Initiated in 5th Semester]	0	0	8	4
TOTAL						20

\*L-T-P for Discipline Electives shall be as mentioned in the respective papers (Annexure I).

Students on exit after three years of the course shall be awarded Bachelor of Computer Applications (BCA) (3 years) after securing the requisite 120 Credits on completion of Semester VI.

**Minimum eligibility criteria for opting the course in the fourth year will be as follows:**

1. **BCA(Honours): BCA Degree**
2. **BCA(Honours with Research): BCA Degree**

### **SEMESTER VII-BCA (Honours)**

#### **1. Specialization–Data Science**

<b>S. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
1	CC401	Python for Data Science	3	-	2	4
2	MDE401	Advanced Statistical Methods for Data Science	2	0	2	3
3	DSE401*	Professional Elective – VIII	-	-	-	4
4	DSE402*	Professional Elective–IX	-	-	-	4
5	SEC401	Dissertation work [evaluation in Eight Semester]	-	-	-	-
6	SEC402	Summer Internship II	0	0	10	5
<b>TOTAL</b>						<b>20</b>

\*L-T-P for Discipline Electives shall be as mentioned in the respective papers (Annexure I).

#### **2. Specialization– Artificial Intelligence & Machine Learning**

<b>S. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
1	CC401	Optimization of ML	3	-	2	4
2	MDE401	Social Network Analysis	2	-	2	3
3	DSE401*	Professional Elective–VIII	-	-	-	4
4	DSE402*	Professional Elective–IX	-	-	-	4
5	SEC401	Dissertation work [evaluation in Eight semester]	-	-	-	-
6	SEC402	Summer Internship II	0	0	10	5
<b>TOTAL</b>						<b>20</b>

\*L-T-P for Discipline Electives shall be as mentioned in the respective papers (Annexure I).

### 3. Specialization–Wireless Communication

S. No.	Course Code	Course Title	L	T	P	Credit
1	CC401	Simulation of Wireless Communication Systems	3	-	2	4
2	MDE401	Information theory and coding	2	0	2	3
3	DSE401*	Professional Elective–VIII	-	-	-	4
4	DSE402*	Professional Elective–IX	-	-	-	4
5	SEC401	Dissertation work [evaluation in Eight semester]	-	-	-	-
6	SEC402	Summer Internship II	0	0	10	5
TOTAL						20

\*L-T-P for Discipline Electives shall be as mentioned in the respective papers (Annexure I).

### SEMESTER VIII- BCA (Honours)

S. No.	Course Code	Course Title	L	T	P	Credit
1	DSE403*	Professional Elective–X	-	-	-	5
2	DSE404*	Professional Elective–XI	-	-	-	5
3	DSE405*	Professional Elective–XII	-	-	-	2
4	SEC401	Dissertation work [Started in Seventh semester]	0	0	16	8
TOTAL						20

\* L-T-P for Discipline Electives shall be as mentioned in the respective papers (Annexure I).

Students on exit after four years of the course shall be awarded BCA (Honours) (4 years) after securing the requisite 160 Credits on completion of Semester VIII.

### SEMESTER VII- BCA (Honours with Research)

S. No.	Course Code	Course Title	L	T	P	Credit
1	CC401	Advanced Data Analysis Tools	2	0	4	4
2	CC402	Research Methodology	2	2	0	4
3	CC403	Research Internship Report and Viva-Voce	0	0	8	4
4	DSE402*	Professional Elective-IX	-	-	-	4
5	DSE403*	Professional Elective-X	-	-	-	4
TOTAL						20

\* L-T-P for Discipline Electives shall be as mentioned in the respective papers (Annexure I).

### SEMESTER VIII-BCA-(Honours with Research)

S. No.	Course Code	Course Title	L	T	P	Credit
1	SEC401	Dissertation (For Research Track)*	-	-	-	20
TOTAL						20

\*The Dissertation work will start from the beginning of fourth year of BCA( Honours with Research) Programme.

Students of Fourth Year shall be assessed for Project Work and Research Internship Report and Viva -Voce and Dissertation (For Research Track).

Students on exit after four years of the course shall be awarded BCA (Honours with Research) (4 years) after securing the requisite 160 Credits on completion of Semester VIII.

## ANNEXURE -I

### Streams with Discipline-Specific Electives (DSE)

#### 1. Data Science

Sl.No	Semester	Course Code	Professional Elective
1	III	DSE201	Basics of Data Analytics using Spreadsheet
2	IV	DSE202	Data Visualization
3	V	DSE301	Introduction to Data Science
4	V	DSE302	Time Series Analysis
5	V	DSE303	Machine Learning
6	VI	DSE304	Big Data Analytics
7	VI	DSE305	Exploratory Data Analysis
8	VII	DSE401	Business Intelligence & Analytics
9	VII	DSE402	Data Mining & Warehousing
10	VIII	DSE403	Advanced Data Visualization
11	VIII	DSE404	Cloud Computing for Data Analytics
12	VIII	DSE405	Data Security & Privacy

#### 2. Artificial Intelligence & Machine Learning

Sl.No	Semester	Course Code	Professional Elective
1	III	DSE201	Feature Engineering
2	IV	DSE202	Introduction to ML
3	V	DSE301	Neural Network
4	V	DSE302	Digital Image Processing
5	V	DSE303	Natural Language Processing
6	VI	DSE304	Deep Learning for Computer Vision
7	VI	DSE305	Predictive Analysis
8	VII	DSE401	Explainable AI
9	VII	DSE402	Evolutionary Algorithm
10	VIII	DSE403	Speech Recognition
11	VIII	DSE404	Augmented Reality & Virtual Reality
12	VIII	DSE405	Security aspects of ML

### 3. Wireless Communication

Sl.No	Semester	Course Code	Professional Elective
1	III	DSE201	Introduction to data communication
2	IV	DSE202	Advanced Computer Network
3	V	DSE301	Network programming
4	V	DSE302	Wireless communication
5	V	DSE303	Cryptography
6	VI	DSE304	Cyber security
7	VI	DSE305	Network administration
8	VII	DSE401	Wireless sensor network
9	VII	DSE402	Mobile Adhoc Networks
10	VIII	DSE403	Software defined radio and cognitive radio
11	VIII	DSE404	AI & ML in wireless communications
12	VIII	DSE405	AI & ML in mobile network security

### 4. Full Stack Development

Sl.No	Semester	Course Code	Professional Elective
1	III	DSE201	Web Programming-I
2	IV	DSE202	Web Programming-II

# **Syllabus of Semester I**

<b>Course Code:</b> CC101	<b>Course Title:</b> Mathematics Foundation to Computer Science-I	<b>3L:1T:0P</b>	<b>4 Credits</b>
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**Distribution of Marks: End-Sem: 60 TH, In-Sem: 40 TH**

## Course Objectives

**CO1:** Provide a basic understanding of fundamental mathematical concepts such as sets, functions, matrix algebra, and discrete mathematics.

**CO2:** This course enables the students to use mathematical models and techniques to analyze and understand problems in computer science.

**CO3:** This course demonstrates how the mathematical principles give succinct abstraction of computer science problems and help them to efficiently analyze.

## Course Content:

### UNIT I: Set, Relation and Function (CO1, CO2) 15 marks

Set, Cartesian Products, Relations on a Set, Properties of Relations, Types of Relations, Equivalence relation and partition on set, Closures of Relations, Warshall's algorithm.

Functions, properties of functions, Some useful functions for Computer Science: Exponential and Logarithmic functions, Polynomial functions, Ceiling and Floor functions.

### UNIT II: Counting and Recurrence Relation (CO1, CO2, CO3) 15 marks

Basics of counting, Pigeonhole principle, permutation, combination, Binomial coefficients, Binomial theorem. Recurrence relations, modeling recurrence relations with examples, like Fibonacci numbers, the tower of Hanoi problem.

### UNIT III: Elementary Graph Theory (CO1, CO2, CO3) 15 marks

Basic terminologies of graphs connected and disconnected graphs, sub graph, paths and cycles, complete graphs, digraphs, weighted graphs, Euler and Hamiltonian graphs. Trees, properties of trees, concept of spanning tree. Planar graphs. Definitions and basic results on the topics mentioned.

### UNIT IV: Matrix Algebra (CO1, CO2, CO3) 15 marks

Types of matrices, algebra of matrices—addition, subtraction, and multiplication of matrices, determinant of a matrix, symmetric and skew-symmetric matrices, orthogonal matrix, rank of a matrix, inverse of a matrix, applications of matrices to solve system of linear equations, Eigen values and Eigen vectors.

## Modes of In-Semester Assessment: (40 Marks)

- Two Internal Examination 20 Marks
- Others 20 Marks
  - Quiz
  - Seminar Presentation
  - Assignment

### Text Books

1. Garg, Reena, Engineering Mathematics, Khanna Book Publishing company, 2024.  
(AICTE Recommended Textbook)
2. Garg, Reena, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2023.
3. Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6<sup>th</sup> Edition, Pearson Education, 2015.
4. Deo Narsingh, Graph Theory with Application to Engineering and Computer Science, Prentice Hall, India, 1979.
5. Vasishtha A.R. and Vasishtha A.K., Matrices, Krishna Prakashan, 2022.

### Reference Books

1. Grimaldi Ralph P. and Ramana B. V., Discrete and Combinatorial Mathematics: An Applied Introduction, Fifth Edition, Pearson Education, 2007.
2. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019.
3. West Douglas B., Introduction to Graph Theory, Second Edition, Pearson Education, 2015

### Web Resources

1. <https://nptel.ac.in/courses/106103205>
2. <https://nptel.ac.in/courses/111101115>

### CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	H	M	M	L	L	M	M	M
CO2	H	M	M	L	L	M	M	L
CO3	H	M	S	L	L	M	M	M

S: Strong, M: Medium, L: Low

<b>Course Code:</b> <b>CC102</b>	<b>Course Title:</b> <b>Computer Fundamentals and Architecture</b>	<b>3L:0T:4P</b>	<b>5 Credits</b>
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**Distribution of Marks: End-Sem: 60(45 TH + 15 PR), In-Sem: 40(30 TH + 10 PR)**

### **Course Objectives**

- C01: To understand the fundamentals of computer and Binary Number System.  
 C02: To learn the implementation of Combinational Circuit.  
 C03: To learn the implementation of Sequential Circuit.  
 C04: To understand the Organization of basic computers.  
 C05: To understand the concept of Parallel Processing.  
 C06: To understand the concept of memory organization.

### **Course Content:**

#### **Unit I : (CO1,CO2)**

**9 Marks**

Brief history of development of computers, types of computers, generations of computers.  
 Basic components of computer system, Input devices, output devices, storage devices.  
 Types of software, system software and application software, Computer Virus

#### **UNIT-II (CO1, CO4)**

**9 Marks**

Number systems: Decimal, Binary, Octal, Hexadecimal, Number System Conversions, Binary Arithmetic, BCD, ASCII, EBCDIC, Excess- 3 Code, The Gray Code.  
 Digital Principles: Definition for Digital signals, Digital logic, Digital computers, Von Neumann Architecture, Boolean Laws and Theorems, K-Map Simplifications, Don't Care Conditions, SOP and POS.

#### **UNIT-III (CO1, CO4)**

**9 Marks**

Combinational Circuits: Half Adder and Full Adder, Subtractor, Decoders, Encoder, Multiplexer, Demultiplexer.  
 Sequential Circuits: Flip-Flops, Registers and Counters.

#### **UNIT-IV (CO2, CO3)**

**9 Marks**

Basic Computer Organization and Design: Instruction Codes, Computer Instructions cycle.  
 Central Processing Unit : Introduction, General Register Organization, Stack Organization, Reduced Instruction Set Computer(RISC), RISC Vs CISC.

#### **UNIT-V (CO4, CO5)**

**9 Marks**

I/O Organization: Input-Output Organization: Peripheral Devices, Computer buses, Modes of Transfer, Priority Interrupt, Direct memory Access,  
 Memory Organization: Primary Memory, Secondary memory, Cache Memory, Virtual Memory

### **Modes of In-Semester Assessment:**

**(40 Marks)**

- One Internal(TH) Examination **10 Marks**
- One Internal(PR) Examination **10 Marks**
- Others **20 Marks**
  - Quiz
  - Seminar Presentation
  - Assignment

### Text Books

1. Donald P Leach, Albert Paul Malvino, Goutam Saha, Digital Principles & Applications, Tata McGraw Hill Education Private Limited, 2011 Edition.
2. M. Morris Mano, Computer System Architecture, Pearson/Phi, Third Edition.

### Reference Books

- 1 William Stallings, Computer Organization and Architecture, Pearson/PHI, 6<sup>th</sup> Edition,
- 2 Andrew S. Tanenbaum, Structured Computer Organization, PHI/Pearson, 4<sup>th</sup> Edition,
- 3 M.V. Subramanyam, Switching Theory and Logic Design, Laxmi Publications (P) Ltd.
- 4 I k vinderpal Singh, Computer Organization Architecture, Khanna Book Publishing.

### CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	H	M	L	L	L	L	M	L
CO2	H	L	L	L	L	L	L	L
CO3	H	L	L	L	L	L	L	L
CO4	H	M	L	L	L	L	M	M
CO5	H	L	L	L	L	L	L	M
CO6	H	L	L	L	L	L	L	L

S: Strong, M: Medium, L: Low

### Suggestive Laboratory Experiments:

1. Application software-word processing, spread sheet, presentation graphics.
2. Verify logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and buffer gates.
3. To verify De- Morgan's theorem for 2 variables
4. Design and test of an S-R flip-flop using NAND/NOR gate.
5. Convert BCD to Excess-3 code using NAND gate
6. To Convert Binary to Grey Code
7. Verification of Truth Tables of J-K Flip-Flop using NAND/NOR gate
8. Realize Decoder and Encoder circuit using Basic Gates.
9. Design and implement the 4:1 MUX using gates.
10. Design and verify operation of half adder and full adder.
11. Design and verify operation of half subtractor.
12. Design and Implement a 4 bit shift register using Flip flops.
13. Implement Boolean function using logic gates in both SOP and POS
14. Design and Implement a 4 bit synchronous counter.
15. Design and verify 4 bit asynchronous counter.

## Hardware

1. Familiarize the computer system layout: marking positions of SMPS, motherboard, FDD, HDD, CD, DVD and add on cards.
2. Identify the Computer Name and Hardware Specification (RAM capacity, Processor type, HDD, 32 bit/ 64 bit)
3. Identify and Troubleshoot the problems of RAM, SMPS and motherboard
4. Configure BIOS settings- disable and enable USB and LAN
5. Adding additional RAM to the system.(expanding RAM size).
6. To Study mother board layout of a system.
7. Demonstrate the assembly of a PC
8. Demonstration of various ports: CPU, VGA port, PS/2 (keyboard, mouse) ,USB, LAN,Speaker.
9. Install and configure windows OS.
10. To study the installation of Printer and trouble shooting.

<b>Course Code:</b> AEC101	<b>Course Title:</b> General English	<b>1L:1T:0P</b>	<b>2 Credits</b>
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**Distribution of Marks: End- Sem: 30 TH, In-Sem: 20 TH**

**Course Objectives:**

**CO1:** To provide learning environment to practice listening, speaking, reading and writing skills.

**CO2:** To assist the students to carry on the tasks and activities through guided instructions and materials.

**CO3:** To effectively integrate English language learning with employability skills and training.

**CO4:** To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

**Course Content:**

**Unit-I: Vocabulary Building (CO1)**

**6 marks**

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign language in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

**Unit-II: Basic Writing Skills (CO1, CO2)**

**6 marks**

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

**Unit-III: Identifying Common Errors in Writing (CO2, CO3)**

**6 marks**

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies

**Unit-IV: Nature and Style of sensible Writing (CO2, CO3, CO4)**

**6 marks**

Describing, Defining, Classifying, providing examples or evidence, writing introduction and conclusion, Module V: Writing Practices, Comprehension, Précis Writing, Essay Writing

**Unit-V: Oral Communication (CO1, CO4)**

**6 marks**

(This Module involves interactive practice sessions in Language Lab)

Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

**Modes of In-Semester Assessment:**

**(20 Marks)**

- Two Internal Examination -
- Others -
  - Quiz
  - Seminar Presentation
  - Assignment

**15 Marks**

**5 Marks**

**Text/Reference Books:**

1. AICTE's Prescribed Textbook: Communication Skills in English (with Lab Manual), Anjana Tiwari, Khanna Book Publishing Co., 2023.
2. Effective Communication Skills. KulBhushan Kumar, Khanna Book Publishing, 2022.
3. Practical English Usage. Michael Swan. OUP. 1995.
4. Remedial English Grammar. F.T. Wood. Macmillan. 2007
5. On Writing Well. William Zinsser. Harper Resource Book. 2001
6. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
7. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011. 8. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

**Alternative NPTEL/SWAYAM Course:**

S.No.	NPTEL/SWAYAM Course Name	Instructor	Host Institute
1	English language for competitive exams	Prof. Ayshaiqbal	IITMADRAS
2	Technical English for engineers	Prof. Ayshaiqbal	IITM

Course Outcomes: The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

**CO-PO Mapping**

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	M	L	L	M	L	M	L
CO2	S	M	M	L	M	L	S	L
CO3	S	S	M	L	M	L	L	L
CO4	S	M	L	L	M	L	L	L

S: Strong, M: Medium, L: Low

<b>Course Code:</b> <b>VAC101</b>	<b>Course Title:</b> <b>Environmental Science and sustainability</b>	<b>2L:0T:0P</b>	<b>2 Credits</b>
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**Distribution of Marks: End- Sem: 30 TH, In-Sem: 20 TH**

**Course Objectives:**

**CO1:** This course aims to familiarize students with basic environmental concepts, their relevance to business operations, and forthcoming sustainability challenges.

**CO2:** This course will equip students to make decisions that consider environmental consequences.

**CO3:** This course will enable future business graduates to become environmentally sensitive and responsible managers.

**Course Content:**

**Unit 1: Understanding Environment, Natural Resources, and Sustainability (CO1) 8 Marks**

Fundamental environmental concepts and their relevance to business operations; Components and segments of the environment, the man-environment relationship, and historical environmental movements. Concept of sustainability; Classification of natural resources, issues related to their overutilization, and strategies for their conservation. Sustainable practices in managing resources, including deforestation, water conservation, energy security, and food security issues. The conservation and equitable use of resources, considering both intergenerational and intergenerational equity, and the importance of public awareness and education.

**Unit II: Ecosystems, Biodiversity, and Sustainable Practices (CO1, CO2) 6 Marks**

Various natural ecosystems, learning about their structure, functions, and ecological characteristics. The importance of biodiversity, the threats it faces, and the methods used for its conservation. Ecosystem resilience, homeostasis, and carrying capacity, emphasizing the need for sustainable ecosystem management. Strategies for in situ and ex situ conservation, nature reserves, and the significance of India as a mega diverse nation.

**Unit III: Environmental Pollution, Waste Management, and Sustainable Development (CO2, CO3) 8 Marks**

Various types of environmental pollution, including air, water, noise, soil, and marine pollution, and their impacts on businesses and communities. Causes of pollution, such as global climate change, ozone layer depletion, the greenhouse effect, and acid rain, with a particular focus on pollution episodes in India. Importance of adopting cleaner technologies; Solid waste management; Natural and man-made disasters, their management, and the role of businesses in mitigating disaster impacts.

**Unit IV: Social Issues, Legislation, and Practical Applications (CO1, CO2, CO3) 8 Marks**

Dynamic interactions between society and the environment, with a focus on sustainable development and environmental ethics. Role of businesses in achieving sustainable development goals and promoting responsible consumption. Overview of key environmental legislation and the judiciary's role in environmental protection, including the Water (Prevention and Control of Pollution) Act of 1974, the Environment (Protection) Act of 1986, and the Air (Prevention and Control of Pollution) Act of 1981. Environmental justice, environmental refugees, and the resettlement and rehabilitation of affected populations; Ecological economics, human population growth, and demographic changes in India.

**Modes of In-Semester Assessment:**

- Two Internal Examination -
- Others -
  - Quiz
  - Seminar Presentation
  - Assignment

**(20 Marks)****15 Marks****5 Marks****Text Books :**

1. Poonia, M.P. Environmental Studies (3rd ed.), Khanna Book Publishing Co.
2. Bharucha, E. Textbook of Environmental Studies (3rd ed.) Orient Blackswan Private Ltd.
3. Dave, D., & Katewa, S. S. Text Book of Environmental Studies. Cengage Learning India Pvt Ltd.
4. Rajagopalan, R. Environmental studies: from crisis to cure (4th ed.). Oxford University Press.
5. Miller, G.T. & Spoolman S. Living in the Environment. (20th ed.).
6. Cengage.Basu, M., & Xavier Savarimuthu, S. J. Fundamentals of environmental studies. Cambridge University Press.
7. Roy, M. G. Sustainable Development: Environment, Energy and Water Resources. Ane Books.
8. Pritwani, K. Sustainability of business in the context of environmental management. CRC Press.
9. Wright, R.T. & Boorse, D.F. Environmental Science: Toward A Sustainable Future (13th ed.).Pearson.

**Web links:**

1. <https://www.ourplanet.com>
2. <https://www.undp.org/content/undp/en/home/sustainable-development-goals.html>
3. [www.myfootprint.org](http://www.myfootprint.org)
4. <https://www.globalchange.umich.edu/globalchange1/current/lectures/klings/ecosystem>
5. <https://www.ecosystem.html>

**CO-PO Mapping**

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	M	L	L	M	L	L	L
CO2	S	M	M	L	M	L	L	L
CO3	S	S	M	L	M	L	L	L

<b>Course Code:</b> <b>SEC101</b>	<b>Course Title:</b> <b>Problem Solving Techniques</b>	<b>3L:0T:4P</b>	<b>5 Credits</b>
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**Distribution of Marks: End-Sem: 60( 45 TH + 15 PR), In-Sem: 40( 30 TH + 10 PR)**

### **Course Objectives**

**CO1:** Understand basic terminology of computers, problem solving, programming Languages and their evolution

**CO2:** Create specific action from problem requirements by asking questions to disambiguate the requirement statement.

**CO3:** Design the solution from specification of a problem and write pseudo code of the algorithm using basic building blocks or structured programming constructs (Sequence, Selection and Repetition statement).

**CO4:** Translate an algorithm into a C computer program

**CO5:** Testing and analyzing programs using debugging tools.

### **Course Content:**

#### **UNIT I: (CO1, CO2)**

**9 Marks**

Problems and Problem Instances, Generalization and Special Cases, Types of Computational Problems, Classification of Problems, Analysis of Problems, Solution Approaches. Algorithm Development, Analysis of Algorithm, Efficiency, Correctness, Standard Algorithm Format.

Pseudo code and Flowcharts. Definition and Characteristics.

Role of Data Structures in Problem Solving, Problem-Solving Steps (Understand the Problem, Plan, Execute, And Review), Breaking the Problem into Sub problems, Input/output Specification, Input Validation, Pre and Post Conditions.

#### **UNIT II :( CO2, CO3, CO4)**

**9 Marks**

Structured Programming Concepts: Sequence (Input/output/Assignment), Selection (If, If-Else) And Repetition (For, While, Do-While) Statements, Control Structures. Different Kinds of Repetitions: Entry Controlled, Exit Controlled, Counter Controlled, Definite, Indefinite and Sentinel-Controlled Repetitions. Problems Involving Iteration and Nesting: Displaying Different Patterns and Shapes Using Symbols and Numbers, Generating Arithmetic and Geometric Progression, Fibonacci and Other Sequences, Approximate Values For  $\pi$ ,  $\sin(x)$ ,  $\cos(x)$ , etc. Using Taylor Series.

#### **UNIT III :(CO2,CO3, CO4)**

**9 Marks**

C Language: Introduction To Programming Languages, Different Generations of Programming Languages. Typed Vs Type-less Programming Languages, History of C Language, Data Types, An Empty C Program. Input (scanf()), Output (printf()) Statements, Assignment, Arithmetic, Relational and Logical Operators. If, If-Else Statements, For, While, Do-While Statements. else-if Ladder, switch Case, Increment/Decrement Operators, break and continue Statements. Translating Pseudo code/Algorithm to C Program. Incremental Compilation and Testing of The C Program. Simple Problems Involving Input, Output, Assignment Statement, Selection and Repetition. Good Coding Practices.

**UNIT IV: ( CO2, CO3, CO4)****9 Marks**

Problems on Numbers: Extracting Digits of a Number (Left to Right and Right to Left), Palindrome, Prime Number, Prime Factors, Amicable Number, Perfect Number, Armstrong Number, Factorial, Converting Number from One Base to Another. Statistics (Maximum, Minimum, Sum and Average) on a Sequence of Numbers which are Read using Sentinel- Controlled Repetition using only a few Variables.

**UNIT V: ( CO2, CO3, CO4, CO5)****9 Marks**

Modular Programming: Top-Down and Bottom-Up Approaches to Problem Solving. Recursion. Problems on Arrays: Reading and Writing of Array Elements, Maximum, Minimum, Sum, Average, Median and Mode. Sequential and Binary Search. Anyone Sorting Algorithm. Matrix Operations. C Language: Function Definition and Declaration (Prototype), Role of Return Statement, One Dimensional and Two-Dimensional Arrays. String Functions. Other Operators, Operator Precedence and Associativity, Debugging.

**Modes of In-Semester Assessment:****(40 Marks)**

- One Internal(TH) Examination
- One Internal(PR) Examination
- Others -
  - Quiz
  - Seminar Presentation
  - Assignment

**10 Marks****10 Marks****20 Marks****Text Books**

1. Venkatesh, NagarajuY, Practical C Programming for Problem Solving, Hanna Book Publishing Company, 2024.
2. AICTE's Programming for Problem Solving (with Lab Manual), Khanna Book Publishing Company, 2024.
3. Harvey Deitel and Paul Deitel,C How to Program, 9<sup>th</sup> edition, Pearson India,2015.
4. R G Dromey,How to Solve It by Computer.

**Reference Books**

1. Brian W.Kernighan and Dennis Ritchie, The C Programming Language, 2nd edition, Pearson, 2015.
2. Jeri Hanly and Elliot Koffman, Problem Solving and Program Design in C, 8<sup>th</sup> edition, Pearson, 2015.

**CO-PO Mapping**

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	M	L	L	M	L	M	L
CO2	S	M	M	L	M	L	S	L
CO3	S	S	M	L	M	L	S	M
CO4	S	M	L	L	M	L	S	M
CO5	S	M	M	M	M	L	S	M

S: Strong, M: Medium, L: Low

<b>Course Code:</b> <b>MDE101</b>	<b>Course Title:</b> <b>Indian Knowledge System</b> ( Indian Science and Technology )	<b>2L:0T:0P</b>	<b>2 Credits</b>
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**Distribution of Marks: End- Sem: 30 TH, In-Sem: 20 TH**

### Course Objectives

**CO1:** To familiarize learners with major sequential development in Indian science, engineering and technology.

**CO2:** To review & strengthen the ancient discovery and research in physics, chemistry, maths, metallurgy, astronomy, architecture, textile, transport, agriculture and Ayurveda etc.

**CO3:** To help students to trace, identify and develop the ancient knowledge systems to make meaningful contribution to development of science today

**CO4:** To help to understand the apparently rational, verifiable and universal solution from ancient Indian knowledge system for the scientific, technological and holistic development of physical, mental and spiritual wellbeing.

### Course Contents:

#### Unit I: Introduction to Indian Knowledge System (CO1)

**6 Marks**

Caturdaśa Vidyāsthānam, 64 Kalas, Shilpa Śāstra, Four Vedas, Vedāṅga, Indian Philosophical Systems, Vedic Schools of Philosophy, Non-Vedic schools of Philosophical Systems, Puranas, Itihasa (Ramayana, Mahabharata), Niti Sastras, Subhasitas.

#### Unit II: Foundation concept for Science & Technology (CO1, CO2)

**6 Marks**

Linguistics & Phonetics in Sanskrit, Computational concepts in Astadhyayi Importance of Verbs, Role of Sanskrit in Natural Language Processing, Number System and Units of Measurement, concept of zero and its importance, Measurements for time, distance and weight.

#### Unit I: Indian Traditional Knowledge; Science and Practices (CO1, CO2, CO3)

**6 Marks**

Introduction to the Science and way of doing science and research in India, Ancient Science in Intra & Inter Culture Dialogue & co evolution. Traditional Ayurveda & plant based medicine, Traditional writing Technology.

#### Unit III: Indian Mathematics in IKS (CO1, CO2, CO3)

**6 Marks**

Indian Mathematics, Great Mathematicians and their contributions, Arithmetic Operations, Geometry, value of  $\pi$ , Trigonometry, Algebra, Chandah Sastra of Pingala,

#### Unit V: Ancient Indian Science (Ayurveda & Yoga) (CO4)

**6 Marks**

Ayurveda for Life, Health and Well-being: Introduction to Ayurveda: understanding Human body and Pancha maha bhuta, the communication between body & mind, health regimen for wellbeing, introduction to yoga (raja yoga, astang yoga, gyan yoga).

### Modes of In-Semester Assessment:

**(20 Marks)**

- Two Internal Examination -
- Others -
  - Quiz
  - Seminar Presentation
  - Assignment

**15 Marks**

**5 Marks**

## References:

1. Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
2. Kapur K and Singh A.K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatvabodh of sankaracharya, Central chinmay mission trust, Bombay, 1995.
3. Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008.
4. SK Das, The education system of Ancient hindus, Gyan publication house, India
5. R P Kulkarni, Glimpese of Indian Engineering and Technology (Ancient & Medieval period, Munshiram Manoharlal Publishers Pvt. Ltd. 2018
6. AK Pathak, Science and Technology in India, Anshika prakashan pratapgarh, 2016
7. PB Sharma, S. Narain, Doctors Scientists and Engineers of Ancient India, Kalpaz Publications 2017
8. NVP, Unithiri, Indian Scientific Traditions (Professor K.N. Neelakantan Elayath

## CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	M	L	L	M	L	L	L
CO2	S	M	M	L	M	L	L	L
CO3	S	S	M	L	M	L	L	L
CO4	S	M	L	L	M	L	L	L

S: Strong, M: Medium, L: Low

<b>Course Code:</b> BCA-Audit-I	<b>Course Title:</b> Foundation of Mathematics-I	<b>Audit Course</b>
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**Distribution of Marks: End- Sem: 60 TH, In-Sem: 40 TH**

**Course Objectives:**

**CO1:** Through this course, students will understand and apply the Principle of Mathematical Induction.

**CO2:** Understand the Binomial Theorem and be able to apply it in expansions

**CO3:** This course demonstrates the understanding and application of limits and derivatives to basic functions.

**CO4:** This course develops understanding of statistical methods for data representation.

### **PART : A**

**Distribution of Marks: End- Sem: 30 TH, In-Sem: 20 TH**

#### **Unit 1: Principle of Mathematical Induction(CO1)**

**10Marks**

Processes of proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers, The principle of mathematical induction and simple its applications.

#### **Unit 2: Binomial Theorem (CO2)**

**10 Marks**

History, statement and proof of the binomial theorem for positive integral indices, Pascal's triangle, general and middle term in binomial expansion, simple applications.

#### **Unit 3: Limits, Derivatives and Integration (CO3)**

**10 Marks**

Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit, Definitions of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions. Concept of Integration, Integration as inverse process of differentiation, basic examples.

#### **Text and Reference Books**

1. C.V. Sastry , Rakesh Nayak, " A Textbook on Discrete Mathematics" , 1<sup>st</sup> Edition, 2020, Wiley India Pvt Ltd
2. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", 7<sup>th</sup> Edition, 2017,McGraw Hill Education
3. Bandaru Ramana, "Higher Engineering Mathematics", 1<sup>st</sup> Edition, 2017,McGraw Hill Education
4. H. K. Das, "Advanced Engineering Mathematics", 22<sup>nd</sup> Edition, 2019,S Chand Publishing

### **PART -B**

**Distribution of Marks: End- Sem: 30 TH, In-Sem: 20 TH**

#### **Unit 1: Statistical Representation of Data (CO4)**

**10 Marks**

Diagrammatic representation of data, Frequency distribution, Graphical representation of Frequency Distribution – Histogram, Frequency Polygon, Ogive, Pie-chart etc. Basic idea of Measures of Central Tendencies and Measures of Dispersions, Co-efficient of Variation, Skewness, Kurtosis etc.

**Unit 2: Correlation and Regression (CO4)****10 Marks**

Scatter diagram, Concept of Covariance, Karl Pearson's Coefficient of Correlation, Spearman's Rank Correlation, Idea of simple linear regression.

**Unit 3: Time Series Analysis (CO4)****10 Marks**

Concept of Time Series, Basic applications including methods, Components of time series, Trend, Seasonal variations.

**Text and Reference Books**

1. Das N.G, "Statistical Methods", 4<sup>th</sup> Edition 2012, Tata McGraw Hill
2. Gupta, S.P. "Statistical Methods", 5<sup>th</sup> Edition 2012, S Chand Sons publication
3. Agarwal B.L., "PROGRAMMED STATISTICS", New Age International Publication, 4<sup>th</sup> Edition, 2022.
4. Shukla S.M., Sahai S.P., "Statistical Methods", Sahitya Bhawan, 2<sup>nd</sup> Edition, 2022

**CO-PO Mapping**

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	M	L	L	M	L	L	L
CO2	S	M	M	L	M	L	L	L
CO3	S	S	M	L	M	L	L	L
CO4	S	M	L	L	M	L	L	L

S: Strong, M: Medium, L: Low

# **Syllabus of Semester II**

<b>Course Code:</b> CC103	<b>Course Title:</b> Mathematics Foundation to Computer Science-II	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Distribution of Marks: End-Sem: 60 TH, In-Sem: 40 TH**

**Course Objectives:**

**CO1:** This course helps the students to understand correct lines of arguments and proofs.

**CO2:** This course introduces mathematical techniques that are foundations for understanding advanced computational methods, including numerical methods and optimization.

**CO3:** This course helps the students to understand various problem-solving strategies and methods to tackle both theoretical and practical challenges in computer science.

**Course Content:**

**UNIT I: Logic and Methods of Proofs (CO1, CO3)**

**18 marks**

Propositions, logical operations, construction of truth table, quantifiers, conditional statements, tautology, contradiction, contingency, logical equivalence. Conjunctive Normal Forms (CNF) and Disjunctive Normal Forms (DNF). Methods of proofs: Rules of inference for propositional logic, modus ponens, modus tollens, syllogism, proof by contradiction, Mathematical Induction.

**UNIT II: Algebraic Structures (CO2, CO3)**

**10 marks**

Semi-group, Monoid, Group, Subgroup, Cyclic group.

**UNIT III: Numerical Methods (CO2, CO3)**

**16 marks**

Concept and importance of errors in numerical methods. Solution of algebraic and transcendental equations: Bisection method and Newton-Raphson methods, Numerical Interpolation Formula and Lagrange's formula. Numerical Integration: Trapezoidal rule and Simpson's 1/3 rule. Only formula and problem solving for all the topics mentioned above.

**UNIT IV: Optimization Techniques (CO2, CO3)**

**16 marks**

Linear programming: Introduction, LP formulation, Graphical method for solving LPs with two variables, Special cases in graphical methods, Simplex method, Duality.

Transportation problem: Definition, Linear form, North-west corner method, Least cost method, Vogel's approximation method for finding feasible solution, MODI method for finding optimum solution.

**Modes of In-Semester Assessment:**

**(40 Marks)**

- Two Internal Examination -
- Others -
  - Quiz
  - Seminar Presentation
  - Assignment

**20 Marks**

**20 Marks**

### Text Books

1. Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition, Pearson Education, 2015.
2. Sastry S. S., Introductory Methods of Numerical Analysis, Fifth Edition, PHL, 2022.
3. Taha Hamdy A., Operations Research: An Introduction, Eighth Edition, Pearson Prentice Hall, 2003.
4. S.B. Singh, Discrete Structures, Khanna Book Publishing, 2023 (AICTE Recommended Textbook)

### Reference Books

1. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019.
2. Chakravorty J. G. and Ghosh P. R., Linear Programming and Game Theory, Moulik Library, 2017.
3. Sharma J. K., Operations Research: Theory and Applications, Fourth Edition, Macmillan Publishers, 2007.

### Web Resources

1. <https://nptel.ac.in/courses/111107127>
2. <https://www.math.iitb.ac.in/~siva/si50716/SI507lecturenotes.pdf>

### CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	H	M	L	L	L	M	M	M
CO2	H	M	M	L	L	M	M	M
CO3	H	M	H	L	L	M	M	M

S: Strong, M: Medium, L: Low

<b>Course Code:</b> CC104	<b>Course Title:</b> Data Structures	<b>3L:0T:4P</b>	<b>5 Credits</b>
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**Distribution of Marks: End-Sem: 60(45 TH + 15 PR), In-Sem: 40(30 TH + 10 PR)**

### **Course Objectives**

CO1: Understand the fundamental concepts of Data Structures and their applications.

CO2: Develop problem-solving skills using Data Structures.

CO3: Implement Data Structures using C programming language.

### **Prerequisite:**

1. Programming Fundamentals: Understanding the basic syntax and semantics of C programming language.

2. Problem-Solving Skills: Ability to break down a problem into smaller steps and devise a step-by-step solution, and familiarity with simple algorithms.

### **Course Content:**

#### **UNIT I: (CO1, CO2, CO3)**

**9 Marks**

Introduction and Overview: Definition, Classification, and Operations of Data Structures.

Algorithms: Complexity, Time-Space Tradeoff.

Arrays: Definition and Classification of Arrays, Representation of Linear Arrays in Memory, Operations on Linear Arrays: Traversing, Inserting, Deleting, Searching, Sorting, and Merging. Searching: Linear Search and Binary Search, Comparison of Methods. Sorting: Bubble Sort, Selection Sort, and Insertion Sort. Two-Dimensional Arrays, Representation of

Two-Dimensional Arrays in Memory, Matrices and Sparse Matrices, Multi-Dimensional Arrays.

#### **UNIT II: (CO1, CO2, CO3)**

**9 Marks**

Linked Lists: Definition, Comparison with Arrays, Representation, Types of Linked Lists, Traversing, Inserting, Deleting, and Searching in Singly Linked List, Doubly Linked List, and Circular Linked List. Applications of Linked Lists: Addition of Polynomials.

Hashing and Collision: Hashing, Hash Tables, Types of Hash Functions, Collision, and Collision Resolution with Open Addressing and Chaining.

#### **UNIT III: (CO1, CO2, CO3)**

**9 Marks**

Stacks: Definition, Representation of Stacks using Arrays and Linked List, Operations on Stacks using Arrays and Linked List, Application of Stacks: Arithmetic Expressions, Polish Notation, Conversion of Infix Expression to Postfix Expression, Evaluation of Postfix Expression.

Recursion: Definition, Recursive Notation, Runtime Stack, Applications of Recursion: Factorial of Number, GCD, Fibonacci Series, and Towers of Hanoi.

#### **UNIT IV: (CO1, CO2, CO3)**

**9 Marks**

Queues: Definition, Representation of Queues using Array and Linked List, Types of Queue: Simple Queue, Circular Queue, Double-Ended queue, Priority Queue, Operations on Simple Queues and Circular Queues using Array and Linked List, Applications of Queues.

#### **UNIT V: (CO1, CO2, CO3)**

**9 Marks**

Graphs: Definition, Terminology, Representation, Traversal.

Trees: Definition, Terminology, Binary Trees, Traversal of Binary Tree, Binary Search Tree, Inserting, Deleting, and Searching in Binary Search Tree, Height Balanced Trees: AVL Trees, Insertion and Deletion in AVL Tree.

**Modes of In-Semester Assessment:****(40 Marks)**

- One Internal(TH) Examination
- One Internal(PR) Examination
- Others -
  - Quiz
  - Seminar Presentation
  - Assignment

**10 Marks****10 Marks****20 Marks****Text Books**

1. R. B. Patel, Expert Data Structures with C, Khanna Book Publishing Company, 2023 (AICTE Recommended Textbook)
2. Seymour Lipschutz, Data Structures with C, Schaum's Outlines, Tata McGraw-Hill, 2011.
3. Yashavant Kanetkar, Data Structures Through C, 4<sup>th</sup> Edition, BPB Publications, 2022.

**Reference Books**

1. Reema Thareja, Data Structures Using C, 2<sup>nd</sup> Edition, Oxford University Press, 2014.
2. Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, Fundamentals of Data Structures in C, 2<sup>nd</sup> Edition, Universities Press, 2007.

**Web Resources**

1. Geeks for Geeks- Data Structures Tutorial
2. Khan Academy- Algorithms Course

**CO-PO Mapping**

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	M	M	L	M	L	S	M
CO2	S	S	M	L	M	L	S	S
CO3	S	S	M	L	M	L	S	S

S: Strong, M: Medium, L: Low

**List of Practical:**

1. Write a program to perform insertion and deletion operations in an array.
2. Write a program to search for an element in an array using:
  - Linear Search
  - Binary Search
3. Write a program to sort an array using:
  - Bubble Sort
  - Selection Sort
  - Insertion Sort
4. Write a program to merge two arrays.
5. Write a program to add and subtract two matrices.
6. Write a program to multiply two matrices.

7. Write a program to insert an element into a Singly Linked List at:
  - (a) The beginning
  - (b) The end
  - (c) A specified position
8. Write a program to delete an element from a Singly Linked List from:
  - (a) The beginning
  - (b) The end
  - (c) A specified element
9. Write a program to perform the following operations in a Doubly Linked List:
  - (a) Create
  - (b) Search for an element
10. Write a program to perform the following operations in a Circular Linked List:
  - (a) Create
  - (b) Delete an element from the end
11. Write a program to implement stack operations using an array.
12. Write a program to implement stack operations using a linked list.
13. Write a program to add two polynomials using linked lists.
14. Write a program to evaluate a postfix expression using a stack.
15. Write a program to perform the following using recursion:
  - (a) Find the factorial of a number
  - (b) Find the GCD of two numbers
  - (c) Solve the Towers of Hanoi problem
16. Write a program to implement simple queue operations using an array.
17. Write a program to implement circular queue operations using an array.
18. Write a program to implement circular queue operations using a linked list.
19. Write a program to perform the following traversals on a Binary Search Tree (BST):
  - (a) Preorder traversal
  - (b) Inorder traversal
  - (c) Postorder traversal
20. Write a program to perform insertion operation in a Binary Search Tree.

<b>Course Code:</b> CC 105	<b>Course Title:</b> Operating Systems	<b>3L:0T:2P</b>	<b>4 Credits</b>
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**Distribution of Marks: End-Sem: 60(45 TH + 15 PR), In-Sem: 40(30 TH + 10 PR)**

### Course Objectives

**CO1:** To learn the basic concepts, structure and types of Operating System.

**CO2:** To understand the core operating system functionalities.

**CO3:** To analyze and compare the efficiency of various CPU scheduling algorithms.

**CO4:** To understand and apply process synchronization and deadlock handling techniques for process management.

**CO5:** To understand memory management techniques and input/output management.

### Course Content:

#### UNIT I: (CO1)

**9 Marks**

Operating Systems Overview: Definition, Evaluation of O.S, Components & Services of OS, Structure, Architecture, types of Operating Systems, Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems.

Operating Systems Structures: Operating system services and systems calls, system programs, operating system structure, operating systems generations.

#### UNIT II: (CO2, CO3)

**9 Marks**

Process Management: Process Definition, Process states, Process State transitions, Process Scheduling, Process Control Block, Threads, Concept of multithreads, Benefits of threads, Types of threads.

#### UNIT III: (CO2, CO3)

**9 Marks**

Process Scheduling: Definition, Scheduling objectives, Scheduling algorithms, CPU scheduling Pre-emptive and Non-pre-emptive Scheduling algorithms (FCFS, SJF and RR), Performance evaluation of the scheduling Algorithms

#### UNIT IV: (CO2, CO4)

**9 Marks**

Process Synchronization: Introduction, Inter-process Communication, Race Conditions, Critical Section Problem, Mutual Exclusion, Semaphores, Monitors.

Deadlocks: System model, deadlock characterization, deadlock prevention, avoidance, Banker's algorithm, Deadlock detection, and recovery from deadlocks.

#### UNIT V: (CO2, CO5)

**9 Marks**

Memory Management: Logical and Physical address map, Swapping, Memory allocation, MFT, MVT, Internal and External fragmentation and Compaction, Paging, Segmentation.

Virtual Memory: Demand paging, Page Replacement algorithms, Allocation of frames, thrashing.

I/O Management: Principles of I/O Hardware: Disk structure, Disk scheduling algorithms.

### Modes of In-Semester Assessment:

**(40 Marks)**

- One Internal (TH) Examination - **10 Marks**
- One Internal (PR) Examination - **10 Marks**
- Others - **20 Marks**
  - Quiz
  - Seminar Presentation

### Text Books:

1. Ekta Walia, Operating Systems Concepts, Khanna Publishing House, 2022 (AICTE Recommended Textbook)
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition OR Later edition, Wiley India Private Limited, New Delhi.
3. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India.

### Reference Books:

1. Andrew S Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall India
2. Sumitabha Das, UNIX Concepts and Applications, 4th Edition, Tata McGraw-Hill.

### CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	M	L	L	L	L	S	M
CO2	S	M	L	L	L	L	S	M
CO3	S	M	L	L	L	L	S	M
CO4	S	M	L	L	L	L	S	M
CO5	L	S	M	L	L	L	M	S

S: Strong, M: Medium, L: Low

### Operating System LAB

#### List of experiments

1. Write C program to simulate the FCFS CPU Scheduling algorithm.
2. Write C program to simulate the SJF CPU Scheduling algorithm.
3. Write C program to simulate the Round Robin CPU Scheduling algorithm.
4. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
5. Write a C program to implement the Producer – Consumer problem using semaphores.
6. Write a C program to illustrate the IPC mechanism using Pipes.
7. Write a C program to illustrate the IPC mechanism using FIFOs.
8. Write a C program to simulate Paging memory management technique.
9. Write a C program to simulate Segmentation memory management technique.
10. Write a C program to simulate the Best Fit contiguous memory allocation technique.
11. Write a C program to simulate the First Fit contiguous memory allocation technique.
12. Write a C program to simulate the concept of Dining-Philosophers problem.
13. Write a C program to simulate the MVT algorithm.
14. Write a C program to implement FIFO page replacement technique.
15. Write a C program to write a C program for implementing sequential file allocation method.

<b>Course Code:</b> VAC102	<b>Course Title:</b> Indian Constitution	<b>2L:0T:0P</b>	<b>2 Credits</b>
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**Distribution of Marks: End- Sem: 30 TH, In-Sem: 20 TH**

**Course Objectives:**

**CO1:** To realize the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.

**CO2:** To identify the importance of fundamental rights as well as fundamental duties.

**CO3:** To understand the functioning of Union, State and Local Governments in Indian federal system.

**CO4:** To learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.

**Course Content:**

**Unit 1: (CO1, CO2) The Constitution – Introduction 6 Marks**

The History of the Making of the Indian Constitution  
Preamble and the Basic Structure, and its interpretation  
Fundamental Rights and Duties and their interpretation  
State Policy Principles

**Unit 2: (CO2, CO3) Union Government 6 Marks**

Structure of the Indian Union  
President – Role and Power  
Prime Minister and Council of Ministers  
Lok Sabha and Rajya Sabha

**Unit 3: (CO3, CO4) State Government 6 Marks**

Governor – Role and Power  
Chief Minister and Council of Ministers  
State Secretariat

**Unit 4: (CO3, CO4) Local Administration 6 Marks**

District Administration  
Municipal Corporation  
Zila Panchayat

**Unit 5: (CO3, CO4) Election Commission 6 Marks**

Role and Functioning  
Chief Election Commissioner  
State Election Commission

**Modes of In-Semester Assessment:**

- Two Internal Examination -
- Others -
  - Quiz
  - Seminar Presentation
  - Assignment

**(20 Marks)**

**15 Marks**

**5 Marks**

### Suggested Learning Resources:

1. Ethics and Politics of the Indian Constitution by Rajeev Bhargava, Oxford University Press, New Delhi, 2008
2. The Constitution of India by B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India by DD Basu Lexis Nexis; Twenty-Third, 2018 edition

### Suggested Software/Learning Websites:

1. <https://www.constitution.org/cons/india/const.html>
2. <http://www.legislative.gov.in/constitution-of-india>
3. <https://www.sci.gov.in/constitution>
4. <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>

### Cases

- Rustom Cavasjee Cooper v. Union of India, (1970) 1 SCC 248
- State of Rajasthan v. Mohan Lal Vyas, AIR 1971 SC 2068 (confirmation of a private monopoly, not a violation of fundamental right)
- Mithilesh Garg v. Union of India, (1992) 1 SCC 168 : AIR 1992 SC 221 (Right to carry on business, not breached when it is liberalised)
- Chintamanrao v. The State of Madhya Pradesh, AIR 1951 SC 118 (scope of reasonable restrictions in relation to trade and occupation)
- Cooverjee B. Bharucha v. Excise Commissioner, Ajmer, AIR 1954 SC 220 (the reasonableness of the restriction imposed may depend upon the nature of the business and prevailing conditions including public health and morality)
- T. B. Ibrahim v. Regional Transport Authority. Tanjore, AIR 1953 SC 79
- Harman Singh v. RTA, Calcutta, AIR 1954 SC 190
- Dwarka Prasad Laxmi Narain v. State of U.P., AIR 1954 SC 224
- State of Bombay v. R.M.D. Chamarbaugwala, AIR 1957 SC 699
- Parbhani Transport Coop. Society Ltd. v. Regional Transport Authority, Aurangabad, AIR 1960 SC 801
- State of Bombay v. R. M. D. Chamarbaugwala, (1957) S.C.R. 874,
- G.K.Krishnan vs State of Tamil Nadu, 1975 SCC (1) 375
- Automobile Transport (Rajasthan) Ltd. Vs State of Rajasthan, AIR 1962 SC 1406

### CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	M	L	L	M	L	M	S
CO2	S	S	M	L	M	L	S	S
CO3	S	S	M	L	M	L	S	S
CO4	S	M	M	L	S	L	S	M

S: Strong, M: Medium, L: Low

<b>Course Code:</b> SEC102	<b>Course Title:</b> Object Oriented Programming using Java	<b>3L:0T:4P</b>	<b>5 Credits</b>
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**Distribution of Marks: End-Sem: 60(45 TH + 15 PR), In-Sem: 40(30 TH + 10 PR)**

### Course Objectives

**CO1:** To introduce the object-oriented programming system concepts.

**CO2:** To introduce syntax and semantics of Java programming language.

**CO3:** To develop modular programs using Java.

**CO4:** To setup JDK environment to create, debug, and run Java programs.

**Prerequisite:** Knowledge of Problem-Solving Techniques using C programming language

### Course Content:

#### UNIT I: (CO1, CO2)

**9 Marks**

Fundamentals of Object-Oriented Programming: Basic Concepts of Object-Oriented Programming (OOP), Benefits and Applications of OOP.

Java Evolution: Java Features, Difference between Java, C, and C++, Java and the Internet, Java Environment.

#### UNIT II: (CO2, CO3)

**9 Marks**

Overview of Java Language: Introduction to Simple Java Program, Use of Comments and Math function, Application of two classes, Java Program Structure, Java Tokens and statements, Implementing Java program and JVM, Command Line Arguments.

Constants, Variables, and Data Types: Constants, Variables, Data Types, Declaration of Variables, Giving values to Variables, Symbolic Constants, Typecasting.

#### UNIT III: (CO2, CO3)

**9 Marks**

Operators & Expressions: Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment & Decrement operators, conditional operators, Bitwise operators, Arithmetic Expressions, Evaluation of Expressions, Type Conversions in Expressions, Operator Precedence & Associativity.

Decision Making, Branching & Looping: Decision Making with Control Statements, Looping statements, Jump in loops, Labelled loops.

#### UNIT IV: (CO2, CO3, CO4)

**9 Marks**

Classes, Objects, and Methods: Defining Class, Methods Declaration, Constructors, Methods Overloading, Overriding Methods, Inheritance

Arrays, Strings, and Vectors: 1D arrays, Creating an Array, 2-D arrays, Strings, Vectors, Wrapper Classes, Enumerated Types

Inheritance: Defining, extending classes, and Implementing Interfaces. Multiple inheritance and polymorphism.

#### UNIT V: (CO2, CO3, CO4)

**9 Marks**

Packages: Basics of packages, System packages, Creating and accessing packages, Creating User-defined packages, adding class to a package.

Exception Handling: Using the main keywords of exception handling: try, catch, throw, throws, and finally; Nested try, multiple catch statements, Creating user-defined exceptions

**Modes of In-Semester Assessment:****(40 Marks)**

- One Internal (TH) Examination - **10 Marks**
- One Internal (PR) Examination - **10 Marks**
- Others - **20 Marks**
  - Quiz
  - Seminar Presentation
  - Assignment

**Text Books**

1. Balaguruswamy E. (2023). Programming with JAVA: A Primer. 7<sup>th</sup> edition. India: McGraw-Hill Education
2. Schildt, H. (2022). Java: The Complete Reference. 12<sup>th</sup> edition. McGraw-Hill Education.

**Reference Books**

1. Arunesh Goyal, The Essentials of JAVA, Khanna Book Publishing Company Private Limited, 2012.
2. Tanweer Alam, Core JAVA, Khanna Book Publishing Company Private Limited, 2015.
3. Y. Daniel Liang, Introduction to Java Programming, 7<sup>th</sup> Edition, Pearson, 2008.
4. S. Malhotra and S. Choudhary, Programming in Java, 2<sup>nd</sup> Edition, Oxford University Press, 2014.

**Web Resources**

1. <https://www.w3schools.com/java/> .
2. <http://www.java2s.com/> .
3. [https://onlinecourses.nptel.ac.in/noc22\\_cs47/preview](https://onlinecourses.nptel.ac.in/noc22_cs47/preview)

**CO-PO Mapping**

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	M	L	L	M	L	M	S
CO2	S	S	M	L	M	L	S	S
CO3	S	S	M	L	M	L	S	S
CO4	S	M	M	L	S	L	S	M

S: Strong, M: Medium, L: Low

**List of Practical**

1. Write a Java program to read two numbers from the user and print their product.
2. Write a Java program to print the square of a number passed through command-line arguments.
3. Write a Java program that accepts the first name and surname of a student through command-line arguments and prints a welcome message.
4. Write a Java program to find the largest number among n natural numbers.
5. Write a Java program to display the Fibonacci series and compute the factorial of a number using both recursive and non-recursive methods.
6. Write a Java program to multiply two given matrices.
7. Write a Java program to sort a given list of names in ascending order.
8. Write a Java program to check whether a given string is a palindrome or not. (Example: "MADAM" is a palindrome.)
9. Write a Java program to read n values into an array and display the array in reverse order.

10. Write a Java program to perform basic mathematical operations using inheritance:
11. Create a class AddSub with methods for addition and subtraction.
12. Create another class MulDiv that extends AddSub and adds methods for multiplication and division.
13. In the main() method, create an object and perform all the operations using the methods.
14. Create a Java class named Student with the following member variables:
15. USN, Name, Branch, Phone, and Percentage
16. Write a Java program to create n Student objects and display their details with suitable headings.
17. Write a Java program that displays the number of characters, lines, and words in a given text file or string.
18. Write a Java program to create a class named Shape with methods getPerimeter() and getArea(). Create a subclass Circle that overrides these methods to calculate the area and perimeter of a circle.
19. Write a Java program to create a class Employee with a method calculateSalary(). Create two subclasses Manager and Programmer that override the method to calculate and return the salary based on specific role-based logic.
20. Write a Java program using an interface called Bank with a method rate\_of\_interest().
21. Implement this interface in two classes: SBI and PNB.
22. Each class should return different rates of interest.
23. Include additional member variables and constructors in both classes.
24. Write a Java program to create a package containing a class Book. Then, import this package in another program and display the book details.
25. Write a Java program to create a package containing a method to find the cube of a number for various data types (int, float, double). Import this package in another class and display the results.
26. Write a Java program to demonstrate divide-by-zero exception handling using try-catch blocks.
27. Write a Java program to read a list of integers from the user and throw an exception if any duplicate numbers are found.
28. Create a custom exception class UnderAge that displays "Under Age" along with the age value.
29. Write another class Exception Demo with a method test(int age) that throws the UnderAge exception if the age is less than 18.
30. In the main() method, test the exception handling by passing different age values and handling the exception appropriately.

<b>Course Code:</b> <b>SEC 103</b>	<b>Course Title:</b> <b>Web Technologies</b>	<b>1L:0T:2P</b>	<b>2 Credits</b>
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**Distribution of Marks: End- Sem: 30(20 TH + 10 PR), In-Sem: 20(10 TH + 10 PR)**

### Course Objectives

**CO1:** To understand the concepts and architecture of the World Wide Web, Markup languages, along with Cascading Style Sheets.

**CO2:** To understand the concepts of event handling and data validation mechanisms.

**CO3:** To understand the concepts of embedded dynamic scripting on client and server side Internet Programming and basic full-stack web development.

**CO4:** To develop modern interactive web applications.

### Prerequisite:

1. Proficiency in at least one programming language, such as Python, Java, or C++.
2. Understanding of programming concepts such as loops, conditionals, functions, and data structures like arrays, lists.
3. Familiarity with object-oriented programming (OOP) principles, including classes, objects, Inheritance, and polymorphism.

### Course Content:

#### Unit I: (CO1)

**10 Marks**

Introduction to HTML, history of HTML, Objective, basic Structures of HTML, Header Tags, body tags, Paragraph Tags.

Tags for FORM Creation, TABLE, FORM, TEXTAREA, SELECT, IMG, FIELDSET, ANCHOR.

Lists in HTML, Introduction to DIV tag, and NAVBAR Design.

Introduction to CSS, types, Selectors, and web page Responsiveness.

Introduction to Bootstrap, downloads/linking, using classes of Bootstrap, understanding the Grid System in Bootstrap.

Introduction to www, Protocols and Programs, Applications and development tools, web browsers, DNS, Web hosting Provider, Setting up of Windows/Linux/Unix web servers, Web hosting in the cloud, Types of Web Hosting.

#### Unit II: (CO2, CO3, CO4)

**10 Marks**

Introduction to JavaScript: Functions and Events, Document Object Model, traversing using JavaScript. Output System in JavaScript, i.e., Alert, throughput, Input box, Console. Variables and Arrays in JavaScript. Date and String handling in JavaScript.

Manipulating CSS through JavaScript: Form Validation like Required validator, length validator, Pattern validator. Advanced JavaScript, Combining HTML, CSS, and JavaScript events and buttons, controlling your browser. Introduction to AJAX, Purpose, advantages and disadvantages, AJAX based Web applications and alternatives of AJAX.

Introduction to XML: uses, Key concepts, DTD 8 schemas, XSL, XSLT, and XSL Elements, and transforming with XSLT. Introduction to XHTML.

JSON: Introduction to JSON, Keys and Values, Types of Values, Arrays, Objects.

### Modes of In-Semester Assessment:

**(20 Marks)**

- One Internal (TH) Examination - **5 Marks**
- One Internal (PR) Examination - **10 Marks**
- Others - **5 Marks**
  - Quiz
  - Seminar Presentation
  - Assignment

### Text Books

1. Laura Lemay, Mastering HTML, CSS & Java Script Web Publishing, BPB Publications, 2016
2. Thomas A. Powell, The Complete Reference HTML & CSS, Fifth Edition, 2017

### Reference Books

1. Silvio Moreto, Bootstrap 4 By Example, ebook, 2016.
2. Tanweer Alam, Web Technologies, Khanna Book Publishing, 2011.

### Web Resources

1. [www.javatpoint.com](http://www.javatpoint.com)
2. [www.w3schools.com](http://www.w3schools.com)
3. <https://www.geeksforgeeks.org/web-technology/>

### CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	M	L	L	M	L	M	S
CO2	S	S	M	L	M	L	S	S
CO3	S	S	M	L	M	L	S	S
CO4	S	M	M	L	S	L	S	M

S: Strong, M: Medium, L: Low

### List of Programs:

#### PART-A

1. Create your class time table using table tag.
2. Design a Webpage for your college containing description of courses, department, faculties, library etc. using list tags, href tags, and anchor tags.
3. Create web page using Frame with rows and columns where we will have header frame, left frame, right frame, and status bar frame. On clicking in the left frame, information should be displayed in right frame.
4. Create Your Resume using HTML, use text, link, size, color and lists.
5. Create a Web Page of a super market using (internal CSS)
6. Use Inline CSS to format your resume that you have created.
7. Use External CSS to format your time table created.
8. Use all the CSS (inline, internal and external) to format college web page that you have created.
9. Write a HTML Program to create your college website using for mobile device.

#### PART - B

1. Write an HTML/JavaScript page to create login page with validations.
2. Develop a Simple calculator for addition, subtraction, multiplication and division operation using JavaScript.
3. Use Regular Expressions for validations in Login Page using JavaScript.
4. Write a Program to retrieve date from a text file and displaying it using AJAX.
5. Create XML file to store Student Information like Register Number, Name, Mobile Number, DOB, and Email-Id.
6. Create a DTD for (0).
7. Create XML scheme for (0).
8. Create XSL file to convert XML file to XHTML file.
9. Write a JavaScript program using Switch case.
10. Write a JavaScript program using any 5 events.
11. Write a JavaScript program using built in JavaScript objects.
12. Write program for populating values from JSON text.
13. Write a program to transform JSON text to a JavaScript object.

<b>Course Code :</b> <b>BCA-Audit-II</b>	<b>Course Title:</b> <b>Foundation of Mathematics-II</b>	<b>Audit Course</b>
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**Distribution of Marks: End- Sem: 60 TH, In-Sem: 40 TH**

### Course Objectives

**CO1:**Develop the ability to solve first-order differential equations

**CO2:**Gain proficiency in vector operations

**CO3:**Learn to represent straight lines in multiple forms

**CO4:** Understand and be able to apply the concepts of sequences and series

### Course Contents:

#### Unit 1: Differential Equations (CO1)

**15 Marks**

Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solution of homogeneous differential equations of first order and first degree.

#### Unit 2: Vectors (CO2)

**15 Marks**

Vectors and scalars, magnitude and direction of a vector. Direction cosines/ ratios of vectors. Types of vectors, position vector of a point, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, Vector (cross) product of vectors.

#### Unit 3: Straight Lines (CO3)

**15 Marks**

Slope of a line and angle between two lines, Various forms of equations of a line, parallel to axes, point-slope form, slope-intercept form, two-point form, intercept form and normal form, General equation of a line, Distance of a point from a line.

#### Unit 4: Sequence and Series (CO4)

**15 Marks**

Sequence and Series. Arithmetic progression (A.P.), arithmetic mean (A.M.), Geometric progression (G.P.), geometric mean (G.M.), general term of a G.P., sum of n terms of a GP., relation between A.M. and GM. Sum to n terms of the special series.

### Text and Reference Books:

1. S L Loney, "The Elements of Coordinate Geometry", 6<sup>th</sup> edition 2016, Arihant Publications.
2. J G Chakravorty, P R Ghosh, "Vector Analysis: Vector Algebra & Vector Calculus", 11<sup>th</sup> Edition, 2018, U N Dhur & Sons Pvt Ltd.
3. Harold Cohen And Daniel Gallup, "Introduction to Differential Equations with Applications", 1<sup>st</sup> Edition, 2021, World Scientific.

### CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	M	L	L	M	L	M	S
CO2	S	S	M	L	M	L	S	S
CO3	S	S	M	L	M	L	S	S
CO4	S	M	M	L	S	L	S	M

S: Strong, M: Medium, L: Low