

# **PROGRAMME PROJECT REPORT (PPR)**

(As approved by the Board of Studies in its Meeting held on 23.12.2019 and approved by the Academic Council in its 40<sup>th</sup> Meeting held on 3.9.2020)

## **BACHELOR OF COMPUTER APPLICATIONS (BCA) Three-Year Programme**

(Open & Distance Learning Mode)

**(Course Code 401)**



**JAMIA HAMDARD**

(Deemed to be University, NAAC Accredited in A+)

**Centre for Distance and Online Education**

Hamdard Nagar, New Delhi-110062

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## PROGRAMME PROJECT REPORT

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## OVER VIEW ABOUT JAMIA HAMDARD AND CDOE

### About Jamia Hamdard

**Jamia Hamdard** was established as Society on 26.04.1989 under the Societies Registration Act, 1860 after the receipt of the Letter of Intent (LoI) for declaring Jamia Hamdard as deemed to be University, issued by the Ministry of Education (Erstwhile Ministry of HRD), Department of Education dated 20.03.1989. Jamia Hamdard has been created after amalgamation of six institutions being run by four Societies (i) The Institute of History of Medicine and Medical Research; (ii) **Indian Institute of Islamic Studies**; (iii) Hamdard Tibbi College (funded by Delhi Government); (iv) Hamdard College of Pharmacy (affiliated to University of Delhi and funded by UGC); (v) Majeedia Hospital and (vi) The School of Nursing after dissolution of their respective societies on 28.04.1989.

**Jamia Hamdard is one of the Government aided deemed to be University** and has been recognized as Minority Institution on 22.09.2014 by the National Commission for Minority Educational Institutions (NCMEI) under Article 30(1) of the Constitution of India. The Jamia Hamdard being a deemed to be University is governed by the UGC (Institutions Deemed to be Universities) Regulations as amended from time to time. Jamia Hamdard over a period of 35 years, Jamia Hamdard has evolved into a premier Centre for higher learning, fulfilling the objectives.

### Mission of Jamia Hamdard

- a) *To promote and advance the cause of higher education* through modern methods of teaching and advanced research in such branches of knowledge as the Jamia Hamdard may continue to develop core competence for and as may be in consonance with the emerging needs of India in general and underprivileged communities in particular.
- b) *To co-operate, collaborate and associate with national and international organizations* and institutions in any part of the world having mission wholly or partly similar to those of the Jamia Hamdard and as per the provision of the UGC Regulations in place from time to time.
- c) *To provide avenues for higher education leading to excellence and innovations* in such branches of knowledge as may be deemed fit primarily at Under-graduate, post-graduate and doctoral/research degree levels, fully conforming to the concept and idea of the University as defined in the UGC Deemed to be Universities Regulations and the vision of the founding fathers of Jamia Hamdard as autonomous institution being a Minority Institution.

## About Centre for Distance and Online Education (CDOE)

In 2004, Jamia Hamdard established the School of Open and Distance Learning, which is currently named as “Centre for Distance and Online Education” (CDOE) to extend educational opportunities through innovative methods. The CDOE utilizes information and communication technologies to enhance the quality and reach of education, especially for those unable to attend on-campus programmes. This initiative aims to empower marginalized groups, including tribal populations and Muslim women, by providing access to new knowledge and skills essential for their development.

### Programmes Offered:

- 1) Master of Business administration (MBA Online mode)
- 2) Master of Computer applications (MCA Online mode)
- 3) MA in Islamic Studies (MAIS Online mode)
- 4) MA in Political Science (MAPS Online mode)
- 5) Bachelor of Business Administration (BBA ODL & Online mode)
- 6) Bachelor of Computer Applications (BCA ODL & Online mode)
- 7) Advanced Diploma in Drug Regulatory Affairs (ADDRA)- Online mode
- 8) Diploma in Professional Arabic (DPA)- online mode

### **Mission of the Centre for Distance and Online Education (CDOE), Jamia Hamdard**

- a) to provide accessible, affordable, flexible, and quality higher education through Open and Distance Learning (ODL) and Online Learning modes.
- b) to empower learners with academic knowledge, professional competencies, digital skills, ethical values, and lifelong learning opportunities to meet the evolving needs of society, industry, and the global knowledge economy.
- c) to promote inclusive education by reaching learners from diverse geographical, social, and economic backgrounds through technology-enabled teaching-learning systems, learner support services, and outcome-based education aligned with national and international standards.

### **Targeted Groups of the Centre for Distance and Online Education (CDOE)**

The distance and online education programmes aim to reach *marginalized and excluded groups*, such as *tribal populations and Muslim women*, who have been largely overlooked by national education initiatives. These programmes provide opportunities for acquiring new knowledge and skills necessary for personal and professional development, thereby fostering inclusive growth and education.

### **Programme Coordinator(s)**

<i>Name</i>	<i>Contact details</i>
<b>Dr. Abdul Majid Farooqi</b> Assistant Professor (Computer Science)	Email: majid@jamiahamdard.ac.in

## Bachelor of Computer Applications (BCA) Programme Highlights

### Basic Information

a.	Name of the Course	<b>Bachelor of Computer Applications (BCA)</b>
b.	Nature	Open and Distance Mode
c.	Duration	Minimum: Three Years Maximum: Six Years
d.	Medium of Instruction and Examinations	English
e.	Eligibility Criteria	S.S.C, Intermediate or Equivalent (recognized by Jamia Hamdard) under 10+2 system of education.
f.	Commencement of the Course	January / July. Twice in a year
g.	Special Feature	After completing the course, a student may either pursue MCA, M.Sc. (Computer Science/IT), MBA programmers or take up a job in the IT industry.
h.	Mode of Admission	As per the norms prescribed by Jamia Hamdard from time to time.
i.	Period of Completion (Span Period)	Not more than 06 years
j.	Fees	Rs. 16,000/- per semester

## 1. MISSION AND OBJECTIVES OF BCA PROGRAMME

### 1.1. Mission:

The mission of the Bachelor of Computer Applications (BCA) programme is to provide quality education in Computer Science and Information Technology through a learner-centric and industry-oriented curriculum that develops technical competence, analytical thinking, problem-solving abilities, ethical values, and professional skills among students.

The programme aims to prepare graduates for successful careers in the IT industry, entrepreneurship, higher education, research, and emerging technological domains by integrating theoretical knowledge with practical learning experiences. It also seeks to promote innovation, lifelong learning, social responsibility, and adaptability to rapidly evolving global technological environments.

The BCA programme is committed to producing competent computing professionals capable of contributing effectively to society, industry, and the digital economy through sustainable and ethical technological solutions.

## 1.2. Objectives of the Bachelor of Computer Applications (BCA) Programme

The Bachelor of Computer Applications (BCA) programme is designed to provide students with a strong foundation in computer science, software development, and information technology. The primary objectives of the programme are as follows: -

- a) To provide students with fundamental and advanced knowledge of computer science, programming languages, database management systems, networking, web technologies, cloud computing, and emerging technologies.
- b) To develop analytical, logical, and problem-solving skills required for designing and developing efficient software applications and computing solutions.
- c) To equip learners with practical and industry-oriented technical skills through laboratory work, projects, assignments, and hands-on training.
- d) To prepare students for careers in software development, system administration, database management, cybersecurity, web and mobile application development, cloud computing, data analytics, and related fields in the IT industry.
- e) To enable students to understand modern computing environments and emerging technological trends such as Artificial Intelligence, Machine Learning, Internet of Things (IoT), Edge Computing, and Cyber Security.
- f) To enhance communication skills, teamwork, leadership qualities, professional ethics, and entrepreneurial abilities among students.
- g) To promote research aptitude, innovation, and lifelong learning so that students can continuously adapt to evolving technologies and industry requirements.
- h) To prepare students for higher education and research opportunities such as MCA, M.Sc. (Computer Science/IT), MBA, and other professional or academic programmes.
- i) To inculcate ethical values, social responsibility, and awareness of legal and professional standards in the field of information technology.
- j) To support skill development aligned with national educational policies, digital transformation initiatives, and industry demands for competent IT professionals.

## 1.3 Program Specific Outcomes:

Upon successful completion of the Bachelor of Computer Applications (BCA) programme, the graduates will be able to:

### **PSO-1: Programming and Software Development**

Develop efficient software applications using programming languages, data structures, algorithms, and modern software development methodologies to solve real-world computing problems.

### **PSO-2: Database and Web Technologies**

Design and manage databases and develop dynamic, secure, and user-friendly web-based applications using contemporary web technologies and database management systems.

### **PSO-3: Networking and System Administration**

Apply knowledge of computer networks, operating systems, cybersecurity, and cloud technologies for configuring, managing, and securing computing environments.

**PSO-4: Emerging Technologies and Innovation**

Utilize modern and emerging technologies such as Artificial Intelligence, Machine Learning, Data Analytics, Internet of Things (IoT), Cloud Computing, and Cyber Security to develop innovative solutions.

**PSO-5: Research and Problem Solving**

Analyze complex computing problems, conduct research, and propose sustainable and technology-driven solutions using analytical and critical thinking skills.

**PSO-6: Professional Competency and Ethics**

Demonstrate professional ethics, leadership qualities, teamwork, communication skills, and social responsibility while working in multidisciplinary and multicultural environments.

**PSO-7: Employability and Entrepreneurship**

Acquire industry-relevant technical and managerial skills required for employment, higher education, entrepreneurship, and lifelong learning in the field of Information Technology and Computer Applications.

**Qualification Descriptors**

Upon successful completion of the Bachelor of Computer Applications (BCA) programme, the graduates will be able to:-

**QD-1:** Apply exploratory, analytical, and problem-solving skills acquired in the field of Computer Science and Applications to address real-world challenges and establish themselves as competent professionals.

**QD-2:** Develop innovative and sustainable solutions for dynamic interdisciplinary and global problems through research, critical thinking, and innovation capabilities.

**QD-3:** Demonstrate employability skills, entrepreneurial abilities, and professional competence required for successful careers in the IT industry and related sectors.

**QD-4:** Adhere to professional ethics and demonstrate leadership qualities while addressing multidisciplinary social, industrial, entrepreneurial, and research-oriented problems.

**QD-5:** Uphold ethical principles, professional responsibilities, and social accountability while working effectively in diverse national and global environments.

**Program Learning Outcomes (PLO)**

Upon successful completion of the Bachelor of Computer Applications (BCA) programme, the graduates will be able to:

**PLO-1: Computational Knowledge**

Apply the knowledge of computer science, mathematics, programming languages, database systems, networking, and software development fundamentals to solve computing problems effectively.

**PLO-2: Problem Analysis**

Identify, analyze, and formulate solutions for complex computing and real-world problems using logical reasoning, analytical thinking, and computational techniques.

**PLO-3: Software Development Skills**

Design, develop, test, and maintain software applications, web applications, and database-driven systems using modern tools and programming practices.

**PLO-4: Modern Tool Usage**

Use contemporary computing tools, platforms, technologies, and software environments for application development, data analysis, networking, cloud computing, and digital solutions.

**PLO-5: Research, Innovation, and Entrepreneurship**

Demonstrate research aptitude, innovation capabilities, and entrepreneurial skills to develop sustainable and technology-driven solutions for societal and industrial needs.

**PLO-6: Environment and Sustainability**

Understand the impact of computing solutions on society, environment, economy, and sustainability, and apply ethical and sustainable practices in professional work.

**PLO-7: Ethics and Professional Responsibility**

Adhere to professional ethics, cyber laws, intellectual property rights, data privacy principles, and social responsibilities in the field of Information Technology.

**PLO-8: Individual and Team Work**

Function effectively as an individual, team member, or team leader in multidisciplinary and multicultural environments.

**PLO-9: Communication Skills**

Communicate effectively through technical reports, presentations, documentation, and interpersonal interactions with technical and non-technical audiences.

**PLO-10: Lifelong Learning**

Recognize the need for continuous learning, professional development, and adaptation to emerging technologies and changing industrial requirements.

**PLO-11: Employability Skills**

Demonstrate professional competency, leadership qualities, critical thinking, and technical expertise required for employment, higher studies, and career advancement in the IT industry.

**PLO-12: Digital and Emerging Technology Competency**

Acquire knowledge and practical exposure to emerging areas such as Artificial Intelligence, Machine Learning, Data Science, Cloud Computing, Cyber Security, Internet of Things (IoT), and related technologies.

## Mapping of Program Learning Outcomes (PLOs) with Qualification Descriptors (QDs)

PLOs/QDs	QD-1	QD-2	QD-3	QD-4	QD-5
PLO-1	3	2	2	1	1
PLO-2	3	3	1	1	1
PLO-3	3	2	3	1	1
PLO-4	2	2	3	1	1
PLO-5	2	3	3	2	1
PLO-6	1	3	1	2	3
PLO-7	1	1	2	3	3
PLO-8	1	1	2	3	2
PLO-9	1	1	2	2	3
PLO-10	2	2	2	1	3
PLO-11	2	1	3	3	1
PLO-12	3	3	2	1	1

Here '3' in the box for 'High-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low-level' mapping.

## 2. RELEVANCE OF THE PROGRAMME WITH MISSION AND GOALS OF JAMIA HAMDARD AND CDOE:

The BCA programme being offered by the CDOE through ODL/Online Mode is a strategic extension of the core mission and goals of both Jamia Hamdard and its Centre for Distance and Online Education, serving as a vehicle for inclusive, quality, and future-ready higher education. The following are the relevance of the BCA Programme matching with the Mission and Goals.

- i. The BCA programme offered through CDOE directly advances Jamia Hamdard's mission to promote higher education through modern methods of teaching. Being delivered via the ODL/Online mode, the programme leverages contemporary digital platforms, making higher education in computing accessible and current.
- ii. India's growing digital economy demands a skilled IT and computing workforce. The BCA programme caters to this need by equipping learners with foundational and applied knowledge in computer applications, aligning with Jamia Hamdard's commitment in achieving the emerging needs of trained manpower requirement of our country.
- iii. A core mission of Jamia Hamdard is to serve underprivileged communities. By offering the BCA through ODL/Online mode at an affordable fee structure, CDOE makes quality computing education reachable to students from economically and socially disadvantaged backgrounds who may otherwise lack access to campus-based programmes.
- iv. CDOE's mission specifically emphasises accessible, affordable, and flexible higher education. The BCA programme fulfils this mandate by removing geographical and

- financial barriers, allowing working professionals, rural students, and first-generation learners to pursue a recognised degree in computer applications.
- v. The BCA curriculum is covering programming, databases, networking, web technologies, and emerging areas which directly builds the digital and professional competencies needed to meet industry and societal expectations.
  - vi. The BCA programme, delivered online, transcends physical boundaries and ensures that students from remote or underserved regions can access a quality undergraduate degree in computing.
  - vii. The BCA programme prepares graduates for roles in IT, software development, data management, and digital services and equipping the learners to participate productively in the nation building in in the technology-driven ecosystem of the industry.
  - viii. The BCA programme, designed with well-defined learning outcomes and competency milestones, nurtures a culture of continuous learning, preparing students to adapt to rapid technological change throughout their careers.

### **3. NATURE OF PROSPECTIVE TARGET GROUP OF LEARNERS:**

The Bachelor of Computer Applications (BCA) programme is designed for learners who aspire to build careers in the fields of Computer Science, Information Technology, Software Development, Data Analytics, Web Technologies, Cloud Computing, Cyber Security, and other emerging technological domains. The programme aims to cater to a diverse group of learners with varying educational, professional, and socio-economic backgrounds.

#### **The prospective target group of learners includes:**

- i. Students who have completed their 10+2 or equivalent examination from a recognized board and wish to pursue higher education in the field of Computer Applications and Information Technology.
- ii. Learners interested in acquiring fundamental and advanced knowledge of computer science, programming, software development, and digital technologies.
- iii. Working professionals seeking to upgrade their technical qualifications, improve employability, or enhance professional competencies in the IT sector through flexible learning opportunities.
- iv. Individuals residing in remote, rural, or underserved regions who are unable to access regular mode education and seek quality higher education through Open and Distance Learning (ODL) and Online modes.
- v. Young Entrepreneurs and self-employed individuals who wish to acquire computing and digital skills for business development, startups, freelancing, and technology-driven ventures.
- vi. Learners intending to pursue higher studies and research in areas such as Computer Applications, Computer Science, Data Science, Artificial Intelligence, Cloud Computing, and related disciplines.
- vii. Candidates aspiring to develop industry-relevant practical skills, analytical abilities, problem-solving aptitude, communication skills, and professional ethics required in modern computing environments.
- viii. Lifelong learners seeking continuous professional development, reskilling, and upskilling in emerging technologies and digital transformation domains.

**4. APPROPRIATENESS OF PROGRAMME TO BE CONDUCTED IN OPEN & DISTANCE, AND ONLINE LEARNING MODE TO ACQUIRE SPECIFIC SKILLS AND COMPETENCE**

- i. The **Bachelor of Computer Applications (BCA) programme** is highly suitable for delivery through Open and Distance Learning (ODL) and Online Learning modes due to the nature of the discipline, the availability of digital learning resources, and the increasing adoption of technology-enabled education systems.
- ii. Computer Applications and Information Technology are inherently technology-driven fields that can effectively utilize online platforms, virtual laboratories, digital content, and interactive learning environments for teaching and skill development.
- iii. The programme is designed to provide theoretical knowledge as well as practical exposure through self-learning materials, e-learning resources, recorded video lectures, live interactive sessions, programming assignments, case studies, project work, discussion forums, and virtual laboratory practices.
- iv. The use of Learning Management Systems (LMS), cloud-based tools, coding platforms, simulation software, and online assessment methods enables learners to acquire both conceptual understanding and practical competencies effectively.

In total, the BCA programme offered through ODL and Online Learning modes is appropriate and effective for developing technical knowledge, professional competence, practical skills, ethical values, and lifelong learning capabilities required in the field of Computer Applications and Information Technology.

## 5. INSTRUCTIONAL DESIGN

The BCA programme follows a structured and interactive instructional design aimed at delivering academic excellence through digital mediums over **six semesters (3 years)**.

### 5.1. Curriculum Design

The curriculum design of the BCA programmes includes the following nine components/types of courses spread across six semesters which includes face to face Lectures/Personal Contact Programmes/Online lectures during weekends, Laboratory and Dissertation:

Course component	Abbreviation	No. of Credits
1. Program Core Course	PCC	40
2. Program Elective	PE	08
3. Open Elective	OE	08
4. Foundation Course	FC	12
5. Ability Enhancement Course	AEC	04
6. Skill Enhancement Elective	SEE	08
7. Laboratory	LAB	20
8. Dissertation	DISS	20
9. Non-Credit Course	NCC	00
<b>Total Credits</b>		<b>120</b>

**Semester – I**

Paper Code	Title of the Paper	Course Type	Marks			Hours	Credits
			Internal Assessment	Semester Exam	Total		
BCA 101	Introduction to 'C' Programming	PCC	30	70	100	12	4
BCA 102	Computer System Architecture	PCC	30	70	100	12	4
BCA 103	Mathematical Foundation of Computer Science	FC	30	70	100	12	4
BCA 104	Communication Skills	AEC	30	70	100	12	2
BCA 105	Media and Information Literacy Communication	AEC	30	70	100	12	2
BCA 106	'C' Programming Lab	LAB	30	70	100	8	2
BCA 107	<b>Computer System Architecture Lab</b>	LAB	30	70	100	8	2
			<b>Total</b>			<b>76 Hours</b>	<b>20</b>

## Semester – II

Paper Code	Title of the Paper	Course Type	Marks			Hours	Credits
			Internal Assessment	Semester Exam	Total		
BCA 201	Introduction to Data Structures	PCC	30	70	100	12	4
BCA 202	Data communication and Computer Networks Basics	PCC	30	70	100	12	4
BCA 203	Fundamental Concepts of Operating Systems	PCC	30	70	100	12	4
BCA 204	Elementary Physics	FC	30	70	100	12	4
BCA 205	Data Structures Lab	LAB	<b>30</b>	<b>70</b>	100	8	2
BCA 206	Unix/Linux Lab	LAB	30	70	100	8	2
BCA ES	Environmental Sciences	NCC	<b>30</b>	<b>70</b>	100	12	0
<b>Total</b>						<b>76 Hours</b>	<b>20</b>

**Semester – III**

Paper Code	Title of the Paper	Course Type	Marks			Hours	Credits
			Internal Assessment	Semester Exam	Total		
BCA 301	Introduction to Object Oriented Programming	PCC	30	70	100	12	4
BCA 302	Introduction to Database Management System	PCC	30	70	100	12	4
BCA 303	Discrete Structures	PCC	30	70	100	12	4
	PE – 1	PE	30	70	100	12	4
BCA 304	'C++' Programming Lab	LAB	30	70	100	8	2
BCA 305	Database Management System Lab	LAB	30	70	100	8	2
			<b>Total</b>			<b>64 Hours</b>	<b>20</b>

**Semester – IV**

Paper Code	Title of the Paper	Course Type	Marks			Hours	Credits
			Internal Assessment	Semester Exam	Total		
BCA 401	Fundamentals of Probability and Statistics	FC	30	70	100	12	4
BCA 402	Introduction to Artificial Intelligence	PCC	30	70	100	12	4
	SEE – 1	SEE	30	70	100	12	4
	OE – 1	OE	30	70	100	12	4
BCA 403	Artificial Intelligence Lab	LAB	30	70	100	8	2
BCA 404	Lab based on SEE – 1	LAB	30	70	100	8	2
			<b>Total</b>			<b>64 Hours</b>	<b>20</b>

**Semester – V**

Paper Code	Title of the Paper	Course Type	Marks			Hours	Credits
			Internal Assessment	Semester Exam	Total		
BCA 501	Fundamentals of Software Engineering	PCC	30	70	100	12	4
	PE – 2	PE	30	70	100	12	4
	SEE – 2	SEE	30	70	100	12	4
	OE – 2	OE	30	70	100	12	4
BCA 502	Software Engineering Lab	LAB	30	70	100	8	2
BCA 503	Lab based on SEE – 2	LAB	30	70	100	8	2
			<b>Total</b>			<b>64 Hours</b>	<b>20</b>

**Semester – VI**

Paper Code	Title of the Paper	Course Type	Marks			Hours	Credits
			Internal Assessment	Viva voce	Total		
BCA 601	Industrial Project and Dissertation	DISS	300	200	500	<b>40 Hours</b>	<b>20</b>

**Grand Total of Credits = 120 (20 credits per semester 20 x 6 = 120)**

### Program Electives (PE)

<b>PE – 1</b>	
BCA PE311	Introduction to Wireless Communication
BCA PE312	Introduction to Mobile Computing
BCA PE313	Web &E-Commerce Technologies
<b>PE – 2</b>	
BCA PE521	Introduction to Data Mining
BCA PE522	Introduction to Cloud Computing
BCA PE523	Introduction to Data Science and Big data

### Skill Enhancement Electives (SEE)

<b>SEE – 1</b>	
BCA SEE411	Internet and Web Technology
BCA SEE412	Programming in Visual Basic
BCA SEE413	Fundamental Concepts of Microprocessor and Arduino Programming
<b>SEE – 2</b>	
BCA SEE521	Introduction to Java Programming
BCA SEE522	Fundamentals of .Net Programming
BCA SEE523	PHP Programming

### Open Electives (OE)

<b>OE – 1</b>	
BCA OE411	Organization Behavior
BCA OE412	Financial Accounting
BCA OE413	Cyber Crimes & Cyber Laws
<b>OE – 2</b>	
BCA OE511	Startup Entrepreneurship
BCA OE512	Concepts of E-Governance and Smart City
BCA OE513	Digital Marketing and E-Commerce

## 5.2. Detailed Syllabus of Bachelor of Computer Applications (BCA) Programme (ODL/OL)

BCA	Paper code	Title of the Course
Semester-1	BCA 101	INTRODUCTION TO 'C' PROGRAMMING

### Course Learning Outcomes (CLO)

After completing this Course, the students should be able to:

**CLO-1:** Develop logics that will help them in writing C programs. (Cognitive level: Create)

**CLO-2:** Use the primitive data types, values, operators and expressions in C.  
(Cognitive level: Apply)

**CLO-3:** Develop programs using the control statements/decision structures, pointers, Arrays, strings, and loops. (Cognitive level: Create)

**CLO-4:** Design programs involving functions and understand about the code reusability with the help of user defined functions. (Cognitive level: Create)

**CLO-5:** Develop the programs using structures and file handling mechanism. (Cognitive level: Create)

### Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
<b>CLO1</b>	-	1	-	-	1	-	3	-	-	-	2	-
<b>CLO2</b>	3	-	-	2	-	-	-	-	1	-	-	3
<b>CLO3</b>	-	3	-	-	3	-	2	-	-	3	3	-
<b>CLO4</b>	-	-	3	3	-	3	-	2	-	-	-	1
<b>CLO5</b>	2	2	-	2	-	-	-	-	3	-	2	-

#### Unit 1: Basic Concepts of Programming

Programming Fundamentals: Algorithms and Flowcharts, problem solving techniques, stepwise refinement; Programming in C: features of 'C', tokens, data type, operators, expression.

#### Unit 2: Branching and Looping

Branching Constructs: if-else, switch, conditional operator & goto statements; looping Constructs: while, do-while, for and Jumping statements.

#### Unit 3: Arrays and Functions

Arrays, string processing, Functions: categories of functions, recursion.

#### Unit 4: Pointers, Structures, and Unions

Pointers: operations on pointers, pointers & structures; Structures and Unions.

#### Unit 5: Debugging and File Handling

Development of efficient programs; Debugging, verification and testing of programs. File Management: Defining & opening a file, closing a file, input operations.

### **Reference Books**

1. Yashvant Kenetkar (2020), *Let Us C*, 17<sup>th</sup> Edition, BPB Publications, India, 486 pages
2. Herbert Schildt (2017), *C The Complete Reference*”, 4<sup>th</sup> Edition, McGraw Hill Education, India, 832 pages.
3. Byron Gottfried (2018), *Programming with C*, 4<sup>th</sup> Edition, McGraw Hill Education, India, 718 pages.
4. Kernighan and D. Ritchie (2015), *The C Programming Language*, 2<sup>nd</sup> Edition, Pearson Education, India; 288 pages.
5. E. Balaguruswamy (2019), *Programming in ANSI C*, 8<sup>th</sup> Edition, McGraw Hill Education, India, 596 pages.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-1</b>	<b>BCA 102</b>	<b>COMPUTER SYSTEM ARCHITECTURE</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Understand the theory and architecture of central processing unit (Cognitive level: Understand)

**CLO-2:** Analyze some of the design issues in terms of speed, technology, cost, performance (Cognitive level: Analyze)

**CLO-3:** Design a simple CPU with applying the theory concepts (Cognitive level: Create)

**CLO-4:** Use appropriate tools to design verify and test the CPU architecture (Cognitive level: Analyze)

**CLO-5:** Learn the concepts of parallel processing, pipelining and interprocessor Communication (Cognitive level: Remember)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit 1: Introduction**

Logic gates, Boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexers, registers, counters and memory units.

#### **Unit 2: Data Representation and Basic Computer Arithmetic**

Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, and multiplication and division algorithms for integers.

#### **Unit 3: Basic Computer Organization and Design**

Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

#### **Unit 4: Central Processing Unit**

Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

#### **Unit 5: Memory and I/O Organization**

Cache memory, Associative memory, mapping; Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

### **Reference Books**

1. Authors (year), *Title of the Book*, Edition, Publishers, Place of Publication, Page Nos.
2. M. Mano, Computer System Architecture, Pearson Education 1992.
3. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004.
4. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India, 2009.
5. M.M. Mano, Digital Design, Pearson Education Asia, 2013.
6. Carl Hamacher, Computer Organization, Fifth edition, McGraw Hill, 2012.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-1</b>	<b>BCA 103</b>	<b>MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Understand and apply the basic mathematics to solve the problems related to algebra of matrices. (Cognitive Level: Understand)

**CLO-2:** Describe and analysis the basic concept of differential calculus, vector calculus and solve related problems. (Cognitive Level: Analyze)

**CLO-3:** Apply the differential calculus to compute the problems of successive differentiation and partial differentiation. (Cognitive Level: Apply)

**CLO-4:** Discuss and demonstrate the fundamentals of curvature, asymptotes, & concavity and trace the standard curves. (Cognitive Level: Create)

**CLO-5:** Utilize the knowledge of circle, parabola, & ellipse and apply to compute the problems related to conic sections. (Cognitive Level: Evaluate)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
<b>CLO1</b>	3	-	2	-	3	-	1	-	-	1	3	-
<b>CLO2</b>	-	2	-	2	-	-	-	-	1	-	-	2
<b>CLO3</b>	2	-	3	-	1	-	2	-	-	3	-	-
<b>CLO4</b>	-	-	3	-	-	3	-	2	1	-	-	<b>1</b>
<b>CLO5</b>	2	-	-	-	2	-	3	-	2	-	2	-

#### **Unit 1: Algebra of Matrices**

Matrix Algebra including rank, inverse, linear system of equation, Eigen value & Caley Hamilton Theorem; Team working and management.

#### **Unit 2: Introduction to Differential Calculus**

Differentiation and partial differentiation, derivative of sum, dot product and cross product of two vectors, gradient, divergence and curl.

#### **Unit 3: Successive and Partial Differentiations**

Successive differentiation, Leibnitz theorem, partial differentiation.

#### **Unit 4: Differential Calculus for curvatures**

Curvature, asymptotes, singular points, concavity, points of inflexion and tracing of Cartesian curve, Differential equation of first order.

#### **Unit 5: Coordinate Geometry**

System of circles, standard equations and properties of parabola and Ellipse; General equation of second degree in two variables, tracing of conic sections, sphere.

**Reference Books**

1. Jain, R. K. and Iyengar, S. R. K., “Advanced Engineering Mathematics”, Narosa, 2003.
2. Ramana, “Higher Engineering mathematics”, TMH.
3. B.S. Grewal, “Elementary Engineering Mathematics”, 34th Ed., 1998.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-1</b>	<b>BCA 104</b>	<b>COMMUNICATION SKILLS</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** To understand about the rules of Grammar (Cognitive level: Apply)

**CLO-2:** To study importance, types and nuances of communication in our lives. (Cognitive level: Apply)

**CLO-3:** To acquire effective reading, writing, speaking and listening skills (Cognitive level: Analyze)

**CLO-4:** To learn speaking and presentation skills (Cognitive level: Analyze)

**CLO-5:** To learn to write effective report and design documentation (Cognitive level: Create)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit 1: Grammar, Dictionary, and Thesaurus**

Review of English Grammar; Written and Spoken language; Common Errors in language; Punctuation (purpose, role, importance and use); Effective use of dictionary, thesaurus, encyclopedia, OED; Figures of speech.

#### **Unit 2: Language, Phonetics, and Writing**

Language Skills (listening, Speaking, Reading, Writing); Meaning what you mean; Listening: Effective and efficient listening in various situations (discussions, lectures, news, seminars, speech, telephone calls etc.); Speaking: Phonetics, intonation, accent, usage; strategies for a good rhetoric; Reading: Purpose; Comprehension; Tactics and strategies for good reading; Writing: Guidelines for good writing; various writing styles (General and technical writing styles).

#### **Unit 3: Effectiveness and Efficiency in Communication**

Communication (purpose, role importance, elements); Effective and efficient communication; role of content, context and language; Spoken and written communication Presentation and delivery; Role of speaker and audience.

#### **Unit 4: Presentation Skills**

Style and body language; Discussion and presentation skills of conferences meeting, seminars.

#### **Unit 5: Drafting the Documents**

General and Technical documents (correspondence applications, letter, resumes, CV), drafts, essays, memos; minutes, notes, proposals , précis, reports, summary, synopsis, references, table of contents, acknowledgements, prologue, epilogue, revision; Use of Audio-Visual Aids: OHP, Slides, Charts, Computers etc.

### **Text Books**

1. Maison, Margaret M., “Examine your English”.
2. R S Sharma, “Technical Writing”.

### **Reference Books**

1. R. Sudarshanam, “Understanding Technical English”.
2. Bansal, R.K. and J. B. Harrison, “Spoken English for India: A Manual of Speech and Phonetics”, Hyderabad: Orient Longman, 1983.
3. Lewis, Hedwig. Body Language, “A Guide for Professionals”, 2000.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-1</b>	<b>BCA 105</b>	<b>MEDIA AND INFORMATION LITERACY COMMUNICATION</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Appraise the different perspectives on Media Education and Literacy (Cognitive level: Analyze)

**CLO-2:** Interpret the politics of Information Literacy (Cognitive level: Evaluate)

**CLO-3:** Compare and describe various types of computing devices (Cognitive level: Evaluate)

**CLO-4:** Assess the nature of Digital Media Content (Cognitive level: Analyze)

**CLO-5:** Evaluate the different orders of Digital Divide (Cognitive level: Evaluate)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	-	-	-	-	-	2	-	-	-	2	-	1
<b>CLO2</b>	-	2	-	-	-	1	-	-	2	-	-	-
<b>CLO3</b>	1	-	3	-	1	-	3	-	-	-	-	-
<b>CLO4</b>	-	-	-	-	-	2	-	-	-	-	1	1
<b>CLO5</b>	-	-	-	-	-	3	-	1	-	-	-	2

#### **Unit 1: Media Education and Literacy**

Introduction to Media Education, History of Media Education; Perspectives on Media Education: The Inoculation Model, the Demystification Model, the Creative Participation Model.

#### **Unit 2: Information Literacy**

Introduction to Information Literacy, The politics of Information Literacy; The fellow Travelers to Information Literacy, Key moments in the History of Information Literacy.

#### **Unit 3: Leveraging the Power of Computing**

Introduction to the History of the Delivery of Computing Power; The Closeness of Computing technology, Mainframes, Micro and Personal Computers; Luggable Computers, Portable Computers, and the Laptop; Pocket Computers, Phones, and the Tablet; Wearable Computing and Augmented Reality Devices.

#### **Unit 4: Digital Media Content**

Introduction to Digital Media Content; the nature of Digital Media content; Participatory Culture; Trans media; Converged Content.

#### **Unit 5: Digital Divides**

Introduction to Digital Divides; First-Order Digital Divides – Access; Second-Order Digital Divides – Skills; Third-Order Digital Divides – Participation and Outcomes.

**Text Books**

1. Marcus Leaning, “Media and Information Literacy – An Integrated Approach for the 21<sup>st</sup> Century” Chandos Publishing (An imprint of Elsevier) 2017.

**Reference Books**

1. Michael C. Alewine and Mark Canada, “Introduction to Information Literacy for Students”, Wiley Blackwell, 2017.
2. Forest Woody Horton Jr., “Overview of Information Literacy Resources Worldwide”, UNESCO, 2013.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-1</b>	<b>BCA 106</b>	<b>INTRODUCTION TO C PROGRAMMING LAB</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** To develop simple algorithms for arithmetic and logical problems

**CLO-2:** To translate the algorithms to programs & execution (in C language)

**CLO-3:** To implement conditional branching, iteration and recursion

**CLO-4:** To decompose a problem into functions and synthesize a complete program using divide and conquer approach

**CLO-5:** To use arrays, pointers and structures to develop algorithms and programs.

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	3	3	1	1	3	1	1	2	2	2	2
<b>CLO2</b>	3	3	3	1	1	3	2	1	2	2	2	2
<b>CLO3</b>	3	3	3	1	1	3	2	1	3	1	2	3
<b>CLO4</b>	3	3	3	1	1	3	1	1	3	2	2	3
<b>CLO5</b>	3	3	3	1	1	2	1	1	3	2	2	2

### **List of Experiments**

- Two numbers are input through the keyboard into two location A and B. Write a program to interchange the content of A and B. Solve this problem using third memory location .
- If a five-digit number is input through the keyboard, write a program to calculate the sum of its digits. (Hint: Use the modulus operator '%')
- Consider a currency system in which there are notes of seven denominations, namely, Rs. 1, Rs. 2, Rs. 5, Rs. 10, Rs. 50, Rs. 100. If a sum of Rs. N is entered through the keyboard, write a program to compute the smallest number of notes that will combine to give Rs. N.
- WAP to find grade of a student take input a mark of subject from the
- candidate. Grades are calculated according to following conditions:  
 If marks <50 then Grade is F  
 if marks >=50 <60 then Grade is D  
 if marks >=60 <70 then Grade is C  
 if marks >=70 <80 then Grade is B  
 if marks >=80 <90 then Grade is A  
 if marks >=90 then Grade is A+

6. Write a C program to input electricity unit charge and calculate the total electricity bill according to the given condition: For first 50 units Rs. 0.50/unit For next 100 units Rs. 0.75/unit For next 100 units Rs. 1.20/unit For unit above 250 Rs. 1.50/unit An additional surcharge of 20% is added to the bill
7. Write a program to print all the ASCII values and their equivalent characters using a for loop. The ASCII values vary from 0 to 255.
8. write a program to find sum of series for n terms:  
 $1+3+5+7+9+\dots\dots\dots$   
 $1-2+3-4+5-6+7-8+\dots\dots\dots$
9. WAP to print all prime numbers between a given range. For example prime no between 10 to 20 Prime no are 11,13,17,19
10. . Write a menu-driven program which has the following options: 1. Factorial of a number. 2. Prime or not 3. Odd or even 4. Exit
11. Write a menu-driven program which has the following options:
  - i.Factorial of a number.
  - ii.Prime or not
  - iii.Odd or even
  - iv. Exit

Once a menu item is selected the appropriate action should be taken and once this action is finished the menu should reappear. Unless the user selects Exit option the program should continue to run.
12. Write a function that receives 5 integers and return the average of these numbers. Call this function from main() and print the results in main().
13. A positive integer is entered through the keyboard, write a function in c language to find the binary equivalent of this number:
14. Write a program to find largest element in an Array
15. Write a program to multiply two matrix.
16. Write a program to find to covert any decimal number to binary number using recursion.
17. Create a structure to specify data of customers in a bank. The data to be stored is Account Number, Name, Balance in the account. Assume a maximum of 200 customers in the bank. (a) Write a function to print the Account number and name of each customer with a balance below Rs. 100. (b) If a customer request for withdrawal or deposit, it is given in the form Acct. no, amount, code (1 for the deposit, 0 for withdrawal) Write a program to give a message, "The balance is insufficient for the specified withdrawal".

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-2</b>	<b>BCA 201</b>	<b>INTRODUCTION TO DATA STRUCTURES</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** To impart basic Data Structure Concepts (Cognitive level: Remember)

**CLO-2:** To introduce the basic concepts of Stacks, Queues, Lists, Trees, and Graphs (Cognitive level: Understand)

**CLO-3:** To give a brief account of Searching and Sorting Techniques (Cognitive level: Understand)

**CLO-4:** To implement the operations on stack and queue using any programming language (Cognitive level: Create)

**CLO-5:** To introduce the applications of tree and graph, their categories and example (Cognitive level: Understand)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit 1: Data Representation**

Representation of data, Data types, ADTs and Data Structures, linear and non – linear data structures.

#### **Unit 2: Arrays, Structures, and Lists**

Single and multidimensional arrays, Structures, Static and Dynamic implementation of arrays, Creation, insertion and deletion of linked list, doubly list, circular list etc.

#### **Unit 3: Stack and its operations**

Stacks and its application: Definition and examples, Implementing Push and Pop operations, Stack using dynamic memory allocation, Use of stack in problem solving, infix, prefix and postfix notations and conversions, Recursion using stack.

#### **Unit 4: Queues**

Queues: Definition and examples, Sequential and dynamic implementation, Implementation of Insert and remove operations.

#### **Unit 5: Tree, Graph, Searching and Sorting**

Introduction to tree and graph, Searching techniques: Linear Search, Binary Search, Sorting: Bubble Sort, Quick Sort, Merge Sort, Insertion Sort, Selection Sort.

**Reference Books**

1. Horowitz, Sahni, Freed, "Fundamentals of Data Structures in C", Silicon Press
2. Kruse R., "Data Structures and Program Design in C", Pearson Education India.
3. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahL angsam, "Data Structures Using C and C++", Second edition, PHI, 2009

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-2</b>	<b>BCA 202</b>	<b>DATA COMMUNICATION AND COMPUTER NETWORKS BASICS</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Use and implement Computer Networks and the basic components of a Network system. Illustrate the OSI and TCP/IP models, Demonstrate the functions of each layer (Cognitive Level: Apply)

**CLO-2:** Discover various communication systems. Illustrate the working of signaling methods and Transmission media (Cognitive Level: Create)

**CLO-3:** Compare and Contrast the concepts of switching techniques. Types of Internet connections (Cognitive Level: Analyze)

**CLO-4:** Apply the elements and protocols of the Data link layer. Illustrate various error and flow control techniques. (Cognitive Level: Apply)

**CLO-5:** Apply the protocols of Transport & Application Layer, Employ the concepts of DNS, E-mail and WWW (Cognitive Level: Apply)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	-	1	-	-	1	-	-	-	3	-	2	-
<b>CLO2</b>	2	-	-	2	-	-	3	-	1	-	-	3
<b>CLO3</b>	-	-	3	-	-	-	2	-	-	3	-	-
<b>CLO4</b>	-	-	3	-	-	3	-	2	-	-	-	<b>1</b>
<b>CLO5</b>	2	-	-	-	2	-	2	-	2	-	2	-

#### **Unit 1: Introduction to Computer Networks**

Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite;

#### **Unit 2: Introduction to Data Communication**

Analog and digital signal; data-ratelimits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

#### **Unit 3: Arrays and Functions**

Circuit switching; packetswitching- connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

#### **Unit 4: Data Link Layer and Multiple Access Protocols**

Error detection and error correction techniques;data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on

Internet; Routing: routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols.

**Unit 5: Transport and Application Layer Functions and Protocols**

Transport services- error and flow control, Connection establishment and release- three way handshake; Overview of DNS protocol; overview of WWW & HTTP protocol.

**Text Books**

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM, 2007.

**Reference Books**

1. Andrew S Tanenbaum: Computer Networks, 4<sup>th</sup> Edition, Pearson Education
2. William Stallings: Data and computer communications, 7<sup>th</sup> Edition Pearson Education.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-2</b>	<b>BCA 203</b>	<b>FUNDAMENTAL CONCEPTS OF OPERATING SYSTEMS</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Understand the creation of processes and threads and explain the mechanisms of OS to handle processes and their communication. (Cognitive level: Understand)

**CLO-2:** Apply the algorithms for process scheduling in terms of CPU utilization, compute and analyze efficiency in terms of -Throughput, Turnaround Time, Waiting Time, Response Time (Cognitive level: Analyze)

**CLO-3:** Discuss, classify and design algorithms for optimal allocation of memory to be processed by increasing memory utilization and the access time. (Cognitive level: Understand)

**CLO-4:** Apply various Page Replacement Algorithms on a given input string and explain the mechanisms involved in memory and storage management in operating system. (Cognitive level: Apply)

**CLO-5:** Understand different File Systems and Directory Structures. (Cognitive level: Understand)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PL O1</b>	<b>PL O2</b>	<b>PL O3</b>	<b>PL O4</b>	<b>PL O5</b>	<b>PL O6</b>	<b>PL O7</b>	<b>PL O8</b>	<b>PL O9</b>	<b>PL O10</b>	<b>PL O11</b>	<b>PL O12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit 1: Introduction to Operating Systems**

Overview of Operating System: Computer System Structure, Operating Systems Structure, Operating System functions; Computing Environments: Traditional Computing, Client-Server Computing, Peer-to-Peer Computing, Web based Computing, and Mobile Computing.

#### **Unit 2: Process Management**

Process Management: Process Concept, Process Scheduling, Inter Process Communication, Multithreading; Scheduling Algorithms: FCFS, SJF, RR, and Priority.

#### **Unit 3: Deadlocks and Synchronization**

Deadlocks: introduction, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock; Process Synchronization

#### **Unit 4: Memory Management**

Memory management: Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation; Virtual Memory Management: Demand Paging, Page Replacement Algorithms, Thrashing.

### **Unit 5: Storage Management**

Storage Management: File System, File Concept, Access Method, Directory and Disk Structure, File Sharing; Secondary-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling; I/O Systems: Overview, I/O Hardware, Application I/O Interface.

#### **Text Books**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne: Operating System Concepts. 8th Edition, John Wiley and Sons.

#### **Reference Books**

1. William Stallings: Operating Systems Internals and Design Principles, 6th Edition, Prentice Hall.
2. Andrew S Tanenbaum: Modern Operating Systems, 3rd Edition, Prentice Hall.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-2</b>	<b>BCA 204</b>	<b>ELEMENTARY PHYSICS</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** To have basic understanding of crucial elementary sub-fields: Electromagnetic Theory, Wave Optics, Fiber Optics, Lasers and Semiconductor Physics. (Cognitive level: Understand)

**CLO-2:** To have reasonably detailed analytical skills required for the basic understanding of the sub-fields (Cognitive level: Evaluate)

**CLO-3:** To have information on modern applications in the sub-fields (Cognitive level: Understand)

**CLO-4:** To be able to solve simple numericals and draw qualitative diagrams on the covered topics in the course (Cognitive level: Evaluate)

**CLO-5:** To be able to logically explain the working mechanism of pn junction diode, lasers and optical signal transmission (Cognitive level: Evaluate)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit 1: Mechanics**

Units and dimensions; Newton's laws; Conservation of linear momentum; Conservative and non-conservative force; Concept of potential energy; Work energy theorem; Periodic and oscillatory motion; Simple harmonic motion: Time period, Frequency, Phase and phase constant, Energy in simple harmonic motion.

#### **Unit 2: Electromagnetism**

Coulomb's law; Superposition principle; Concept of electric field and electric potential: Gauss's law, Simple applications of Gauss's law; Electric Current and current density: Ohm's law, Combination of resistors in series and parallel; Salient features of electromagnetic spectrum.

#### **Unit 3: LASER**

Conventional sources of light and LASER, Spontaneous emission, Stimulated Emission, Population inversion, Principle of LASER, Einstein's coefficients, Working of helium-neon and Ruby lasers.

#### **Unit 4: Fiber Optics**

Total internal reflection, Introduction of fiber optics, Numerical aperture, Step index and graded index fibers, Attenuation and dispersion mechanism, Application of optical fibers.

### **Unit 5: Elementary Ideas of Semiconductors**

Classification of semiconductors: intrinsic and extrinsic semiconductors, Doping, P-type and N-type semiconductors; Band gap: Classification of materials on the basis of band gap, Formation of P-N junction, Depletion width, Forward biased and reverse biased P-N junction, I-V characteristics; Working of Light Emitting Diode (LED) and solar cell.

### **Reference Books**

1. Malik and Singh, "Engineering Physics", Mc Graw Hill, 2017
2. Ghatak, "Optics", McGraw Hill Education, 2012
3. David Griffiths, "Introduction to Electrodynamics"
4. D. Neamen, D. Biswas, "Semiconductor Physics and Devices," McGraw Hill Education.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-2</b>	<b>BCA 205</b>	<b>DATA STRUCTURES LAB</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Will convey the concept of commonly used data structures as well as their representation,

**CLO-2:** Will be able to uses, and apply algorithms for their traversal and manipulation.

**CLO-3:** Use these structures in implementations and assessing the relative effectiveness of alternative implementations.

**CLO-4:** Acquire the skill of designing and implementation

**CLO-5:** Analyze and prescribe the right data structure for a problem

### **Mapping of Course Learning Outcomes (COs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	2	1	2	2	1	1	1	1	-	3	2	3
<b>CLO2</b>	3	2	2	3	2	-	1	-	-	1	1	2
<b>CLO3</b>	1	2	2	-	2	1	-	1	1	-	1	2
<b>CLO4</b>	1	2		2	-	2	-	1	2	-	1	-
<b>CLO5</b>	3	2	2	2	1	-	-	-	2	1	1	2

### **List of Experiments**

1. WAP to initialize a student marks array of size 5 taking input marks from user and print the elements of the marks array.
2. WAP to take average of the elements of an array of size 10 taking array input from user.
3. Write a program to implement linear search. If element x to be searched matches with an element of the array return the index of that element.
4. WAP to initialize a two-dimensional array of size 10x3 taking input from user and print elements of the array.
5. WAP to search an element of a 2-dimensional array using linear search.
6. WAP to implement binary search, to search an element in an array. (Sorted Array)
  - a) Iterative way without using function
  - b) Recursive way using function
7. WAP to Create a Book structure to display the details of a book
8. WAP Create a student structure to display the details of a student
9. WAP to Create array of structures containing array of i) books and ii) students with their corresponding features and display their details.
10. WAP to create a singly linked list with five nodes, traverse the created list and print the data of each node.

11. WAP to demonstrate insertion methods to insert a node at the beginning, in between and at the end of a singly Linked List.
12. WAP to demonstrate deleting a node from a given position of the singly linked list.
13. Write a program that uses functions to perform i) Create a doubly linked list of elements. ii) Delete a given element from the above doubly linked list. iii) Display the contents of the above list after deletion.
14. Write a program to implement Circular linked list and perform insertion, deletion at the start, and display the elements of the list.
15. WAP to implement stack using array.
16. WAP to implement stack using Linked List.
17. WAP to implements the queue to perform insert, delete and display operation using array.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-2</b>	<b>BCA 206</b>	<b>UNIX/LINUX LAB</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this course the students should be able to:

**CLO-1:** Appraise the different types of LINUX Directory Commands (Cognitive Level: Analyze)

**CLO-2:** Demonstrate the different Aspects of LINUX Administration (Cognitive Level: Apply)

**CLO-3:** Compare and describe various types of LINUX Tools (Cognitive Level: Evaluate)

**CLO-4:** Assess the editing convenience of VI Editor (Cognitive Level: Evaluate)

**CLO-5:** Choose the suitable Shell Scripts to solve the programming problems (Cognitive Level: Evaluate)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	-	-	-	-	2	-	-	-	-	2	-	-
<b>CLO2</b>	2	3	3	-	2	1	-	1	2	-	1	-
<b>CLO3</b>	2	2	2	-	2	-	-	-	-	-	-	-
<b>CLO4</b>	2	2	2	-	2	-	-	-	-	1	-	-
<b>CLO5</b>	3	3	3	-	2	-	1	-	-	-	-	1

### **List of Experiments:**

1. Implement Directory Commands
2. Demonstrate Working with Files
3. Assign File Permissions
4. Perform LINUX Administration and User Management
5. Implement Redirection, Filters and Pipes
6. Use various LINUX Tools
7. Perform LINUX Process Management
8. Use VI Editor
9. Use LINUX Environmental Variables
10. Write Shell Scripts

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-2</b>	<b>BCA ES</b>	<b>ENVIRONMENTAL STUDIES</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After the completion of the course, the student would be able to:

**CLO-1:** Get the information about ecosystem and also about its functions like Food chain, Ecological pyramids etc. (Cognitive level: Understand)

**CLO-2:** Get the knowledge about the different types of resources like land, water, mineral and energy and also about the effects of environment by the usage of these resources. (Cognitive level: Understand)

**CLO-3:** Gain the knowledge about the ecosystem diversity, its values and also about the importance of the endemic species and different techniques involved in its conservation (Cognitive level: Understand)

**CLO-4:** Gain the knowledge about the different types of pollutions and their control technologies, Waste water treatment, Bio medical waste management etc. (Cognitive level: Understand)

**CLO-5:** Get the complete information about EIA- Environmental Impact Assessment, Sustainable developmental activities, environmental policies and regulations, awareness among people about protection of wild life, forest and other natural resources. (Cognitive level: Understand)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit 1: Introduction to environmental studies** (8 hours)

Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development

#### **Unit 2: Concept of ecology and ecosystem** (8 hours)

Structure and function of ecosystem; Energy flow in an ecosystem; food chains, food webs; Basic concept of population and community ecology; ecological succession

#### **Unit 3: Natural Resources** (8 hours)

Concept of Renewable and Non-renewable resources; Land resources, Land degradation, soil erosion and desertification; Deforestation; Water: Use and over-exploitation of surface and ground water, floods, droughts

**Unit 4: Environmental Pollution**

(8 hours)

Environmental pollution: concepts and types; Air, water, soil, noise and marine pollution-causes, effects and controls; Concept of hazardous waste and human health risks; Solid waste management: Control measures of Municipal, biomedical and e-waste

**Unit 5: Case study**

(10 hours)

Discussion of real-life cases that have an impact on the natural environment

**Text/ Reference Books**

1. Asthana, D. K. (2006). Text Book of Environmental Studies. S. Chand Publishing.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-3</b>	<b>BCA 301</b>	<b>INTRODUCTION TO OBJECT ORIENTED PROGRAMMING</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

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

**CLO-1:** Differentiate between different programming approaches and its pros and cons. (Cognitive level: Understand)

**CLO-2:** Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity. (Cognitive level: Understand)

**CLO-3:** Name and apply some common object-oriented design patterns and analyses real world problems to use the features of OOP. (Cognitive level: Analyze)

**CLO-4:** Know how to reuse the code and apply polymorphism in programing. (Cognitive level: Understand)

**CLO-5:** Enhances their logical ability to optimize their programming skills and create state of art software to solve real-world problems. (Cognitive level: Apply)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Principles of Object Oriented Programming (OOP)**

Concepts of structured and object oriented programming; advantage of OOP methodologies.

#### **Unit – II: Characteristics of OOP languages**

Objects, classes, Data Abstraction, Encapsulation, inheritance, reusability, polymorphism and operator overloading, function overloading.

#### **Unit – III: Introduction to C++**

Keywords, Data types, Constants, Variables, Expressions and statements, Operators; Control Structures: if, if... else, switch; Repetitive Statements: for, while, do... while; Pointers, arrays and strings.

#### **Unit – IV: Functions in C++**

Parameter passing, Friend Functions, Inline Functions, Function Overloading, Operator overloading; Classes and Objects; Constructors and Destructors.

#### **Unit – V: Inheritance**

Single Inheritance, Multilevel inheritance, Multiple inheritance, Hierarchical Inheritance, Hybrid Inheritance; Pointers, Virtual Functions and Polymorphism.

**Text books**

1. E Balaguruswamy, “Object oriented programming with C++”, Eighth Edition, Tata McGraw Hill.

**Reference books**

1. E Bjarne Stroustrup, “The C++ Programming Language”, Special Edition, Pearson Education.
2. Bruce Eckel, “Thinking in C++”, 2nd Edition, Pearson Education

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-3</b>	<b>BCA 302</b>	<b>INTRODUCTION TO DATABASE MANAGEMENT SYSTEM</b>

### **COURSE LEARNING OUTCOMES (CLO):**

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

**CLO-1:** Analyze database concepts, different database models, and database management systems (Cognitive Level : Analyze)

**CLO-2:** Design the databases for a given specification of the requirement using ER method (Cognitive Level :Create )

**CLO-3:** Develop SQL (Structured Query Language) statements to create, manipulate, and query databases. (Cognitive Level: Apply)

**CLO-4:** Identify database management issues including data integrity, security, and recovery. (Cognitive Level: (Analyze)

**CLO-5:** Design and develop Enterprise database (Cognitive Level: Create)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Introduction & Database System Architecture**

Overview of Database Management System, DBMS architecture, Characteristics of database approach, Various views of data, data models, Schemes, data independence, Advantages of DBMS over file processing systems, Responsibility of database administrator, Introduction to Database Languages & Environments.

#### **Unit – II: E-R Modeling**

Entity types, Entity set, attribute and key, relationships, relation types, roles and structural constraints, weak entities, enhanced E-R and object modeling, Sub classes; Super classes, inheritance, specialization and generalization.

#### **Unit – III: Relational Data Model**

Relational model concepts, relational constraints, relational algebra SQL: SQL queries, programming using SQL. EER and ER to relational mapping: Data base design using EER to relational language.

#### **Unit – IV: Transaction Processing Concepts**

Transaction system, testing of serializability, Serializability of schedules, Conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, Checkpoints, deadlock handling.

### **Unit – V: Data Normalization**

Functional Dependencies, Normal form up to 3<sup>rd</sup> normal form. Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version Schemes, Recovery with concurrent transaction.

#### **Text books**

1. Abraham Silberschatz, Henry Korth, S.Sudarshan, “Database Systems Concepts”, McGraw-Hill.
2. Date C J, “An Introduction to Database System”, Addison Wesley.

#### **Reference books**

1. R. Elmasri, S. Navathe, “Fundamentals of Database Systems”, Pearson Education.
2. Jim Melton, Alan Simon, “Understanding the new SQL: A complete Guide”, Morgan Kaufmann Publishers.
3. A.K.Majumdar, P. Bhattacharya, “Database Management Systems”, TMH.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-3</b>	<b>BCA 303</b>	<b>DISCRETE STRUCTURES</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Express a given logic sentence in terms of predicates, logical connectives, and quantifiers (Cognitive Level: Apply)

**CLO-2:** Derive the solution for a given problem using deductive logic and prove the solution based on logical inferences (Cognitive Level: Create)

**CLO-3:** Classify the algebraic structure for a given a mathematical problem. (Cognitive Level: Understand)

**CLO-4:** Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra. (Cognitive Level: Evaluate)

**CLO-5:** Perform operations and algebra on sets, determine properties of relations, identify functions, and determine their properties. (Cognitive Level: Understand)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	3
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	3
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Introduction to propositional calculus**

Introduction to propositional calculus: Statements, logical operations; truth tables of logical identities, Equivalence of logical identities, Tautologies and contradiction, Negation and De Morgan's law, Conditional and biconditional; Introduction to Boolean algebra: Basic definition and theorems, Boolean expressions, Sum-Of-Products form.

#### **Unit – II: Sets and related operations**

Cardinality, Union, Intersection, Complement, Difference, Symmetric Difference, Cartesian Product, subset, superset, power set, Venn diagram, Algebra of Sets, Duality; Properties of operators: commutative, associative, distributive; De Morgan's law, Standard sets.

#### **Unit – III: Relations and their properties**

Properties of relation: reflexive, irreflexive, symmetric, asymmetric, antisymmetric, transitive; Matrix of relations, relations represented as digraph, Equivalence relation, partition and equivalence class.

#### **Unit – IV: Functions and its properties**

Types of functions: One-to-one, onto, into, everywhere defined, Domain and range, Invertible functions, Composition of functions.

### **Unit – V: Introduction to recurrence relation**

Homogeneous and non-homogeneous recurrence relations, Order and degree of a recurrence relation, Formulation of recurrence relations, Characteristic relation, Solution of recurrence relations.

#### **Reference Books**

1. Kenneth H. Rosen, “*Discrete Mathematics and Its Applications*”, TMH.
2. C.L. Liu, “*Elements of Discrete Mathematics*”, TMH
3. Kolman, Busby & Ross, “*Discrete Mathematical Structures*”, PHI
4. Narsingh Deo “*Graph Theory With Application to Engineering and Computer Science*”, PHI.
5. J. P. Trembly & P. Manohar, “*Discrete Mathematical Structures with Applications to Computer Science*”, McGraw Hill.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-3</b>	<b>BCA 304</b>	<b>C++ PROGRAMMING LAB</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** To develop simple algorithms for arithmetic and logical problems

**CLO-2:** To translate the algorithms to programs & execution (in C language)

**CLO-3:** To implement conditional branching, iteration and recursion

**CLO-4:** To decompose a problem into functions and synthesize a complete program using divide and conquer approach

**CLO-5:** To use arrays, pointers and structures to develop algorithms and programs.

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	3	3	1	1	3	1	1	2	2	2	2
<b>CLO2</b>	3	3	3	1	1	3	2	1	2	2	2	2
<b>CLO3</b>	3	3	3	1	1	3	2	1	3	1	2	3
<b>CLO4</b>	3	3	3	1	1	3	1	1	3	2	2	3
<b>CLO5</b>	3	3	3	1	1	2	1	1	3	2	2	2

### **List of Experiments**

- Two numbers are input through the keyboard into two location A and B. Write a program to interchange the content of A and B. Solve this problem using third memory location .
- If a five-digit number is input through the keyboard, write a program to calculate the sum of its digits. (Hint: Use the modulus operator '%')
- Consider a currency system in which there are notes of seven denominations, namely, Rs. 1, Rs. 2, Rs. 5, Rs. 10, Rs. 50, Rs. 100. If a sum of Rs. N is entered through the keyboard, write a program to compute the smallest number of notes that will combine to give Rs. N.
- WAP to find grade of a student take input a mark of subject from the
- candidate. Grades are calculated according to following conditions:  
If marks <50 then Grade is F  
if marks >=50 <60 then Grade is D  
if marks >=60 <70 then Grade is C  
if marks >=70 <80 then Grade is B  
if marks >=80 <90 then Grade is A  
if marks >=90 then Grade is A+
- Write a C program to input electricity unit charge and calculate the total electricity bill according to the given condition: For first 50 units Rs. 0.50/unit For next 100 units Rs.

0.75/unit For next 100 units Rs. 1.20/unit For unit above 250 Rs. 1.50/unit An additional surcharge of 20% is added to the bill

7. Write a program to print all the ASCII values and their equivalent characters using a for loop. The ASCII values vary from 0 to 255.
8. write a program to find sum of series for n terms:  
1+3+5+7+9+.....  
1-2+3-4+5-6+7-8+.....
9. WAP to print all prime numbers between a given range. For example prime no between 10 to 20 Prime no are 11,13,17,19
10. Write a menu-driven program which has the following options: 1. Factorial of a number. 2. Prime or not 3. Odd or even 4. Exit
11. Write a menu-driven program which has the following options:
  - i. Factorial of a number.
  - ii. Prime or not
  - iii. Odd or even
  - iv. ExitOnce a menu item is selected the appropriate action should be taken and once this action is finished the menu should reappear. Unless the user selects Exit option the program should continue to run.
12. Write a function that receives 5 integers and return the average of these numbers. Call this function from main() and print the results in main().
13. A positive integer is entered through the keyboard, write a function in c language to find the binary equivalent of this number:
14. Write a program to find largest element in an Array
15. Write a program to multiply two matrix.
16. Write a program to find to covert any decimal number to binary number using recursion.
17. Create a structure to specify data of customers in a bank. The data to be stored is Account Number, Name, Balance in the account. Assume a maximum of 200 customers in the bank. (a) Write a function to print the Account number and name of each customer with a balance below Rs. 100. (b) If a customer request for withdrawal or deposit, it is given in the form Acct. no, amount, code (1 for the deposit, 0 for withdrawal) Write a program to give a message, "The balance is insufficient for the specified withdrawal".

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-3</b>	<b>BCA 305</b>	<b>DATABASE MANAGEMENT SYSTEM LAB</b>

### **COURSE LEARNING OUTCOMES (CLO):**

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

**CLO-1:** Analyze database concepts, different database models, and database management systems (Cognitive Level : Analyze)

**CLO-2:** Design the databases for a given specification of the requirement using ER method (Cognitive Level :Create )

**CLO-3:** Develop SQL (Structured Query Language) statements to create, manipulate, and query databases. (Cognitive Level : Apply)

**CLO-4:** Identify database management issues including data integrity, security, and recovery. (Cognitive Level : (Analyze)

**CLO-5:** Design and develop Enterprise database (Cognitive Level : Create)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

### **List of Experiments**

1. Write an SQL query to fetch “FIRST\_NAME” from Worker table in upper case.
2. Write an SQL query to print the first three characters of FIRST\_NAME from Worker table.
3. Write an SQL query to find the position of the alphabet (‘a’) in the first name column ‘Amitabh’ from Worker table.
4. Write an SQL query to print the FIRST\_NAME from Worker table after removing white spaces from the right side.
5. Write an SQL query to print the DEPARTMENT from Worker table after removing white spaces from the left side.
6. Write an SQL query that fetches the unique values of DEPARTMENT from Worker table and prints its length.
7. Write an SQL query to print the FIRST\_NAME from Worker table after replacing ‘a’ with ‘A’ .
8. Write an SQL query to print the FIRST\_NAME and LAST\_NAME from Worker table into a single column COMPLETE\_NAME. A space char should separate them.
9. Prepare Sample Data To Practice SQL Skill.
10. Sample Table – Worker

WORKER_ID	FIRST_NAME	LAST_NAME	SALARY	JOINING_DATE	DEPARTMENT
001	Monika	Arora	100000	2014-02-20 09:00:00	HR
002	Niharika	Verma	80000	2014-06-11 09:00:00	Admin
003	Vishal	Singhal	300000	2014-02-20 09:00:00	HR
004	Amitabh	Singh	500000	2014-02-20 09:00:00	Admin
005	Vivek	Bhati	500000	2014-06-11 09:00:00	Admin
006	Vipul	Diwan	200000	2014-06-11 09:00:00	Account
007	Satish	Kumar	75000	2014-01-20 09:00:00	Account
008	Geetika	Chauhan	90000	2014-04-11 09:00:00	Admin

#### 11. Sample Table – Bonus

WORKER_REF_ID	BONUS_DATE	BONUS_AMOUNT
1	2016-02-20 00:00:00	5000
2	2016-06-11 00:00:00	3000
3	2016-02-20 00:00:00	4000
1	2016-02-20 00:00:00	4500
2	2016-06-11 00:00:00	3500

## 12. Sample Table – Title

WORKER_REF_ID	WORKER_TITLE	AFFECTED_FROM
1	Manager	2016-02-20 00:00:00
2	Executive	2016-06-11 00:00:00
8	Executive	2016-06-11 00:00:00
5	Manager	2016-06-11 00:00:00
4	Asst. Manager	2016-06-11 00:00:00
7	Executive	2016-06-11 00:00:00
6	Lead	2016-06-11 00:00:00
3	Lead	2016-06-11 00:00:00

13. Write an SQL query to fetch “FIRST\_NAME” from Worker table using the alias name as <WORKER\_NAME>.
14. Write an SQL query to fetch unique values of DEPARTMENT from Worker table.
15. Write an SQL query to print all Worker details from the Worker table order by FIRST\_NAME Ascending.
16. Write an SQL query to print details for Workers with the first name as “Vipul” and “Satish” from Worker table.
17. Write an SQL query to print details of workers excluding first names, “Vipul” and “Satish” from Worker table.
18. . Write an SQL query to print details of Workers with DEPARTMENT name as “Admin”.
19. Write an SQL query to print details of the Workers whose FIRST\_NAME contains ‘a’.
20. Write an SQL query to print details of the Workers whose FIRST\_NAME ends with ‘a’.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-4</b>	<b>BCA 401</b>	<b>FUNDAMENTALS OF PROBABILITY AND STATISTICS</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Understand and apply the fundamental concept of probability in computer science. (Cognitive Level: Understand)

**CLO-2:** Discuss and solve the problems related to probability, probability distributions. (Cognitive Level: Create)

**CLO-3:** Analyze and compute the problems associated with measure of central tendency like mean, mode and median. (Cognitive Level: Analyze)

**CLO-4:** Define and solve the problems related to measures of dispersions like range, mean deviation, standard deviation. (Cognitive Level: Evaluate)

**CLO-5:** Understand and apply the principles of correlation and regression in real life or practical problems. (Cognitive Level: Apply)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Overview of Probability**

Introduction, Events & Different Types of Events, Addition & Multiplication Law, Conditional Probability, Bayes' Theorem.

#### **Unit – II: Probability Distribution**

Random Variables, Expectation of Discrete Random Variables & Its Properties Continuous & Discrete Probability Function, Binomial, Poison & Normal Distribution.

#### **Unit – III: Measures of Central Tendency**

Definition, Function & Scope of Statistics, Arithmetic Mean, Weighted A.M., Median, Mode, Geometric & Harmonic Mean and Their Merits & Demerits.

#### **Unit – IV: Measures of Variation**

Measures of Variation: Range, The Interquartile Range or Quartile Deviation, Average (Mean), Deviation Standard Deviation, Coefficient of Variation, Skew ness, Moments & Kurtosis.

#### **Unit – V: Correlation and Regression Analysis**

Introduction, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient, Regression Analysis: Difference Between Correlation & Regression, Regression Lines, Regression Equations, Regressions Coefficient.

**Reference Books**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
4. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-4</b>	<b>BCA 402</b>	<b>INTRODUCTION TO ARTIFICIAL INTELLIGENCE</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, inference and logic. (Cognitive level: Create)

**CLO-2:** To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs. (Cognitive level: Understand)

**CLO-3:** To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning. (Cognitive level: Understand)

**CLO-4:** To understand the basic of knowledge representation using propositional logic and in programming, introduction of uncertainty and probability (Cognitive level: Understand)

**CLO-5:** To apply decision tree, neural network and natural language processing concepts in the context of artificial intelligence. (Cognitive level: Apply)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Overview of Artificial Intelligence**

Introduction to AI, Importance of AI, AI and its related field, AI techniques, Criteria for success; Scope of Artificial Intelligence, intelligent agents; Expert systems.

#### **Unit – II: Problem Solving**

Problems, problem space and search: Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem, Solving Problems by Searching, heuristic search techniques, constraint satisfaction problems, stochastic search methods.

#### **Unit – III: Game Playing and Knowledge**

Minimax, alpha-beta pruning; Knowledge: Definition and importance of knowledge, Knowledge representation, Various approaches used in knowledge representation, Issues in knowledge representation.

**Unit – IV: Knowledge Representation and Reasoning**

Building a Knowledge Base: Propositional logic, first order logic, situation calculus, theorem proving in First Order Logic; Planning, partial order planning; Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks.

**Unit – V: Learning**

Overview of different forms of learning, Learning Decision Trees, Neural Networks; Introduction to Natural Language Processing.

**Reference books**

1. D.W. Patterson, "Introduction to AI and Expert Systems", PHI
2. Nils J Nilsson, "Artificial Intelligence -A new Synthesis" Harcourt Asia Ltd
3. E. Rich and K. Knight: Artificial intelligence, TMH

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-4</b>	<b>BCA 403</b>	<b>ARTIFICIAL INTELLIGENCE LAB</b>

### **COURSE LEARNING OUTCOMES (CLO)**

After completing this Course, the students should be able to:

**CLO-1:** Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, inference and logic.

**CLO-2:** To implement AI algorithm in practical problem solving such as using minimax algorithm etc.

**CLO-3:** To create experts systems by incorporating understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning.

**CLO-4:** To understand the basic of knowledge representation using propositional logic and in programming, introduction of uncertainty and probability

**CLO-5:** To apply decision tree, neural network and natural language processing concepts in the context of artificial intelligence.

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	-	-	3	-	-	2	-	2	2	1	2	-
<b>CLO2</b>	-	-	2	1	-	-	-	-	-	-	-	3
<b>CLO3</b>	-	3	-	-	2	-	3	-	-	-	-	2
<b>CLO4</b>	-	1	-	3	1	-	3	-	2	1	-	2
<b>CLO5</b>	3	-	-	1	3	3	-	2	-	--	3	-

### **List of experiments**

1. Solve Travelling Salesman Problem (TSP) using Nearest Neighbor Heuristics.
2. Implement the Generate-and-Test algorithm (take problem of your choice).
3. Implement the Simple hill climbing and Steepest hill climbing algorithm (you can consider 8-puzzle problem).
4. Implement the A\* algorithm (take problem of your choice).
5. Implement the game Tic-Tac-Toe using Minimax search procedure (you are encouraged to implement alpha-beta pruning as well).
6. Implement linear regression algorithm (take dataset of your choice) and test your model.
7. Implement K- Nearest Neighbor algorithm (take handwritten digit dataset) and test your model.
8. Implement logistic regression algorithm (take IRIS dataset) and test your model.
9. Implement Decision Tree algorithm (take dataset of your choice) and test your model.
10. Implement ANN algorithm (take IRIS dataset) and test your model.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-5</b>	<b>BCA 501</b>	<b>FUNDAMENTALS OF SOFTWARE ENGINEERING</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Ability to perform Feasibility analysis for Software Project. (Cognitive level: Analyze)

**CLO-2:** To concentrate more on the efficiency of the designed Software (Cognitive level: Analyze)

**CLO-3:** Students should be able to manage and plan the Software development processes (Cognitive level: Evaluate)

**CLO-4:** Analyze that how the different quality attributes effect the nature of Software being designed (Cognitive level: Analyze)

**CLO-5:** Optimize the implementation and maintenance of the Software delivered. (Cognitive level: Analyze)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Software and Software Engineering**

The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI)

#### **Unit – II: Software Requirement Analysis**

Software Requirement Analysis, Initiating Requirement Engineering Process, Requirement Analysis and Modeling Techniques, Flow Oriented Modeling, Need for SRS, Characteristics and Components of SRS.

#### **Unit – III: Software Development Management**

Estimation in Project Planning Process, Project Scheduling, Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan, Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects.

**Unit – IV: Design Engineering**

Design Concepts, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level.

**Unit – V: Software Testing Strategies & Tactics**

Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White-Box Testing and their type.

**Reference Books**

1. Pressman S.Roger, Software Engineering, Tata McGraw-Hill.
2. Yogesh Singh, Software Testing, Cambridge University Press.2011.
3. SommervilleIan, Software Engineering, 5th ed., Addison Wesley-2000.
4. Fairley Richard, Software, Software Engineering Concepts, Tata McGraw-Hill.
5. Jalote Pankaj, An integrated approach to software engineering, Narosa Publishing House.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-5</b>	<b>BCA 502</b>	<b>SOFTWARE ENGINEERING LAB</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Ability to perform Feasibility analysis for Software Project. (Cognitive level: Analyze)

**CLO-2:** To concentrate more on the efficiency of the designed Software (Cognitive level: Analyze)

**CLO-3:** Students should be able to manage and plan the Software development processes (Cognitive level: Evaluate)

**CLO-4:** Analyze that how the different quality attributes effect the nature of Software being designed (Cognitive level: Analyze)

**CLO-5:** Optimize the implementation and maintenance of the Software delivered. (Cognitive level: Analyze)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

1. Write down the problem statement for a suggested system of relevance.
2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
3. To perform the function oriented diagram: Data Flow Diagram (DFD) and Structured chart.
4. To perform the user's view analysis for the suggested system: Use case diagram.
5. To draw the structural view diagram for the system: Class diagram, object diagram.
6. To draw the behavioral view diagram : State-chart diagram, Activity diagram
7. To perform the behavioral view diagram for the suggested system : Sequence diagram, Collaboration diagram
8. To perform the implementation view diagram: Component diagram for the system.
9. To perform the environmental view diagram: Deployment diagram for the system.
10. To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system.
11. Perform Estimation of effort using FP Estimation for chosen system.
12. To prepare time line chart/Gantt Chart/PERT Chart for selected software project.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-3</b>	<b>BCA PE311</b>	<b>INTRODUCTION TO WIRELESS COMMUNICATION</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** An understanding on functioning of wireless communication system and evolution of different wireless communication systems and standards. (Cognitive level: Understand)

**CLO-2:** An ability to compare recent technologies used for wireless communication. (Cognitive level: Analyze)

**CLO-3:** An ability to explain the architecture, functioning, protocols, capabilities and application of various wireless communication networks. (Cognitive level: Evaluate)

**CLO-4:** An ability to explain multiple access techniques for Wireless Communication (Cognitive level: Analyze)

**CLO-5:** An ability to evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks. (Cognitive level: Evaluate)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Introduction to Basic Principles**

Liberalization of communications Industry, Digitalization of content, changes in spectrum management, cellular reuse, drive towards broadband, Evolution of mobile communications, mobile radio systems- Examples, trends in cellular radio and personal communications.

#### **Unit – II: Cellular Concept**

Frequency reuse, channel assignment, hand off, Interference and system capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems. Cellular telephony: frequency reuse principle, transmitting, receiving, roaming, GSM network architecture, GSM channel structure, GPRS.

#### **Unit – III: Mobile radio propagation**

Free space propagation model, reflection, diffraction, scattering, link budget design, Outdoor Propagation models, Indoor propagation models, Small scale Multipath propagation, Impulse model, Small scale Multipath measurements, parameters of Mobile multipath channels, types of small scale fading, statistical models for multipath fading channels.

#### **Unit – IV: Second Generation and Third Generation Wireless Networks and Standards**

WLL, Bluetooth. AMPS, GSM, IS-95 and DECT Satellite networks: orbits, footprint, categories of satellites. Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Capacity of Cellular CDMA and SDMA.

### **Unit – V: Introducing the Mobile Internet**

Key Services for the mobile Internet, Business opportunities. WAP: the Mobile Internet Standard: Challenges and Pitfalls, Overview of the Wireless Application Protocol, Implementing WAP Services: The Wireless Markup Language, Enhanced WML: WML Script and WTAI,

#### **Reference books**

1. W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications", Second Edition, McGraw-Hill International, 1998.
2. Stephen G. Wilson, "Digital Modulation and Coding", Pearson Education, 2003.

BCA	Paper code	Title of the Course
Semester-3	BCA PE312	INTRODUCTION TO MOBILE COMPUTING

### COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to:

**CLO-1:** To study the basics of wireless, cellular technology. (Cognitive level: Understand)

**CLO-2:** To analyse the working of Mobile IP, ad hoc network. (Cognitive level: Analyze)

**CLO-3:** To understand features of mobile operating systems. (Cognitive level: Understand)

**CLO-4:** To know J2ME, SDK, android that helps the mobile application development. (Cognitive level: Analyze)

**CLO-5:** To understand the use of M-Commerce application (Cognitive level: Understand)

### Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### Unit – I: Mobile communication Introduction

Mobile computing devices mobile computing function, mobile computing architecture, evaluation of wireless technology (1G, 2G, 3G, 4G technology).

#### Unit – II: PCS and GSM

PCS Architecture, GSM architecture, Location tracking and call setup, Mobility management: Handover Security-GSM, SMS, International roaming for GSM.

#### Unit – III: GPRS and Packet Data Network

GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Limitations of GPRS, Spread Spectrum technology, Third Generation Networks, Applications on 3G.

#### Unit – IV: Wireless Networks

Wireless LAN: IEEE 802.11, Standards, Architecture, Services, Mobile Ad hoc Networks: WiFi and WiMAX, Wireless Local Loop, Bluetooth.

#### Unit – V: Emerging Mobile Communication Technology

Mobile IP, Cellular IP, VoIP, SIP, LTE, 4G goal and architecture.

#### Text books:

1. Fundamentals of Mobile Computing, Prasant Kumar Pattanaik, Rajib Mall, Second Edition, PHI, ISBN: 978-81-203-5181-3

#### Reference books:

1. Mobile Computing, ASOKE TALUKDER HASAN AHMED ROOPA R YAVAGAL, Second Edition. Mc GrawHill.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-3</b>	<b>BCA PE313</b>	<b>WEB &amp; E-COMMERCE TECHNOLOGIES</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** To introduce the concepts of various web technologies. (Cognitive level: Understand)

**CLO-2:** To impart knowledge related with website designing. (Cognitive level: Remember)

**CLO-3:** To introduce the concept of E-commerce. (Cognitive level: Understand)

**CLO-4:** To explain how payments are made on e-commerce sites. (Cognitive level: Remember)

**CLO-5:** To explain the role of encryption in e-commerce. (Cognitive level: Remember)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	2	-	2	1	3	2	-	-	-	1	-	1
<b>CLO2</b>	-	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: An introduction to Electronic commerce**

What is E-Commerce (Introduction And Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce, Electronic Commerce Applications, Electronic Commerce and Electronic Business(C2C)(C2G,G2G, B2G, B2P, B2A, P2P, B2A, C2A, B2B, B2C).

#### **Unit – II: The Internet and WWW**

Evolution of Internet, Domain Names and Internet Organization (.edu, .com, .mil, .gov, .net etc.), Types of Network, Internet Service Provider, World Wide Web, Internet & Extranet, Role of Internet in B2B Application, building own website, Cost, Time, Reach, Registering a Domain Name, Web promotion, Target email, Baner, Exchange, Shopping Bots.

#### **Unit – III: Internet Security**

Secure Transaction, Computer Monitoring, Privacy on Internet, Corporate Email privacy, Computer Crime (Laws, Types of Crimes), Threats, Attack on Computer System, Software Packages for privacy, Hacking, Computer Virus (How it spreads, Virus problem, virus protection, Encryption and Decryption, Secret key Cryptography, DES, Public Key Encryption, RSA, Authorisation and Authentication, Firewall, Digital Signature (How it Works).

#### **Unit – IV: Electronic Data Exchange**

Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDI model, Electronic Payment System: Introduction, Types of Electronic Payment System,

Payment Types, Value Exchange System, Credit Card System, Electronic Fund Transfer, Paperless bill, Modern Payment Cash, Electronic Cash.

**Unit – V: Planning for Electronic Commerce and Internet Marketing**

Planning Electronic Commerce initiates, Linking objectives to business strategies, Measuring cost objectives, Comparing benefits to Costs, Strategies for developing electronic commerce web sites; Internet Marketing: The PROS and CONS of online shopping, The cons of online shopping, Justify an Internet business, Internet marketing techniques, The E-cycle of Internet marketing, Personalization e-commerce.

**Text books:**

1. Steven Holzner, "HTML Black Book", Dreamtech press.
2. Web Technologies, Black Book, Dreamtech Press
3. Web Applications : Concepts and Real World Design, Knuckles, Wiley-India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.
5. Greenstein and Feinman, "E-Commerce", TMH
6. Ravi Kalakota, Andrew Whinston, "Frontiers of Electronic Commerce", Addison Wesley
7. Denial Amor, " The E-Business Revolution", Addison Wesley
8. Diwan, Sharma, "E-Commerce" Excel
9. Bajaj & Nag, "E-Commerce: The Cutting Edge of Business", TMH

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-5</b>	<b>BCA PE521</b>	<b>INTRODUCTION TO DATA MINING</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** To identify the scope and necessity of Data Mining. (Cognitive Level: Evaluate)

**CLO-2:** Describe the designing of Data Mining Techniques. (Cognitive Level: Understand)

**CLO-3:** To develop ability to understand various algorithms based on data mining tools. (Cognitive Level: Create)

**CLO-4:** To develop and apply critical thinking, problem-solving, and decision-making skills. (Cognitive Level: Create)

**CLO-5:** To discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms. (Cognitive Level: Analyze)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	-	-	2	1	3	2	-	-	-	1	-	1
<b>CLO2</b>	2	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	-	2	-	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Data Mining Concepts**

Data mining primitives, Basics of data mining, Data Mining Functionalities, Classification of Data Mining Systems, Architectures of data mining system.

#### **Unit – II: Association Rules In Large Databases**

Association Rule Mining, Mining Single Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases.

#### **Unit – III: Classification And Prediction**

Issues Regarding Classification and Prediction, Classification by Decision Tree Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction.

#### **Unit – IV: Cluster Analysis In Data Mining**

Types of Data in Cluster Analysis. A Categorization of Major Clustering Methods, Partitioning Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Outlier Analysis.

#### **Unit – V: Data Warehousing and various Issues in Data Mining :**

Introduction to Data Warehouse, Data warehousing and its characteristics, Online analytical processing (OLAP), characteristics of OLAP system, Scalability and data management issues in data mining algorithms, measures of interestingness.

**Text Books:**

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education.2005.
2. Richard Roiger, Michael Geatz, Data Mining: A Tutorial Based Primer, Pearson Education 2003.

**Reference books:**

1. G.K. Gupta, Introduction to Data Mining with Case Studies, PHI, 2006.
2. Soman K P, Diwakar Shyam, Ajay V Insight into Data Mining: Theory and Practice, PHI, 2006.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-5</b>	<b>BCA PE522</b>	<b>INTRODUCTION TO CLOUD COMPUTING</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

On completion of this course the students will be able to:

**CLO-1:** Analyze the trade-offs between deploying applications in the **CLO**ud and over the local infrastructure. (Cognitive Level: Analyze)

**CLO-2:** Compare the advantages and disadvantages of various **CLO**ud computing platforms. (Cognitive Level: Analyze)

**CLO-3:** Deploy applications over commercial **CLO**ud computing infrastructures such as Amazon Web Services, Windows Azure, and GoogleApp Engine. (Cognitive Level: Create)

**CLO-4:** Analyze the performance, scalability, and availability of the underlying **CLO**ud technologies and software. (Cognitive Level: Analyze)

**CLO-5:** Identify security and privacy issues in **CLO**ud computing. (Cognitive Level: Analyze)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	3	-	2	-	-	-	1	-	2
<b>CLO2</b>	-	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Introduction to Cloud Computing**

Recent trends in Computing, Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing.

#### **Unit – II: Cloud Computing Architecture**

Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment Models such as Public cloud, Private cloud, Hybrid cloud, Community cloud,

#### **Unit – III: Case Studies**

Case study of NIST architecture, Case study of Service model using Google App Engine, Microsoft Azure, Amazon EC2, Eucalyptus.

#### **Unit – IV: Service Management in Cloud Computing**

Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware such as Traditional vs. Cloud, Economics of scaling.

#### **Unit – V: Cloud Security**

Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing.

**Text Books:**

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011.
3. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012

**Reference books:**

1. **CLO**ud Security: A Comprehensive Guide to Secure **CLO**ud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010
2. Gautam Shroff, Enterprise **CLO**ud Computing Technology Architecture Applications, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, **CLO**ud Computing, A Practical

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-5</b>	<b>BCA PE523</b>	<b>INTRODUCTION TO DATA SCIENCE AND BIG DATA</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

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

**CLO-1:** Understand fundamental tools and technologies of Data Science. (Cognitive Level: Understand)

**CLO-2:** Analyze Big Data issues and identify solutions (Cognitive Level: Analyze)

**CLO-3:** Use basic data visualization techniques using Tableau and Power BI, etc. (Cognitive Level: Create)

**CLO-4:** Will learn basics of No SQL (Cognitive Level: Learn)

**CLO-5:** Familiar with Hadoop and its related technologies (Cognitive Level: Understand)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Understanding Big Data**

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing fraud and big data, risk and big data ,credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data mobile business intelligence, Crowd sourcing analytics ,inter and trans firewall analytics

#### **Unit – II: NoSQL Data Management**

Introduction to NoSQL , aggregate data models ,aggregates ,key-value and document data models, relationships, graph databases, schema less databases ,materialized views, distribution models, sharding , master-slave replication , peer-peer replication, sharding and replication, consistency , relaxing consistency , version stamps , mapreduce, partitioning and combining , composing map-reduce calculations

#### **Unit – III: Basics Of Hadoop**

Data format , analyzing data with Hadoop , scaling out , Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface , data flow, Hadoop I/O, data integrity, compression, serialization, Avro file-based data structures.

### **Unit – IV: Map Reduce Applications**

Map Reduce workflows, unit tests with MRUnit , test data and local tests – anatomy of Map Reduce job run, classic Map-reduce , YARN , failures in classic Map-reduce and YARN, job scheduling , shuffle and sort , task execution, MapReduce types , input formats, output formats.

### **Unit – V: Hadoop Related Tools**

Hbase, data model and implementations, Hbase clients, Hbase examples– praxis.Cassandra ,cassandra data model , cassandra examples , cassandra clients, Hadoop integration. Pig , Grunt , pig data model , Pig Latin , developing and testing Pig Latin scripts. Hive , data types and file formats , HiveQL data definition , HiveQL data manipulation – HiveQL queries

#### **Text Books:**

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012. 5. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

#### **Reference Books:**

1. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012. 7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
2. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
3. Alan Gates, "Programming Pig", O'Reilley, 2011

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-4</b>	<b>BCA SEE411</b>	<b>INTERNET AND WEB TECHNOLOGY</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

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

**CLO-1:** Understand fundamental tools and technologies and protocols governing the web. (Cognitive Level: Understand)

**CLO-2:** Analyze a web page and identify its elements and attributes. (Cognitive Level: Analyze)

**CLO-3:** Create web pages using HTML and Cascading Style Sheets. (Cognitive Level: Create)

**CLO-4:** Build dynamic web pages using JavaScript (Client side programming). (Cognitive Level: Create)

**CLO-5:** Develop an understanding of electronic commerce and emerging internet trends. (Cognitive Level: Create)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit 1: Introduction to Internet and WWW**

Introduction to Internet: History of World Wide Web; Protocols governing the web; Understanding the Internet: syntax of URLs, web page and browsers, search engine; Introduction to Cyber Laws in India.

#### **Unit 2: Internet Applications**

Internet applications: FTP, Telnet, Email, Chat; Internet addressing: identification of each computer using domain name and IP addresses, DNS.

#### **Unit 3: Formatting Web Pages**

Introduction to HTML, XML, DHTML and CSS; Formatting Web Pages with the help of different HTML tags, HTML table, HTML form; using CSS for formatting different objects; using DHTML for dynamic designing of web page.

#### **Unit 4: JavaScript**

Introduction to Javascript: Advantages of Javascript, Javascript Syntax, documents, forms, Datatype, Variable, Array, Operator and Expression, Looping Constructor, Event Handling, cookies.

#### **Unit 5: E-Commerce and emerging trends**

E-Commerce and security issues; Emerging trends: Internet telephony, virtual reality over the web, etc.; Intranet and extranet; firewall design issues.

**Text Books:**

1. Raymond Greenlaw and Ellen Hepp, “Fundamentals of Internet and World Wide Web”, TMH.
2. Ivan Bayross, “Web Technologies Part II”, BPB Publications.

**Reference Books:**

1. Thomas A Powell, “HTML The Complete Reference”, Tata McGraw Hill Publications.
2. Burdman, “Collaborative Web Development”, Addison Wesley.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-4</b>	<b>BCA SEE412</b>	<b>PROGRAMMING IN VISUAL BASIC</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Students will be able to implement syntax rules in visual basic programs. (Cognitive Level: Create)

**CLO-2:** Students will have the understanding of variables and data types used in program development. (Cognitive Level: Understand)

**CLO-3:** Students will be able to apply decision structures for determining different operations, apply loop structures to perform repetitive tasks. (Cognitive Level: Understand)

**CLO-4:** Students will be able to debug codes written in VB language. (Cognitive Level: Analyze)

**CLO-5:** Students will be able to develop mini projects based on user interactivity, logical relations among different data etc. (Cognitive Level: Create)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Introduction to VB**

Visual & Non-Visual programming, Procedural, Object-Oriented, Object-Based and Event-Driven Programming Languages, VB as Even-Driven and Object-Based Language, VB Environment: Menu bar, Toolbar, Project explorer, Toolbox, Properties Window, Form Designer, Form Layout, Immediate window, Default Controls in Tool Box Visual Development and Event Driven programming.

#### **Unit – II: Basics of Programming**

Variables: Declaring Variables, Types of variables, Converting Variables Types, User Defined Data Types, Forcing Variable Declaration, Scope & Lifetime of Variables; Constants: Named & Intrinsic, Operators: Arithmetic, Relational & Logic.

#### **Unit – III: Decision Statements in VB**

If statement, if-then-else, select-case; Looping Statements in VB: do-loop, for-next, while-wend; Exit statement, Nested Control Structure; Arrays: Declaring and using Arrays, One-dimensional, Two-dimensional and Multi-dimensional Arrays, Static and Dynamic arrays, Array of Arrays.

#### **Unit – IV: Procedures**

General & Event Procedures, Subroutines, Functions, Calling Procedures, Arguments - Passing Mechanisms, Optional Arguments, Named Arguments, Functions Returning Custom Data Types Simple Program Development in VB such as Sum of Numbers, Greatest among Numbers, Checking Even/Odd Number, HCF of Two Numbers, Generate Prime Numbers, Generate Fibonacci Series, Factorial of a Number, Searching, Sorting, etc.

#### **Unit – V: VB Objects and Monitoring Mouse Activity**

Dialog Boxes, Common Controls, Menus, MDI Forms, Testing, Debugging and Optimization – Working with Graphics.

Monitoring Mouse Activity: File handling, File system controls, File system objects, DLL Servers.

#### **Text/Reference Books:**

1. Steven Holzner, Visual Basic 6 Programming: Black Book, Dreamtech Press.
2. Evangelos Petroustos, Mastering Visual Basic 6, BPB Publications.
3. Julia Case Bradley & Anita C. Millspaugh, Programming in Visual Basic 6.0, Tata McGraw-Hill Edition.
4. KMichael Halvorson, Step by Step Microsoft Visual Basic 6.0 Professional, PHI.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-4</b>	<b>BCA SEE413</b>	<b>FUNDAMENTAL CONCEPTS OF MICROPROCESSOR AND ARDUINO PROGRAMMING</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Learn the Basic of microprocessor and its architecture. (Cognitive Level: Understand)

**CLO-2:** Learn the Arduino programming language and IDE (Cognitive Level: Understand)

**CLO-3:** Program basic Arduino examples. (Cognitive Level: Understand)

**CLO-4:** Prototype circuits and connect them to the Arduino(Cognitive Level: Create)

**CLO-5:** Connect the Arduino microcontroller to a serial terminal to understand communication and stand-alone use . (Cognitive Level: Apply)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	-	-	2	-	2	1	-	3	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	2	1	-	2	-	2	-	-	-	1	1	3
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	-	3	2	-	1	-	2

#### **Unit – I: Fundamentals of Microprocessor**

Fundamentals of Architecture: 8 & 16 bit Microprocessor and Microcontroller and its comparison, Embedded System & its Characterization. 8051 Architecture Family: Block Diagrams, CPU, ALU, Family of Bus, Registers, Pointers. Timing Diagrams and Execution Cycles, Overview of Microprocessor Family, I/O Interfacing.

#### **Unit – II: Instruction Set and programming**

Addressing modes: Introduction, Instruction syntax, Data types, Subroutine, Types of Addressing. 8051 Instruction set, Instruction timings, Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs, Assemblers and compilers.

#### **Unit – III: Introduction to Arduino**

Fundamentals of Arduino, Serial Monitoring, Digital and Analog Inputs, Understanding variables, If-Else Statement, comparison Operators and Conditions, While statement, Analog I/O and Serial Communications.

#### **Unit – IV: Programming using Arduino**

Arduino Environment, C Programming used for Arduino, ArduinoToolchain, Cross-Compilation, Arduino Sketches, Classes, Pins, Input and Outputs, Debugging, UART protocol, UART parity and Stop.

#### **Unit – V: Applications**

Microprocessor: LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing.

Arduino: Traffic Light Count Down Timer, Parking Lot Counter, Weighing Machines, Emergency Light for railways, Security Systems.

#### **Text Books:**

1. The AVR Microcontroller and Embedded Systems Using Assembly and C, By Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, Pearson Education.
2. Michael J. Pont, Embedded C AddisonWesley, Pearson Education Limited, 2002.
3. An Embedded Software Primer - David E. Simon, Pearson Education.
4. “Beginning Arduino”, Michal Mc Roberts, Second Edition
5. Michal Mc Roberts “Beginning Arduino” Second Edition, Technology in Action
6. Massimo Banzi, “Getting started with Arduino” 2nd Edition, Orelly 2011

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-5</b>	<b>BCA SEE521</b>	<b>INTRODUCTION TO JAVA PROGRAMMING</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Understand Java Programming concept and various rule. (Cognitive Level: Understand)

**CLO-2:** Read and understand Java-based software code of medium-to-high complexity. (Cognitive Level: Understand)

**CLO-3:** Use standard Java's API's when writing applications. (Cognitive Level: Evaluate)

**CLO-4:** Understand the basic principles of creating Java application (Cognitive Level: Understand)

**CLO-5:** Understand the fundamental concepts of Object-Oriented Programming through Java language (Cognitive Level: Understand)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	3	-	2	-	-	-	2	-	3
<b>CLO2</b>	-	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	3	-	2	-	-	-	1	1	2
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	-	3	2	-	1	-	2

#### **Unit – I: Introduction to Java**

Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods).

#### **Unit – II: Arrays, Strings and I/O**

Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

#### **Unit – III: Object-Oriented Programming Overview**

Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection. Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, extending interfaces and packages, Package and Class Visibility, Using Standard

Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

**Unit – IV: Exception Handling, Threading, Networking and Database Connectivity**

Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

**Unit – V: Applets and Event Handling**

Java Applets:Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms,Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, textfields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets

**Text Books:**

1. Programming with Java, E Balagurusamy, Second edition, TMH.
2. Java -The Complete Reference, Patrick Naughton and Herbertz Schidt.
3. Core Java Volume-I and II 2nd edition-Sun MicroSystem.

**Reference books:**

1. The Java Programming Language, Ken Arnold, James Gosling, David Homes.
2. Cay S. Horstmann, GaryCornell, "Core Java 2 Volume 1 ,9th Edition,Printice Hall.
3. Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-5</b>	<b>BCA SEE522</b>	<b>FUNDAMENTALS OF .NET PROGRAMMING</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

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

**CLO-1:** Develop applications using ASP.NET IDE. Develop simple web page using built in Objects (Cognitive Level: Create)

**CLO-2:** Use controls available with the IDE platform of ASP.NET for given purpose (Cognitive Level: Apply)

**CLO-3:** Apply Styles, themes and Master pages in ASP.NET Web applications (Cognitive Level: Apply)

**CLO-4:** Develop programs using session management and user's preference in ASP.NET. (Cognitive Level: Create)

**CLO-5:** Describe Objects of ADO.NET (Cognitive Level: Evaluate)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	3	-	2	1	2	2	-	-	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	1	1	3	2	2	2	-	-	-	1	1	1
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	2	2	2	-	1	-	2

#### **Unit – I: Introduction to .NET Framework and C#**

.NET framework, MSIL, CLR, CLS, CTS, Namespaces, Assemblies The Common Language Implementation, Assemblies, Garbage Collection, The End to DLL Hell - Managed Execution, Name Spaces - Constructor and Destructors, Function Overloading & Inheritance, Operator Overloading, Modifiers - Property and Indexers , Attributes & Reflection API, When to use Console Applications - Generating Console Output, Processing Console Input.

#### **Unit – II: C#.NET and ADO.NET:**

Creating Language Features and Creating .NET Projects, Namespaces Classes and Inheritance -, Namespaces Classes and Inheritance -, C, Exploring the Base Class Library -, Debugging and Error Handling -, Data Types -, Exploring Assemblies and Namespaces, String Manipulation ,Files and I/O ,Collections.

#### **Unit – III: Windows Forms and Controls in details**

The Windows Forms Model, Creating Windows Forms Windows Forms Properties and Events, Windows Form Controls, Menus - Dialogs – ToolTips, Apply Inheritance techniques to Forms,

Creating Base Forms, Programming Derived Forms, Printing - Handling Multiple Events, GDI+, Creating Windows Forms Controls

**Unit – IV: Connectivity ASP.NET - Themes and Master Pages:**

Introduction to ASP.NET, Working with Web and HTML Controls, Using Rich Server Controls, Login controls, Overview of ASP.NET Validation Controls, Using the Simple Validations, Using the Complex Validators Accessing Data using ADO.NET.

**Unit – V: Managing State:**

Preserving State in Web Applications and Page-Level State, Using Cookies to Preserve State, ASP.NET Session State, Storing Objects in Session State, Configuring Session State, Setting Up an Outof-Process State Server, Storing Session State in SQL Server.

**Text Books**

1. ASP.NET: The Complete Reference Books Matthew Macdonald McGraw Hill education

**Reference Books**

1. Programming in Visual Basic. NET Julia Case Bradley, Anita C. Millspaugh McGraw Hill, latest edition

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-5</b>	<b>BCA SEE523</b>	<b>PHP JAVA PROGRAMMING</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

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

**CLO-1:** Understand how server-side programming works on the web. (Cognitive Level: Understand)

**CLO-2:** PHP Basic syntax for variable types and calculations. (Cognitive Level: Understand)

**CLO-3:** Creating conditional structures. (Cognitive Level: Create)

**CLO-4:** Storing data in arrays. Understanding POST and GET in form submission. (Cognitive Level: Apply)

**CLO-5:** Using PHP built-in functions and creating custom functions. (Cognitive Level: Apply)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	-	-	2	1	-	2	-	-	-	1	-	2
<b>CLO2</b>	2	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	3	1	-	3	-	2	-	-	-	1	1	3
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	-	-	2	-	1	-	1

#### **Unit – I: Introduction to PHP**

Java PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.), PHP with other, technologies, scope of PHP, Basic Syntax, PHP variables and constants, Types of data in PHP, Expressions, scopes of a variable (local, global), PHP Operators : Arithmetic, Assignment, Relational, Logical operators, Bitwise, ternary and MOD operator. PHP operator Precedence and associativity

#### **Unit – II: Handling HTML form with PHP**

Capturing Form Data, GET and POST form methods Dealing with multi value fields, Redirecting a form after submission. PHP conditional events and Loops: PHP IF Else conditional statements (Nested IF and Else), Switch case, while, For, and Do While Loop, Goto, Break, Continue and exit.

#### **Unit – III: PHP Functions**

Function, Need of Function, declaration and calling of a function, PHP Function with arguments, Default Arguments in Function, Function argument with call by value, call by reference, Scope of Function Global and Local.

#### **Unit – IV: ConnectivityString Manipulation and Regular Expression**

Creating and accessing String, Searching & Replacing String, Formatting, joining and splitting String, String Related Library functions, Use and advantage of regular expression over inbuilt function, Use of preg\_match(), preg\_replace(), preg\_split() functions in regular expression.

### **Unit – V: Array**

Anatomy of an Array, Creating index based and Associative array, Accessing array, Looping with Index based array, with associative array using each() and foreach(), Some useful Library function.

#### **Text Books:**

1. PHP : The Complete Reference, Steven Holzner, Mcgraw Higher Ed.
2. PHP Beginner's Practical Guide, Pratiyush Guleria, Bpb publications.
3. Web Programming with PHP And MYSQL: A Practical Guide, Max Bramer, Springer.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-4</b>	<b>BCA OE411</b>	<b>ORGANIZATION BEHAVIOR</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** To understand the conceptual framework of the discipline of OB and its practical applications in the organisational set up. (Cognitive Level: Understand)

**CLO-2:** To deeply understand the role of individual, groups and structure in achieving organizational goals effectively and efficiently. (Cognitive Level: Understand)

**CLO-3:** To critically evaluate and analyse various theories and models that contributes in the overall understanding of the discipline. (Cognitive Level: Evaluate)

**CLO-4:** To develop creative and innovative ideas that could positively shape the organisations. (Cognitive Level: Create)

**CLO-5:** To accept and embrace in working with different people from different cultural and diverse background in the workplace. (Cognitive Level: Evaluate)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	1	-	2	-	3	2	-	-	-	1	-	-
<b>CLO2</b>	2	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	-	1	3	2	2	2	-	-	-	1	1	3
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	-	3	2	-	1	-	2

#### **Unit – I: Overview of Organization Behavior**

Nature, Scope, Definition and Goals of organizational Behaviour, Fundamental Concepts of Organizational Behaviour, Models of Organizational Behaviour, essential attributes, Psychological dimensions and relevance in the emerging society.

#### **Unit – II: Learning**

Styles and principles, Skinner, Thorndike and Piaget theories, Conditions of learning; Memory: Short term and long term; Efficient and effective ways in respect of thinking, problem solving and decision making.

#### **Unit – III: Effects of employee attitudes**

Personal and Organizational Values, Job Satisfaction, Nature and Importance of Motivation, Achievement Motive, Theories of Work Motivation: Maslow’s Need Hierarchy Theory, McGregor’s Theory ‘X’ and Theory ‘Y’.

#### **Unit – IV: Personality and Stress**

Models of personality, factors and desirable features of a healthy personality; Basic Needs and their hierarchy: Mallow model and self actualizing personalities; Work stress: Meaning and definition of Stress, Symptoms of Stress, Sources of Stress, Stress management.

**Unit – V: Conflict in organization**

Nature of Conflict, Process of Conflict, Levels of Conflict - Intrapersonal, Interpersonal, Sources of Conflict, Effect of Conflict, Conflict Resolution, Meaning and types of Grievances & Process of Grievances Handling.

**Text Books**

1. Essentials of Organizational Behaviour, Stephen P Robbins, Timothy A Judge; latest edition
2. Organisational Behavior Book by K. Aswathappa; latest edition

**Reference Books**

1. Organisation Theory and Behaviour, T N Chhabra, B P Singh; latest edition

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-4</b>	<b>BCA OE412</b>	<b>FINANCIAL ACCOUNTING</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** Students should be able to conceptually define accounting and bookkeeping. (Cognitive Level: Remember)

**CLO-2:** Identify the accounting rules required for business enterprises. (Cognitive Level: Analyze)

**CLO-3:** Apply the accounting rules in determining financial results. (Cognitive Level: Apply)

**CLO-4:** Connect knowledge and record business changes. (Cognitive Level: Evaluate)

**CLO-5:** Compare the specificity of different accounts within the accounting policies. (Cognitive Level: Analyze)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	-	-	2	1	-	2	-	-	-	1	-	2
<b>CLO2</b>	2	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	3	1	-	3	-	2	-	-	-	1	1	3
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	-	-	2	-	1	-	1

#### **Unit – I: Overview of Financial Accounting**

Meaning and Nature of Financial Accounting, Scope of Financial Accounting, Financial Accounting & Management Accounting, Accounting concepts & convention, Accounting standards in India.

#### **Unit – II: Basics of accounting**

Capital & Revenue items, Application of Computer in Accounting Double Entry System, Introduction to Journal, Ledger and Procedure for Recording and Posting, Introduction to Trial Balance, Preparation of Final Account, Profit & Loss Account and related concepts, Balance Sheet and related concept.

#### **Unit – III: Financial statement analysis**

Ratio analysis, Funds flow analysis, concepts, uses, Preparation of funds flow statement, simple problem, Cash flow analysis, Concepts, uses, preparation of cash flow statement, simple problem, Break – even analysis.

**Unit – IV: Definition nature and Objective of Financial Management**

Long Term Sources of Finance, Introductory idea about capitalization, Capital Structure, Concept of Cost of Capital, introduction, importance, explicit & implicit cost, Measurement of cost of capital, cost of debt.

**Unit – V: Concept & Components of working Capital**

Factors Influencing the Composition of working Capital, Objectives of working Capital Management – Liquidity Vs. Profitability and working capital policies. Theory of working capital: Nature and concepts. Cash Management, Inventory Management and Receivables Management.

**Text books:**

1. T S Grewal, Double Entry Book Keeping, latest edition
2. Sandeep Garg, Accounting Financial Accounting, latest edition

BCA	Paper code	Title of the Course
Semester-4	BCA OE413	CYBER CRIMES & CYBER LAWS

### COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to:

**CLO-1:** Describe laws governing cyberspace and analyze the role of Internet Governance in framing policies for Internet security. (Cognitive Level: Understand)

**CLO-2:** Discuss different types of cybercrimes and analyze legal frameworks of different countries to deal with these cybercrimes. (Cognitive Level: Remember)

**CLO-3:** Explain the importance of jurisdictional boundaries and identify the measures to overcome cross jurisdictional cyber-crimes. (Cognitive Level: Understand)

**CLO-4:** Illustrate the importance of ethics in legal profession and determine the appropriate ethical and legal behavior according to legal frameworks. (Cognitive Level: Analyze)

**CLO-5:** Demonstrate knowledge about Intellectual Property and International aspects of Cyber Laws. (Cognitive Level: Remember)

### Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
<b>CLO1</b>	-	-	2	1	-	2	-	-	-	1	-	2
<b>CLO2</b>	2	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	3	1	-	3	-	2	-	-	-	1	1	3
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	-	-	2	-	1	-	1

#### Unit – I: Introduction to IT laws & Cyber Crimes

Internet, Hacking, Cracking, Viruses, Virus Attacks, Software Piracy.

#### Unit – II: E-Mail Investigation

E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers.

#### Unit – III: Introduction to Cyber Crime Investigation

Cyber Forensics, Investigation Tools, e-Discovery, Digital Evidence Collection, Evidence Preservation, Forensics Tools and Softwares, Recovering deleted evidences, Password Cracking, Cyber Security.

#### Unit – IV: Intellectual property, Legal System of Information Technology

Social Engineering, Mail Bombs, Bug Exploits, Law of Intellectual Property: Copy Right Act, Trade and Merchandise Act, Patent Act, Domain Name Disputes, Cyber-Squatting.

#### Unit – V: International Perspective of Cyber Law

Electronic Data Interchange, EDI: Concept and legal Issues. Electronic Signature Law's of Major Countries, Cryptography Laws, Cyber Law's of Major Countries.

**Text books:**

1. Chris Reed and John Angel, "Computer Law", OUP, New York, 2007.
2. Justice Yatindra Singh, "Cyber laws", Universal Law publishing Co, New Delhi, 2012.
3. SK Verma and Raman Mittal, "Legal dimensions of cyber space", Indian Law Institute, New Delhi, 2004.
4. SR Bhansali, "Information Technology Act 2000", University book house pvt. Ltd., Jaipur.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-5</b>	<b>BCA OE511</b>	<b>STARTUP ENTREPRENEURSHIP</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

After completing this Course, the students should be able to:

**CLO-1:** To be able to understand basic concepts associated to entrepreneurship. (Cognitive Level: Understand)

**CLO-2:** To gain an insight about available sources of finance (Cognitive Level: Remember)

**CLO-3:** Know various schemes available by government for startups (Cognitive Level: Remember)

**CLO-4:** Able to develop their own startups (Cognitive Level: Create)

**CLO-5:** Learn competitive edge (Cognitive Level: Remember)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	-	-	2	-	2	1	-	3	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	2	1	-	2	-	2	-	-	-	1	1	3
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	-	3	2	-	1	-	2

#### **Unit – I: Introduction to Entrepreneurship**

Meaning and concept of entrepreneurship, the history of entrepreneurship development, role of entrepreneurship in economic development, agencies in entrepreneurship management and future of entrepreneurship, Meaning of entrepreneur, the skills required to be an entrepreneur, the entrepreneurial decision process, and role models, mentors and support system.

#### **Unit – II: Business Opportunity Identification and Planning**

Capturing Business ideas, methods of generating ideas, and opportunity recognition, Preparing a Business Plan: Meaning and significance of a business plan, components of a business plan, and feasibility study

#### **Unit – III: Financing the New Venture**

Importance of new venture financing, types of ownership securities, venture capital, types of debt securities, determining ideal debt-equity mix, and financial institutions and banks

#### **Unit – IV: Launching and Managing the New Venture**

Choosing the legal form of new venture, protection of intellectual property, and marketing the new venture, Characteristics of high growth new ventures, strategies for growth, and building the new venture capital

#### **Unit – V: Harvesting Rewards**

Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy

#### **Text Books:**

1. Fundamentals of Entrepreneurship and Small Business Management, Vasant Desai, Himalaya Publishing House.

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-5</b>	<b>BCA OE512</b>	<b>CONCEPTS OF E-GOVERNANCE AND SMART CITY</b>

### **COURSE LEARNING OUTCOMES (CLOs)**

Upon completion of the course students should be able to:

**CLO-1:** This course is designed to give exposure to project management tools and techniques applicable for planning, controlling & monitoring of Smart Infrastructure and Cities. (Cognitive Level: Remember)

**CLO-2:** This course would also enable to develop insight for managing project risks, uncertainties and complexities of smart cities project. (Cognitive Level: Remember)

**CLO-3:** Understanding of road map for Planning Smart Cities and benchmarking their performance for Indian context. (Cognitive Level: Understand)

**CLO-4:** Understand basic principles and concept of green as well as energy efficient buildings as a part of Smart, sustainable development. (Cognitive Level: Understand)

**CLO-5:** Optimizing/designing the green building system and use of sustainable materials. (Cognitive Level: Analyze)

### **Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	-	-	2	-	2	1	-	3	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	2	1	-	2	-	2	-	-	-	1	1	3
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	-	3	2	-	1	-	2

#### **Unit – I**

**E-Government**— Overview, E-Governance and E-Government, E-Governance Definitions E-Government Definitions, Framework for e-Government versus e-Governance, E-Government Services, G2G – Government to Government, Government to Constituents (E-Democracy), E-Government around the World

#### **Unit – II**

Government, Governance and Democracy, E-Governance Projects in India, Measures to be considered before going for E-Governance

#### **Unit – III**

**Smart City overview**, Introduction, meaning, features, Concept of Smart Community, Smart Transportation, City typologies, -Sustainable cities, Liveable cities, Intelligent cities.

Smart Building and Home Device, Smart Health, Smart Government, Smart Energy and Water Cyber security, Safety, and Privacy, Internet of Things, Block chain, Artificial Intelligence, Alternate Reality, Virtual Reality

#### **Unit – IV**

International smart cities-European: Copenhagen, Asian: Singapore

UK smart cities initiatives, Initiatives, Birmingham initiatives, London initiatives, Smart Birmingham vs. smart London

## **Unit – V**

Phases, Stages of Project & their Approval Status, Work Breakdown Structure, Project Organization Structure, Planning, Scheduling & CPM, Smart Cities –Global Standards and Performance, Benchmarks, Practice Code, Smart City Planning and Development, Case Studies on PM of Smart Cities

### **Text Books:**

1. Smart Cities (The MIT Press Essential Knowledge series)
2. Introduction to Smart Cities by Anil Kumar, Pearson.
3. Smart City Governance by Alois Paulin

<b>BCA</b>	<b>Paper code</b>	<b>Title of the Course</b>
<b>Semester-5</b>	<b>BCA OE513</b>	<b>DIGITAL MARKETING AND E-COMMERCE</b>

**COURSE LEARNING OUTCOMES (CLOs)**

Upon completion of the course students should be able to:

**CLO-1:** Analyze the impact of E-commerce on business models and strategy (Cognitive Level: Analyze)

**CLO-2:** Describe the major types of E-commerce (Cognitive Level: Remember)

**CLO-3:** Explain the process that should be followed in building an E-commerce presence (Cognitive Level: Remember)

**CLO-4:** Identify the key security threats in the E-commerce environment (Cognitive Level: Evaluate)

**CLO-5:** Describe how procurement and supply chains relate to B2B E-commerce (Cognitive Level: Remember)

**Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)**

	<b>PLO 1</b>	<b>PLO 2</b>	<b>PLO 3</b>	<b>PLO 4</b>	<b>PLO 5</b>	<b>PLO 6</b>	<b>PLO 7</b>	<b>PLO 8</b>	<b>PLO 9</b>	<b>PLO 10</b>	<b>PLO 11</b>	<b>PLO 12</b>
<b>CLO1</b>	-	-	2	-	2	1	-	3	-	1	-	1
<b>CLO2</b>	3	-	-	2	-	-	2	1	1	-	1	-
<b>CLO3</b>	2	1	-	2	-	2	-	-	-	1	1	3
<b>CLO4</b>	-	3	1	-	2	-	-	1	1	-	1	-
<b>CLO5</b>	2	-	-	2	1	-	3	2	-	1	-	2

**Unit – I: History, Nature and Impact of E-Commerce**

Internet and E-Commerce, The Nature of E-Commerce, Retailing on the Internet, Global E-Commerce, Doing Business on the Internet

**Unit – III: E-Commerce Essentials**

Distribution in E-Commerce, Customer Service and Web Site Personalization, Advertising for E-Commerce.

**Unit – III: Marketing management**

Marketing Information Management, Conducting Marketing Research, Creating a Web Site, Fundamentals of Internet Marketing.

**Unit – IV: Business Structures and the Business Plan in E-Commerce**

Business Structures and Economics in E-Commerce, Revenue Models and the Business Plan in E-Commerce

**Unit – V: Marketing Entrepreneurship**

Building a Career in E-Commerce, Ethical, Legal, and Social Responsibilities in E-Commerce Risk Management, Financing the Business.

**Text Books:**

1. Anita Agrawal et.al., E-Commerce and Digital Marketing (Mumbai University), Himalayan Publishing House, New Delhi (latest edition).
2. Dr. Shivani Arora, E-Commerce, Taxmann, latest edition
3. Phillip Kotler, Marketing 4.0, Wiley publishers, latest edition

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### 5.3. Duration of the programme: 3 years (six semesters)

The duration of BCA Programme ODL/OL mode is three Years spread into six semesters. A candidate can complete the programme with a maximum duration of six years (span period). Beyond the said period, such cases shall be considered on case-to-case basis with the approval of the Vice Chancellor or Academic Council as per the extent norms of Jamia Hamdard. In such cases, the student has to seek readmission as per 'Re-Admission' rules and pay the requisite fees.

### 5.4. Faculty and support staff requirements

As per the UGC ODL/OL Regulation norms, the following faculties have been attached to the CDOE Jamia Hamdard on full time basis to cater the needs of BCA (ODL/OL) and MCA (Online):

#### Full Time Faculty:

<i>S.No.</i>	<i>Name of the Faculty (full time)</i>	<i>Qualification</i>	<i>Date of appointment/ joining CDOE</i>
01.	Dr. Abdul Majid Farooqi Assistant Professor- Computer Science	M.Sc (Computer Science), M.Tech (CSE) and Ph.D (CSE)	14.11.2023
02.	Dr. Mohd. Mubashshir Hasan Farooqi Assistant Professor-CSE	M.Tech (Electronics and Telecommunications Engineering) and Ph.D	08.02.2024 (JH) 19.12.2025 (CDOE)
03.	Mr. Rehan Saeed Khan Assistant Professor-CSE	M.Sc (Physics), MCA and UGC-NET (CS)-2013	10.11.2023 (JH) 19.12.2025(CDOE)
04.	Ms. Juveria Assistant Professor-CSE	M.Sc (Computer Science), UGC NET (CS) Dec 2018	9.2.2024 (JH) 21.5.2026 (CDOE)

Lab Classes for BCA are conducted with the assistance of regular support staff of Centre for Information Technology by the Faculty Members.

Besides, as per the following Academic Counsellors have been engaged for counselling/PCP and Laboratory classes for BCA programmes on ODL/OL mode (2025-26 session):

**List of Academic Counselors for BCA Programme**

S No	Name of the Academic Counsellor	Designation	Qualifications	Experience in Teaching / Research	Area of Specialization	Courses being taught through PCP/OL	Mobile Number & Email ID
1.	Dr. Safdar Tanweer	Associate Professor, SEST, JH	Ph.D. (CSE)	13 years	Computer Science & Engineering	BCA - 601 Project Work	9810465885 safdardanweer@yahoo.com
2.	Dr. Md. Tabrez Nafis	Associate Professor, SEST, JH	Ph.D. (CSE)	11 years	Computer Science & Engineering	BCA - 103 Computer Mathematics	9953448275 <a href="mailto:tabrez.nafis@jamiyahamdard.ac.in">tabrez.nafis@jamiyahamdard.ac.in</a>
3.	Dr. Siddhartha Sankar Biswas	Assistant Professor, SEST, JH	Ph.D. (CSE)	10 years	Computer Science & Engineering	BCA - 503 Operating System Administration With Windows 2000	9910115368 ssbiswas1984@gmail.com
4.	Mr. Syed Sibtain Khalid	Assistant Professor, SEST, JH	M. Tech. (ECE)	06 years	Electronics and Communication Engineering	BCA - 601 Project Work	9818719677 Sibtain1977@gmail.com
5.	Mr. Nafisur Rahman	Assistant Professor, SEST, JH	M. Tech. (CSE)	05 years	Computer Science & Engineering	BCA-202 Operating System	8376026512 <a href="mailto:nafiis@gmail.com">nafiis@gmail.com</a>
6.	Mr. Tabrej Ahmad Khan	Assistant Professor, SEST, JH	M. Tech. (Information Security), Ph.D. (CS) Pursuing	06 years	Information Security	BCA-302 Objective Oriented Programming in C++ BCA-401 Numerical and Statistical analysis	9718129289 tabrejsmvdu@gmail.com
7.	Dr. Naseem Rao	Assistant Professor, SEST, JH	Ph.D. (ECE)	12 years	Electronics and Communication Engineering	BCA-104 Principle of Management BCA-301 Computer System Architecture BCA-403 Computer Networks	9811468973 naseemjmi0786@gmail.com
8.	Dr. Md. Onais Ahmad	JH Staff	M.Tech. (CSE), Ph.D. (CSE)	05 years (SODL)	Computer Science & Engineering	BCA-105 Lab-I (PC Software) BCA-201 Programming Fundamentals	9910690317 <a href="mailto:oahmad@jamiyahamdard.ac.in">oahmad@jamiyahamdard.ac.in</a>

						BCA-305 Lab-I (C++ Application Development	
9.	Dr. Abdul Majid Farooqi	Asstt. Professor, Computer Science, CDOE, JH	M.Tech. (CSE), Ph.D.(CS E) Pursuing	02 years (SODL)	Computer Science & Engineerin g	BCA-101 Computer Fundamentals BCA - 402 Data Structures in C BCA -502 Java Programming	9891958565 majid@jamiaham dard.ac.in

### 5.5. Instructional Delivery Mechanisms

The Bachelor of Computer Applications (BCA) programme is offered through both Online and Open & Distance Learning (ODL) modes using a blended and technology-enabled teaching-learning approach designed to ensure flexibility, accessibility, academic quality, and effective learner engagement.

The delivery of the programme is supported through a Learning Management System (LMS), digital learning resources, self-learning materials, live interactive sessions, recorded lectures, assignments, practical exercises, discussion forums, and academic mentoring. The programme is designed to facilitate both self-paced learning and faculty-guided instruction to achieve the desired learning outcomes and professional competencies.

#### *Delivery Method in Open & Distance Learning (ODL) Mode*

A blended approach combining self-learning with face-to-face academic support. The delivery mechanism includes:

- i. Printed and digital Self-Learning Materials (SLMs) prepared in accordance with UGC-DEB Regulations to facilitate independent learning.
- ii. Academic counseling and Personal Contact Programme (PCP) conducted on weekends within the university campus to support learners academically and practically.
- iii. Weekend classes are conducted by qualified CDOE, Department of Computer Science & Engineering Faculty members as well as from other Department and qualified teachers from other institutions who provide lectures, practical guidance, discussions, mentoring, and doubt-clearing support to learners.
- iv. Laboratory sessions, programming practice, project work, and practical demonstrations are conducted during contact sessions to enhance hands-on learning and technical competency.
- v. Learners are also provided access to digital learning resources, recorded lectures, online support systems, and LMS facilities for supplementary learning.

- vi. Assignments, practical activities, internal assessments, and project evaluations are conducted periodically to monitor learner progress and ensure attainment of programme outcomes.

### ***Delivery Method in Online Mode***

In the Online mode, teaching-learning activities are conducted primarily through digital platforms and online technologies. The programme delivery includes:

- i. Live online classes conducted through video conferencing platforms by qualified university faculty and subject experts.
- ii. Access to e-Self Learning Materials (e-SLM), e-books, lecture notes, presentations, recorded video lectures, and multimedia content through the LMS.
- iii. Interactive learning through webinars, virtual classrooms, online discussion forums, quizzes, assignments, and project-based activities.
- iv. Continuous learner support through online mentoring, doubt-clearing sessions, email communication, and academic counseling.
- v. Online practical demonstrations, coding exercises, software-based laboratory activities, and virtual lab sessions to strengthen technical and programming skills.
- vi. Continuous internal assessment through assignments, presentations, quizzes, practical work, and project evaluation.

### **5.6. Identification of Media: The Print, Audio or Video, Online, Computer aided**

The Bachelor of Computer Applications (BCA) programme offered through Online and Open & Distance Learning (ODL) modes utilizes a variety of instructional media to facilitate effective teaching-learning processes, learner engagement, and attainment of programme outcomes. The media adopted by the university are selected based on their suitability for delivering theoretical knowledge, practical skills, learner support, and interactive learning experiences. The following media is being utilized for programme delivery:-

- i. ***Print Media:*** The CDOE provides printed or e-published Self-Learning Materials (SLMs) developed in house by Jamia Hamdard in accordance with UGC-DEB guidelines. The printed study materials are designed to facilitate self-paced learning and include learning objectives, explanatory content, illustrations, examples, self-assessment exercises, references, and review questions. These materials serve as the primary learning resource for learners enrolled in the programme.
- ii. ***Video Media:*** The CDOE provides recorded video lectures by experts and faculty members of Jamia Hamdard, live interactive classes, practical demonstrations, webinars, expert sessions, tutorials, and multimedia learning content. Video resources enable learners to gain conceptual understanding as well as practical exposure to programming, software development, database management, networking, and emerging technologies.
- iii. ***Online Media:*** Online lectures by experts and faculty members are delivered to the enrolled students covering the syllabus during the weekends for not less than 12 hours each course through the LMS portal. Though these online media is aimed to provide counselling and mentoring for the online students, these

resources are also made available to ODL students equally for their benefits. Learners of ODL/OL can access recorded lectures, assignments, quizzes, discussion forums, announcements, academic resources, and learner support services. Besides webinar and lectures expert members in the field is also arranged by the CDOE in a given topic to create interest of the learners in the subject.

- iv. **Online Computer Aided Services:** Computer-aided learning forms an integral part of the BCA programme. Learners are provided opportunities to use programming environments, software development tools, database management systems, simulation software, virtual laboratories, cloud-based platforms, networking tools, and other computing resources required for practical learning. These tools support hands-on skill development, project work, experimentation, and application-oriented learning.
- v. **Interactive and Digital Learning Resources:** -The CDOE also provides a range of interactive digital learning resources including:
  - a. E-books and digital study materials
  - b. Online assessments and quizzes
  - c. Discussion forums and collaborative learning platforms
  - d. Digital library resources and research databases
  - e. Virtual laboratory facilities
  - f. Project-based and case-study-based learning resources
  - g. Faculty mentoring and academic support services

The integration of print, audio, video, online, and computer-aided learning media ensures a comprehensive, flexible, learner-centric, and technology-enabled educational environment that supports effective learning, practical skill development, and achievement of programme objectives in both Online and ODL modes.

### 5.7. Student Support Services Systems.

The delivery methodology ensures flexibility, inclusiveness, practical exposure, industry relevance, and learner-centric education while maintaining academic standards and quality assurance in accordance with UGC-DEB regulations and institutional policies. i. Students can register their grievances through online as continuous feedback mechanism and the same are regularly monitored and reviewed. The programme delivery in both Online and ODL modes is supported by:

- a. Learning Management System (LMS)
- b. E-learning resources and digital library facilities
- c. Faculty mentoring and academic counseling
- d. Recorded and live lectures
- e. Practical and project-based learning
- f. Online and offline learner support services
- g. Continuous assessment and feedback mechanisms
- h. Online grievance handling mechanism to redress their grievances and monitoring of such complaints/grievances are done regularly at the Assistant Director or Director level.

## 6. PROCEDURE FOR ADMISSIONS, CURRICULUM TRANSACTION & EVALUATION

**6.1. Procedure for Admissions:** - Admission to the Bachelor of Computer Applications (BCA) programme shall be carried out in accordance with the rules, regulations, and guidelines of Jamia Hamdard, UGC, and UGC-DEB norms applicable to Open & Distance Learning (ODL) and Online programmes.

**Admission Prospectus:** The admission procedure, examination procedure, minimum eligibility conditions, fee structure, span period, portability of programmes from ODL to OL and vice versa as approved by the Board of Studies and Academic Council of the University and other related information to the students are provided through CDOE **Admission Prospectus** every academic year.

**Admission process:** The admission process generally includes the following steps:-

- a) Publication of Admission Notification released by the University through leading newspapers and put up on the university website, social media handles to disseminate the information to the target learners and their parents. Besides, digital flyers are released from time to time.
- b) Admission Prospectus and Programme Brochures are made available on the University and CDOE website for allowing adequate opportunity to the prospective learners for choosing a suitable programme through online or ODL mode.
- c) The CDOE OL/ODL Programmes are open to the persons of all genders and of whatever caste, creed, race or class.
- d) Admission of the students are based on the minimum standard prescribed by the UGC, AICTE and adopted by the Jamia Hamdard for CDOE programmes meeting the UGC and AICTE Regulations.
- e) Fees for each programme of CDOE are prescribed by the competent bodies of university from time to time keeping in view of the UGC (Institutions Deemed to be Universities) Regulations 2023 as amended from time to time. Special fee concessions (ranging from 50 to 75% in the tuition fees) are made available to the employees of Jamia Hamdard and their wards as per the University Policy.
- f) Submission of online application forms by eligible candidates along with the prescribed application fee and required documents.
- g) Verification of eligibility criteria, academic qualifications, identity proof, and supporting documents by the university authorities.
- h) Admission shall be granted on the basis of merit, eligibility criteria, and university admission policies subject to the limit of seats limit fixed by UGC/AICTE/Jamia Hamdard fixed from time to time
- i) Selected candidates are required to complete the admission formalities, including fee payment and document verification, within the stipulated time.
- j) After successful admission, learners are provided enrollment details, LMS access credentials, academic calendar, learner handbook, and programme-related information.
- k) Student support services are made available to assist learners regarding admissions, fee submission, academic counseling, examination-related queries, and technical support.

**6.2. Curriculum Transaction:** - The curriculum transaction of the BCA programme is designed to ensure effective delivery of theoretical knowledge, practical skills, professional competencies, and learner engagement through Online and ODL modes. Revision and updation of curriculum are carried out every year to bring changed in the subject concerned keeping in view of the skill and industry requirement of the learner. The curriculum transaction includes the following components: -

- a. Self-Learning Materials (SLMs):- The programme provides high-quality Self-Learning Materials (SLMs) in printed and digital formats prepared in accordance with UGC-DEB guidelines. The SLMs are designed in a learner-centric manner with clear learning objectives, illustrations, self-assessment questions, examples, exercises, and references for independent learning.
- b. Online Learning Support:- Learners are provided access to the Learning Management System (LMS) for accessing e-content, recorded lectures, presentations, assignments, quizzes, discussion forums, and announcements. Live online classes, webinars, and interactive sessions are conducted by qualified faculty members and subject experts. Recorded video lectures and digital learning resources are made available for flexible and self-paced learning.
- c. Academic Calendar: Activities of the programmes are planned in advance and notified to all the learners, programme coordinators, academic counsellors for effective course delivery in consonance with the directives of UGC-DEB and AICTE Regulations. The Academic Calendar for each cycle of batch of students in an academic year has been prepared after due deliberations in the Faculty Meetings and approved by the Board of Studies of CDOE.



**JAMIA HAMDARD**  
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Date: 18-02-2026

**Tentative Academic Calendar for BBA, BCA and B. Com Program**  
Students admitted in the years 2024, 2025 and 2026 (Sem 1<sup>st</sup>, Sem 2<sup>nd</sup>, Sem 3<sup>rd</sup>, Sem 4<sup>th</sup> Sem)

ACTIVITIES	DATE (s)
Student Induction programme and commencement of classes	26 <sup>th</sup> Feb 2026
Faculty Led Live sessions commences	28 <sup>th</sup> Feb 2026 - 1 June 2026
Release of Assignment I	21 April 2026
Last Date for Submission of Assignment I	25 May 2026
Mid-Semester Student Feedback	18 May 2026
Semester Exam- Eligibility list/Student registration confirmation	03 June 2026
Release of Date Sheet/Exam Schedule	04 <sup>th</sup> June 2026
Semester Exams- Mock Test & Exam prep session	06 June 2026 – 07 June 2026
BBA/BCA/BCOM 6 <sup>th</sup> Semester Dissertation Submission	15 <sup>th</sup> June 2026 (Tentative)
End Semester Regular/Reappear Exams	10 June 2026   13 July 2026
Result Declaration (Tentatively)	Last week of July
Last Date of Payment of Fee for next semester	01-Aug-2026
Start of New Semester (Tentatively)	02-Aug-2026

  
Director  
CDOE, Jamia Hamdard



### 6.3. Examinations/Student Evaluation:

The Examination and Student evaluation system of the BCA programme is designed to assess theoretical knowledge, practical competencies, analytical abilities, and overall learning outcomes in a continuous and comprehensive manner. The evaluation process consists of the following components:

Continuous Internal Assessment (CIA):- Continuous assessment is conducted through assignments, quizzes, programming exercises, presentations, case studies, practical work, project submissions, and participation in academic activities. Internal assessment helps in monitoring learner progress, understanding, and skill development throughout the semester.

Term-End Examination (TEE):-Term-End Examinations are conducted at the end of each semester as per the academic calendar and university regulations. The examinations conducted in offline mode for ODL learners, and in online mode for Online learners, or blended mode as decided by the university and applicable regulatory guidelines. The question papers are designed to evaluate conceptual understanding, analytical thinking, practical application, and problem-solving abilities.

Practical Examination and Project Evaluation: -Practical examinations are conducted for laboratory-oriented and skill-based courses to assess programming, software development, database management, networking, and technical competencies. Project work is evaluated based on implementation, innovation, presentation, documentation, and viva-voce examination.

Grading and Result Declaration:-The performance of learners is evaluated based on the grading system adopted by the university in accordance with UGC norms. Results are declared through the official university portal, and learners are provided opportunities for re-evaluation and grievance redressal as per university rules.

Quality Assurance in Evaluation:-The university ensures transparency, confidentiality, fairness, and reliability in the examination and evaluation process. Moderation mechanisms, faculty review, academic monitoring, and continuous feedback systems are implemented to maintain academic quality and integrity.

Semester Teaching and Annual Examination:- For teaching and counseling, each academic year shall consist of two Academic Semesters, the first referred to as ODD Semester (July-December) and the second as EVEN semester (January-June). Examinations of papers of both the semesters will be held at the end of every EVEN semester. Prescriptions for conducting examinations of papers, are presented in the following table:

1.	Theory Papers	Written only
2.	Lab Papers	Viva Voce
3.	Duration: Theory Paper	3 Hours
4.	Examiners	Paper setters and evaluators to be decided by the university for each paper from time to time. The University will appoint External examiners for each lab paper for every Study Centre.

Award of division to successful candidates:- The result of the successful candidates shall be classified at the end of the final year of examination on the basis of the

aggregate of marks of all subjects (theory, practical and project) secured by the candidate in the I & II year examinations, as indicated below:

Passing percentage	40% & above
II Division	50% & above
I Division	60% & above
Distinction	75% & above based on the overall score of the student of the programme.

Rationalization of weightage for internal assessment and term end examination would be 70% for external/Term end marks and 30% for Internal Assessment as prescribed by the UGC-DEB Regulations.

## 7. REQUIREMENT OF LABORATORY SUPPORT AND LIBRARY RESOURCES

**7.1 Laboratory Support:** - Jamia Hamdard provides adequate laboratory infrastructure and technical support facilities for learners enrolled in the Bachelor of Computer Applications (BCA) programme in both Online and Open & Distance Learning (ODL) modes. The university ensures that learners receive practical exposure, hands-on training, and skill-based learning opportunities required for achieving the programme outcomes and industry-oriented competencies. The university provides the following laboratory support facilities to learners:

- a) A well-equipped computer laboratory with modern computing systems, high-speed internet connectivity, and necessary hardware infrastructure to support practical learning activities.
- b) Access to updated operating systems, programming environments, compilers, integrated development environments (IDEs), database management systems, networking tools, and other software required for practical courses.
- c) Availability of licensed and open-source software tools related to programming, web development, database management, networking, cloud computing, cybersecurity, data analytics, and emerging technologies.
- d) Practical sessions, laboratory exercises, coding practice, software demonstrations, and project-based learning activities conducted under the supervision of qualified university faculty members.
- e) Weekend contact classes and practical sessions for ODL learners conducted within the university campus to provide face-to-face academic and laboratory support.
- f) Virtual laboratory facilities, simulation tools, cloud-based platforms, and online practical support mechanisms for learners enrolled in Online mode.
- g) Technical assistance and learner support services for accessing software, virtual tools, LMS platforms, and practical learning resources.
- h) Facilities for project development, experimentation, innovation activities, and practical assessment to strengthen technical and professional competencies.
- i) Regular maintenance, upgradation, and enhancement of laboratory infrastructure and software resources to align with current industry standards and technological advancements.

**7.2 Library Resources:** - Jamia Hamdard provides comprehensive library and digital learning resources to support the academic, practical, and research needs of learners enrolled in the BCA programme. The university ensures access to both physical and digital learning resources for Online and ODL learners to facilitate continuous learning, research, and professional development. The university provides the following library resources and facilities:-

- a) A well-established central library with a rich collection of textbooks, reference books, journals, magazines, dissertations, and academic resources related to Computer Science, Information Technology, and allied disciplines.
- b) Access to digital library facilities including e-books, e-journals, online databases, research repositories, conference proceedings, and academic publications.
- c) Remote access facilities for Online and ODL learners to utilize digital library resources, e-content, and academic databases from any location.
- d) Access to previous year question papers, project reports, case studies, research articles, and reference materials for academic and research purposes.
- e) Internet-enabled library services, reading room facilities, and digital learning support systems to encourage self-learning and research-oriented activities.
- f) Library orientation, academic guidance, and user support services to help learners effectively utilize physical and digital library resources.
- g) Continuous updating and expansion of library collections and digital resources in accordance with curriculum requirements, technological developments, and industry trends.
- h) Access to plagiarism awareness tools, citation resources, and research support services for project work, assignments, and academic writing activities.

The university continuously strengthens its laboratory and library support systems to ensure effective curriculum delivery, practical skill development, research support, and achievement of learning outcomes for all learners enrolled in the BCA programme through Online and ODL modes.

## **8. COST ESTIMATE OF BCA PROGRAMME ON DISTANCE MODE**

### **(a) Semester - Wise Cost/Benefit Structure**

<b>Recurring Expenses (A)</b>	
Number of Courses	8
Number of Counseling Sessions	12
Cost Per Counselling Session	Rs. 750/- per hour/per Session
Cost Per Course – Counselling Charges	Rs. 9,000
Total cost of Counseling Sessions for 8 courses	Rs. 72,000
Administrative Expenditure per Semester	Rs. 30,000/-
Total Administrative Expenditure/Semester	Rs. 2,00,000

<b>Total Recurring Expenses (A)</b>	<b>Rs. 2,93,000</b>
<b>Fixed Cost (B) Study Material Development</b>	
Course Development /Course	Rs. 1,00,000
Course Development for 8 courses (Writing/editing/vetting Cost )	Rs. 3,84,000
Total Courses writing for 3 years	Rs. 23,04,000
<b>Total Cost for SLM per student (including course writing and printing)- One time cost.</b>	<b>Rs. 4032/-</b>

**(b) Total Cost BBA ODL Mode programme**

All Sessions Counselling (A x 6 Semester)	Rs. 17,58,000
Office Expenditure	Rs. 12,00,000
Total Recurring Expenses (A)	<b>Rs. 29,58,000</b>
<b>Total cost of counseling class per student</b>	<b>Rs. 16,200</b>
<b>Cost of one semester Per Student</b>	<b>Rs. 4500</b>

**(c) Proposed Fee Structure**

Expected Admissions per semester	250 students
Fees per semester/per student	Rs. 16,000/-
Total Revenue in one Semester (if the expected numbers are met). But presently the number of students are 90 students July 2025 batch.	<b>Rs. 40,00,000/-</b>

**(d) Mode Of Program**

Admission in a year	Two Batches
First Admission	Jan- June
Second Admission	July-Dec

Total Admission in a Year	1000
<b>Total Revenue (for three-year duration of BCA Programme @Rs. 40.00 Lakh per semester if the target of 250 students is achieved. The batch size of July 2025 admission stands at 90 students)</b>	<b>Rs. 2,40,00,000</b>

## 9. QUALITY ASSURANCE MECHANISM AND EXPECTED PROGRAM OUTCOMES

**9.1. Quality Assurance Mechanism:** - In accordance with the guidelines of the University Grants Commission (UGC) and UGC-DEB regulations, Jamia Hamdard has established a Centre for Internal Quality Assurance (CIQA) for the Centre for Distance and Online Education (CDOE) to ensure continuous quality enhancement, academic excellence, learner satisfaction, and effective programme delivery in Online and Open & Distance Learning (ODL) modes. The CIQA functions as an institutional mechanism for maintaining quality standards in teaching-learning processes, learner support services, curriculum development, assessment practices, and overall programme management. The Centre continuously works towards developing a culture of quality consciousness, innovation, accountability, and continuous improvement. The quality assurance mechanism includes the following components:

- a) The CIQA Committee has been constituted in accordance with UGC-DEB guidelines to regularly monitor, review, and enhance the quality of academic programmes and institutional processes.
- b) The Centre organizes academic activities, workshops, meetings, training programmes, and quality enhancement initiatives on a regular basis and maintains proper documentation of programmes, activities, and institutional records related to quality improvement.
- c) The CIQA is responsible for incorporating advancements and developments in curriculum design, learning resources, instructional methodologies, digital learning systems, and learner support mechanisms to ensure continuous academic upgradation.
- d) The Centre promotes awareness regarding quality culture, academic standards, best practices, and continuous improvement among faculty members, learners, counselors, and administrative staff.
- e) The CIQA prepares and submits the Annual Quality Assurance Report (AQAR) in accordance with prescribed guidelines and quality parameters to ensure institutional accountability and transparency.
- f) The programme content and digital learning resources are designed in accordance with the Four Quadrant Approach prescribed by UGC, including:
  - a. e-Tutorials
  - b. e-Content
  - c. Self-Assessment
  - d. Discussion Forums and Interactive Components
- g) Programme review and monitoring mechanisms are implemented regularly. The CIQA places the programme before the Review Committee constituted by the university to evaluate the effectiveness, relevance, quality, and learning outcomes of programmes offered through Online and ODL modes.
- h) The Internal Quality Assurance Cell (IQAC) of the university works in coordination with the CIQA for academic monitoring, quality enhancement, and continuous institutional improvement.
- i) A comprehensive feedback mechanism is implemented to obtain 360-degree feedback from learners, faculty members, academic counselors, alumni, employers, and

administrative staff. The feedback received is systematically analyzed, and necessary improvements are incorporated into curriculum design, learner support systems, and programme delivery processes.

- j) The programme is continuously benchmarked with the regular on-campus programmes offered by the university to maintain equivalence in academic standards, quality, and learning outcomes.
- k) Student performance in assignments, practical work, internal assessments, examinations, projects, and other academic activities is periodically analyzed to evaluate learning achievement and programme effectiveness.
- l) Post-completion feedback and learner progression analysis are conducted through surveys, interviews, alumni interactions, and employer feedback to assess the impact of the programme on learners' professional growth, employability, higher education opportunities, and career advancement.
- m) The observations, recommendations, and quality indicators generated through various review and feedback mechanisms are utilized for continuous revision, enhancement, and alignment of the programme with industry requirements, technological advancements, and global academic standards.

**9.2. Expected Programme Outcomes:** - The quality assurance framework is expected to ensure the following: -

- a. Achievement of Programme Learning Outcomes (PLOs) and Programme Specific Outcomes (PSOs)
- b. Enhancement of employability and professional competencies among learners
- c. Development of practical, analytical, entrepreneurial, and research-oriented skills
- d. Effective learner engagement and satisfaction
- e. Continuous academic improvement and curriculum relevance
- f. Alignment of the programme with industry expectations and emerging technologies
- g. Promotion of ethical values, social responsibility, and lifelong learning among graduates
- h. Maintenance of academic quality and institutional excellence in Online and ODL education modes.

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