Bachelor of Computer Applications

(Cloud Technology and Information Security)

Semester–IV

Course Code	Course Title	L	T	P	Credits
BCA-212A	Data Communication and Computer Networks (Pre-requisite: None)	3	0	0	3
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-212A.1	Understand data communication components, network types, transmission modes/media, topologies, and OSI/TCP-IP models.
BCA-212A.2	Identify network devices, communication types, modulation, switching and multiplexing
BCA-212A.3	Describe LAN technologies, IEEE standards, Ethernet types, data link control methods, and MAC protocols ALOHA and CSMA.
BCA-212A.4	Understand routing, congestion control, traffic shaping, and network security including encryption and firewalls.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-212A.1	3	-	-	-	-	-	-	-
BCA-212A.2	3	-	-	-	-	-	-	3
BCA-212A.3	3	2	2	2	-	-	-	3
BCA-212A.4	3	2	2	-	-	-	2	3

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I **Contact Hours: 11**

Data Communication and Network Models

Introduction to Data Communications: Components, use and type of computer networks (LAN, MAN, WAN), peer to peer network, client-server model, Transmission modes, Transmission media: guided and unguided, Transmission Impairments, network topologies: bus, ring, star, mesh, tree, hybrid

Network Models: Connection-Oriented & Connectionless Services, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Functions of each layer, Comparison of OSI and TCP/IP.

UNIT-II **Contact Hours: 12**

Network Devices, Analog and Digital Communications, Switching and multiplexing

Network connectivity Devices: connectors, Transceivers, Repeaters, Hubs, Network Interface Cards and PC Cards, Bridges, switches, Routers, Gateways.

Analog and Digital Communications: Analog and digital data and signals, bandwidth and data rate, capacity, baud rate, Modems and modulation techniques.

Switching and multiplexing: circuit, packet and message switching; multiplexing (frequency division, time division and wavelength division)

UNIT-III **Contact Hours: 11**

LAN technologies and Data Link Control

Overview of LAN technologies: IEEE Standards for LAN: 802, VLAN, Bluetooth, Ethernet and types of Ethernets, Token ring, Polling,

Data Link Control: Framing, error detection and correction, sliding window protocols: stop and wait, Go Back N and selective repeat, Media Access Control: ALOHA: pure and slotted ALOHA, CSMA: CSMA/CD and CSMA/CA.

UNIT-IV **Contact Hours: 11**

Routing and Network Security

Routing: Adaptive and Non adaptive routing: Centralised, Distributed, isolated, flooding, random walk, Routing algorithms: Link state, Distance Vector, Congestion Control techniques and Traffic shaping algorithms: leaky bucket and token bucket.

Network Security: Issues, Security attacks, Hacking, Encryption and decryption, cryptography, Digital signatures and certificates, firewalls

Text Books:

1. Behrouz, Forouzan, *Data communication and Networking*, Tata Mc- Graw Hill.
2. Tannenbaum, *Computer Networks,* PHI.

Reference Books:

1. William Stallings, *Data and Computer Communications,* Pearson Education.
2. Comer D., *Computer Networks and Internet, 2nd Edition*, Pearson Education.

Course Code	Course Title	L	T	P	Credits
BCA-214A	Cyber Laws and Ethics (Pre-requisite: None)	3	0	0	3
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-214A.1	Equip the students with understanding of cyberspace, cybercrime and jurisprudence
BCA-214A.2	Get knowledge about legalities under the Information Technology Act.
BCA-214A.3	Comprehend the legal and regulatory frameworks governing cyberspace and the dispute resolution mechanism.
BCA-214A.4	Navigate the legal and ethical frameworks for cyber forensics

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-214A.1	3	-	-	-	-	-	3	2
BCA-214A.2	3	-	-	-	-	-	3	3
BCA-214A.3	3	2	2	-	-	2	3	3
BCA-214A.4	3	-	2	-	-	2	3	3

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I **Contact Hours: 11**

Introduction to Cyber Laws

Evolution of computer technology, Emergence of cyber space. Computer Crimes and Cyber Crimes, Forms of Cyber Crimes, Cyber Jurisprudence, Cyber Ethics, Cyber Jurisdiction, Civil and criminal jurisdictions, Web space, Web Development agreement, Legal and Technological Significance of Domain Names, Internet as a tool for global access.

UNIT-II **Contact Hours: 12**

IT Act - Key Provisions and Amendments

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crimes and Offences, Challenges of Prevention and Control of cyber crime, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

UNIT-III **Contact Hours: 12**

Cyber Law and Related Legislation

Patent Law, Trademark Law, Copyright, Software: Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal

Procedural Code

Relevant Sections of the following acts: Indian Evidence Act, Indian Penal Code Bankers Book Evidence Act, Reserve Bank of India Act

Laws Relating to Employees and Internet, Alternative Dispute Resolution, Online Dispute Resolution (ODR).

UNIT-IV **Contact Hours: 10**

Cyber Ethics and Ethical Issues

Cyber Ethics: Importance of Cyber Law, Ethical and privacy issues in cyber law enforcement, Significance of Cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society,

Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics

Text Books:

1. Behrouz, Forouzan, *Data communication and Networking*, Tata Mc- Graw Hill.
2. Tannenbaum, *Computer Networks*, PHI.

Reference Books:

1. William Stallings, *Data and Computer Communications*, Pearson Education.
2. Comer D., *Computer Networks and Internet, 2nd Edition*, Pearson Education.

Course Code	Course Title	L	T	P	Credits
BCA-216A	Fundamentals of Storage and Data Centres (Pre-requisite: None)	3	0	0	3
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-216A.1	Explain the evolution of storage technology, architecture, storage system components, and key challenges in managing the information lifecycle.
BCA-216A.2	Compare different RAID levels, their implementation, and analyze their impact on disk performance and reliability.
BCA-216A.3	Describe the structure, roles, and application architecture models of data centers in enterprise and service provider environments.
BCA-216A.4	Understand data center requirements including location, power, cooling, bandwidth, and physical infrastructure based on industry standards.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-216A.1	3	2	-	-	-	2	-	-
BCA-216A.2	3	3	2	-	-	-	-	2
BCA-216A.3	3	-	-	2	-	-	2	2
BCA-216A.4	3	-	-	2	-	-	2	3

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I **Contact Hours: 12**

Introduction to Storage Technology and architecture

Introduction to Storage Technology Information storage, evolution of storage technology and architecture, data center infrastructure, key challenges in managing information, information lifecycle. Storage system environments: components of storage system environment, Disk Drive components, Disk Drive Performance, fundamental laws governing disk performance, logical components of the host, application requirements and disk performance.

UNIT-II **Contact Hours: 11**

Data Protection and Intelligent Storage System

Data Protection: RAID: Implementation of RAID, RAID array components, RAID levels, RAID comparison, RAID Impact on disk performance, host spares. Intelligent Storage System: Components of an Intelligent Storage System, Intelligent Storage array, concepts in Practice: EMC CLARIION and Symmetric.

UNIT-III **Contact Hours: 10**

Data Centers and Architecture models

Overview of Data Centers: Data Centers Defined, Data Center Goals, Data Center Facilities, Roles of Data

Centers in the Enterprise, Roles of Data Centers in the Service Provider Environment, Application Architecture Models. The Client/Server Model and Its Evolution, The n-Tier Model, Multitier Architecture Application Environment, Data Center Architecture.

UNIT-IV **Contact Hours: 12**

Data Center Requirements

Data Center Requirements: Data Center Prerequisites, Required Physical Area for Equipment and Unoccupied Space, Required Power to Run All the Devices, Required Cooling and HVAC, Required Weight, Required Network Bandwidth, Budget Constraints, Selecting a Geographic Location, Safe from Natural Hazards, Safe from Man-Made Disasters, Availability of Local Technical Talent, Abundant and Inexpensive Utilities Such as Power and Water, Selecting an Existing Building (Retrofitting), tier standard

Text Books:

1. G. Somasundaram, A. Shrivastava, *EMC Corporation : Information Storage and Management*, Wiley publishing
2. Barrie Sosinsky, *Cloud Computing Bible*, Wiley-India

Reference Books:

1. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, *Cloud Computing: Principles and Paradigms*, Wiley
2. Meeta Gupta, *Storage Area Network Fundamentals*, Pearson Education Limited

Course Code	Course Title	L	T	P	Credits
BCA-282A	Storage and Data Centres Lab (Pre-requisite: Linux)	0	0	4	2
		CIE	SEE		Total
		50	50		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-282A.1	Illustrate the evolution of storage devices and analyze disk performance and structure using diagnostic tools and Linux commands.
BCA-282A.2	Implement various RAID levels using open-source tools and design RAID configurations suited to enterprise needs.
BCA-282A.3	Demonstrate understanding of application architecture models and analyze real-world data center designs through case studies.
BCA-282A.4	Evaluate and plan physical and environmental requirements of a data center, including location, rack layout, tier level, and disaster recovery strategies.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-282A.1	3	-	-	-	-	-	-	-
BCA-282A.2	3	-	-	-	-	-	-	2
BCA-282A.3	3	2	2	2	-	-	2	2
BCA-282A.4	3	2	2	2	-	-	2	3

List of Experiments

No.	Experiment Detail
1.	Study and report the evolution of storage devices (e.g., floppy disks to SSDs).
2.	Identify and compare components of different storage environments (DAS, NAS, SAN).
3.	Simulate disk performance using tools like CrystalDiskMark or Iometer.
4.	Analyze disk structure and read/write speeds using Linux commands (e.g., hdparm, iostat, lsblk).
5.	Prepare a presentation/report on information lifecycle management with case examples.
6.	Simulate RAID levels (0, 1, 5, 10) using open-source tools like mdadm in Linux.
7.	Create a RAID configuration plan for a small enterprise system.
8.	Map application architecture models (2-tier, 3-tier) using diagrams and real-world use cases.
9.	Case study analysis: Google/Amazon/Microsoft data center design and evolution.
10.	Design a rack layout plan for a given number of servers with space and weight constraints.
11.	Create a checklist for selecting a data center location with justification for each criterion.
12.	Calculate and compare the Tier levels of data centers and prepare a summary table.
13.	Create a basic disaster recovery plan for a simulated storage environment.
14.	Use VMware or Virtual Box to set up a multi-OS environment for testing shared storage.

Text Books:

1. G. Somasundaram, A. Shrivastava, *EMC Corporation : Information Storage and Management*, 1st Edition, Wiley publishing
2. Barrie Sosinsky, *Cloud Computing Bible*, Wiley-India

Reference Books:

1. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, *Cloud Computing: Principles and Paradigms*, Wiley
2. Meeta Gupta, *Storage Area Network Fundamentals*, Pearson Education Limited

Course Code	Course Title	L	T	P	Credits
BCA-202A	Quantitative Aptitude (Pre-requisite: Basic math)	2	0	0	2
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to	
BCA-202A.1	Understand the concept of system of algebraic equations and clocks.
BCA-202A.2	Solve problems related to time-distance, work-time, and work-wages.
BCA-202A.3	Solve problems related to interest, partnership, sets, and trigonometric ratios.
BCA-202A.4	Apply the concepts of Permutations and Combinations, Probability, and Data interpretation

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-202A.1	3	-	-	-	-	-	-	2
BCA-202A.2	3	2	3	-	-	-	-	3
BCA-202A.3	3	2	3	-	2	-	-	3
BCA-202A.4	3	2	3	-	-	-	-	3

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I **Contact Hours: 8**

System of algebraic equations, Ages and Clocks problems

Linear Equations, Quadratic equations, System of algebraic equations in two variables and their applications in simple problems. Problems on ages, Clocks.

UNIT-II **Contact Hours: 7**

Time and distance, Work and Time problems

Time and distance: Problems based on trains, Boats and Streams, Pipes and Cistern. Work and time: Problems on work and time, work and wages.

UNIT-III **Contact Hours: 7**

Interest, Partnership, Sets, Height and Distance problems

Simple interest, Compound Interest, Partnership. Basic idea of set theory to solve practical problems. Trigonometric ratios and identities, Height and distance.

UNIT-IV **Contact Hours: 8**

Permutations and Combinations, Data interpretation

Basic idea of Permutations and Combinations. Events and sample space, Probability. Data interpretation: Raw and grouped data, Bar Graph, Pie Chart, Mean, Median and Mode.

Text Books:

1. R. S. Aggarwal, *Quantitative Aptitude*, S. Chand & Company Limited, New Delhi
2. A. Guha. *Quantitative Aptitude*, 7th Edition, McGraw-Hill Publications
3. V. Dyke, J. Rogers and H. Adams, *Fundamentals of Mathematics*, Cengage Learning

Reference Books:

1. A.S. Tussy, R. D. Gustafson and D. Koenig, *Basic Mathematics for College Students*, Brooks Cole
2. C. C. Pinter, *A Book of Set Theory*, Dover Publications

Course Code	Course Title	L	T	P	Credits
BCA-218A	Full Stack Development-2 (MEAN) (Pre-requisite: Web Technology (HTML, CSS, JavaScript))	2	0	0	2
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to	
BCA-218A.1	Understand the core concepts of the MEAN stack, including Angular.js, Express.js, Node.js, and MongoDB.
BCA-218A.2	Understand Directives, Controllers, and Filters in Angular.js
BCA-218A.3	Acquire knowledge about Angular JS Modules and Scope Lifecycle.
BCA-218A.4	Design applications with Node.js, Express.js, and MongoDB

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-215A.1	3	-	-	-	-	-	-	2
BCA-215A.2	3	-	3	3	-	2	-	2
BCA-215A.3	3	2	3	3	-	-	-	2
BCA-215A.4	3	2	3	3	-	2	2	2

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I **Contact Hours: 8**

Introduction to MEAN Stack & Node.js

Overview of Full Stack Development and MEAN Stack.Node.js: Introduction, history, features, and its role in MEAN. Comparison between JavaScript Client-side vs. Server-side programming. Installation of Node.js and npm, writing and executing basic scripts. Understanding JavaScript fundamentals: Variables, functions, loops, and arrays. Event-driven architecture and the Node.js runtime environment.

UNIT-II **Contact Hours: 7**

Introduction to Angular.js

AngularJS - Overview: Need of Angular JS, Applications of Angular JS, Core features, MVC Architecture
Directives: ng-app, ng-init, ng-model, ng-bind, ng-repeat, Directive Lifecycle, Binding Controls to Data, Matching Directives, Angular Expressions
Built in Filters, Using Angular JS Filters. Role of Controller, Controllers and Modules, Nested Controllers, Using Filters in Controllers.

UNIT-III **Contact Hours: 7**

Angular JS Modules and Scope Lifecycle

Introduction to Angular JS Modules, Working with Angular forms, Model Binding Forms, Updating Models with a twist. Scope, Scope Lifecycle, Scope Inheritance, Scope and Controllers, Rootscope, Scope Broadcasting.

Dependency Injection, Creating Services, Factory Service and Provider.

UNIT-IV **Contact Hours: 8**

Application Development with Node.js, Express.js, and MongoDB

Node.js Modules: Core modules, global modules, and user-defined modules.Express.js: Introduction, routing, request handling, middleware. Template Engines (EJS) for rendering dynamic web pages. Middleware: Introduction to Express.js middleware and error handling. Database Integration: Introduction to MongoDB, performing CRUD operations with Mongoose. Using Postman for API testing.

Text Books:

1. Basarat Ali Syed, *Beginning Node.js,* Apress.
2. Ruebbelke L., "*Angular JS in Action"*, Manning Publications
3. Alex Young, Bradley Meck, Mike Cantelon, Tim Oxley, Marc Harter, T.J. Holowaychuk, Nathan Rajlich , "*Node.js in Action*", Dreamtech Press
4. Ethan Brown, *Learning JavaScript Design Patterns*, O'Reilly.
5. Simon Holmes, Clive Harber, *Getting MEAN with Mongo, Express, Angular, and Node,* Manning Publications.

Reference Books:

1. Kyle Simpson, *You Don't Know JS: Up and Going*, O'Reilly.
2. Seshadri S., Green B., "*Angular JS Up and Running"*, O'Reilly
3. David Flanagan, *JavaScript: The Definitive Guide*, O'Reilly Media.
4. Vasan Subramanian, *Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node,* Apress,

Course Code	Course Title	L	T	P	Credits
BCA-284A	Full Stack Development-2 (MEAN) Lab (Pre-requisite: MEAN Stack)	0	0	4	2
		CIE	SEE		Total
		50	50		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-284A.1	Implement Node.js applications
BCA-284A.2	Write programs implementing Express.js
BCA-284A.3	Write programs implementing Angular.js
BCA-284A.4	Design Applications with Node.js, Express.js, and MongoDB

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-284A.1	3	2	2	2	-	-	-	2
BCA-284A.2	3	2	2	2	-	-	-	2
BCA-284A.3	3	3	2	2	-	-	-	2
BCA-284A.4	3	3	3	2	-	2	2	2

List of Experiments

No.	Experiment Detail
1.	Write a simple 'Hello World' program in Node.js.
2.	Create a Node.js script that reads and writes files using the `fs` module.
3.	Build a basic Express.js server with different routes.
4.	Implement middleware in Express.js for logging request details.
5.	Create a RESTful API in Express.js to perform CRUD operations on a MongoDB database.
6.	Implement authentication using JWT in an Express.js application.
7.	Upload and retrieve files/images using `multer` in Express.js.
8.	Write program implementing Angular.js directives
9.	Implement Angular.js controllers.
10.	Write program to demonstrate Angular.js Scopes
11.	Write program to demonstrate Angular.js Services
12.	Design an application using Node.js, Express.js, and MongoDB

Text Books:

1. Basarat Ali Syed, *Beginning Node.js*, Apress.
2. Adam Boduch, Roy Derks, *React and React Native*, Packt Publishing.
3. Ethan Brown, *Learning JavaScript Design Patterns*, O'Reilly.

4. Vasan Subramanian, *Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node*, Apress, 2019.

Reference Books:

1. Boronczyk, Naramore, *Beginning PHP, Apache, MySQL Web Development*, Wiley India Pvt.Ltd.
2. Kyle Simpson, *You Don't Know JS: Up and Going*, O'Reilly.
3. David Flanagan, *JavaScript: The Definitive Guide*, O'Reilly Media.
4. Simon Holmes, Clive Harber, *Getting MEAN with Mongo, Express, Angular, and Node*, Manning Publications.

Course Code	Course Title	L	T	P	Credits
BCA-260A(i)	Essentials of Python (Pre-requisite: None)	3	0	0	3
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to	
BCA-260A(i).1	Understand the fundamentals of Python programming, including data types, input/output
BCA-260A(i).2	Analyze and implement operators and control structure in Python.
BCA-260A(i).3	Utilize ordered data objects including string, list and tuple.
BCA-260A(i).4	Utilize unordered data objects including set and dictionary and design functions.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-260A(i).1	3	-	-	2	-	-	-	2
BCA-260A(i).2	3	3	2	2	-	-	-	3
BCA-260A(i).3	3	3	3	3	-	-	-	3
BCA-260A(i).4	3	3	3	3	-	-	2	3

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I **Contact Hours: 9**

Basics of Python

Overview and applications areas of Python, Python installation, Comments, Keywords, Identifiers, Variables declaration, Standard Data types, id(), type(), quotations for string literals, data type conversion methods, Input/Output statements, escape characters, round( ), importing 'math' package

UNIT-II **Contact Hours: 11**

Operators and Control statements in Python

Operators: Arithmetic, Assignment, Comparison, Logical, Bitwise, Reference or identity (is/ is not), Membership (in /not in)

Control Statements: conditional statements (if, else, elif), loop statements (for, while), break, continue, pass statement.

UNIT-III **Contact Hours: 13**

Ordered Data Objects

Ordered Data Objects: String: declaration, indexing, len(), concatenation, repetition, 'in'/'not in' operator, slice, Traversal, Built-in functions; List: declaration, indexing, len(), creating list using range(), list with initial values, converting string to list, concatenation, repetition, 'in'/'not in' operator, slice, traversal, built-in functions; Tuple: declaration, indexing, len( ), creating tuple using range(), tuple with initial values, converting

string to tuple, converting list to tuple, concatenation, repetition, 'in'/'not in' operator, slice, traversal, built-in functions.

UNIT-IV **Contact Hours: 12**

Unordered Data Objects and Functions

Unordered Data Objects: Set: Roster and Rule form, len(), converting list to set and set to list, Built-in functions, Set operations; Dictionary: declaration, len(), inserting and accessing a value, keys(), values(), items(), Built-in functions

Functions: defining a function, calling a function, keyword arguments, default arguments, variable length arguments, scope of variables, Recursive function, map(), Lambda function

Text Books:

1. E. Balagurusamy, *Introduction to Computing and Problem Solving Using Python*, McGrawHill Education
2. Yashavant Kanetkar, Aditya Kanetkar, *Let us Python*, BPB Publications
3. Bob Dowling, *An introduction to Python for absolute beginners*, Cambridge University Press.
4. Vamsi Kurama, *Python Programming: A Modern Approach*, Pearson Education
5. Sheetal Taneja, Naveen Kumar, *Python Programming A Modular Approach*, Pearson
6. Rao R. Nageswara , *Core Python Programming*, Dream Tech, New Delhi

Reference Books:

1. Mark Lutz, *Learning Python*, 5th edition, O'Reilly.
2. Martin C. Brown, *Python: The Complete Reference*, McGraw-Hill

Course Code	Course Title	L	T	P	Credits
BCA-286A(i)	**Essentials of Python Lab** (Pre-requisite: Python)	0	0	4	2
		CIE	**SEE**		**Total**
		50	50		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-286A(i).1	Develop Python programs using data types, input/output
BCA-286A(i).2	Apply operators and control structures in Python
BCA-286A(i).3	Utilize ordered data objects in designing Python programs
BCA-286A(i).4	Design programs using unordered data objects and functions.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-286A(i).1	3	2	3	2	-	-	-	2
BCA-286A(i).2	3	3	3	2	-	-	-	3
BCA-286A(i).3	3	3	3	2	-	-	-	3
BCA-286A(i).4	3	3	3	2	-	-	2	3

List of Experiments

No.	Experiment Detail
1.	Assume you travel 80 km to and fro in a day. Fuel Cost is INR 80 per liter and your vehicle's Fuel Average is 18 km/litre. Write a Python program to calculate the Driving Cost per day.
2.	Write a program to calculate the area and circumference of a circle for the given radius as input.
3.	Write a program to make use of various Data conversion methods in Python.
4.	Write a Python program which iterates the integers from 1 to 30 (included). if number is divisible by 3 print "PIET", if number is divisible by 5 print "DCA". if number is divisible by both 3 and 5 print "PIET & DCA" and otherwise print the number itself.
5.	Write a Python program to display the following pattern for the given input of no. of lines. 1 121 12321 1234321
6.	Write a program to check whether the given integer number is Palindrome or not.
7.	Assuming your weight in kilogram and height in meters, calculate your Body Mass Index (BMI) value using the formula BMI=weight/(height*height) Height is given in (feet.inches) form and weight is given in kgs and to convert total height in meters consider 1 Feet = 0.3048 meter and 1 Inch = 0.0254 meter
8.	Create a list of city names from the given list where city name contains substring 'pur' cities=['Jaipur','Ambala','Nagpur','Kanpur','Karnal','Sholapur']
9.	Wrtie a program to remove leading and trailing blank spaces from string items in the list animals = [' monkey ', ' pitbull dog ', ' rabbit ']

10.	Book order is given as list of sublists with the following items Order Number Book Title Author Quantity Unit Price 34587 Learning Python Mark Lutz 4 40.95 98762 Programming Python Mark Lutz 5 56.80 77226 Head First Python Paul Barry 3 32.95 Write a Python program to generate the Order summary in this List of tuple form [('34587', 163.8), ('98762', 284.0), ('77226', 108.85)] Where first item in the tuple is Order Number, second item is Net Price i.e. Quantity*Unit Price if Net Price < 100.00 it should be increased by Rs. 10.
11.	employees=['Gurpreet','Manjot','Shabadpreet','Gurleen','Vishal','Noor','Navjeet'] gym_members=['Shabadpreet','Vishal','Navjeet'] developers=['Shabadpreet','Gurpreet','Gurleen','Manjot','Navjeet'] From the above given lists write Python program to answer the following queries: i) List all employees who have gym membership and also developers ii) List all the employees who are not either gym members or developers
12.	A string is given to you e.g. "aabaacdaadd". Create a dictionary of each character in the given string and its frequency, i.e. output={'a': 6, 'b': 1, 'c': 1, 'd': 3}
13.	In a shop store, data operator enters Item Name, Quantity sold and its Unit Price one by one till 'CLOSE' is entered. Create Python dictionary of Item Name and its Net Price. **Sample Input**: BANANA FRIES 2 20.60 POTATO CHIPS 3 15.50 APPLE JUICE 10 100.75 CANDY 5 2.50 APPLE JUICE 6 100.75 CANDY 5 2.50 CANDY 5 2.50 BANANA FRIES 3 20.60 CANDY 5 2.50 POTATO CHIPS 5 15.50 CLOSE **Sample Output:** {'BANANA FRIES': 103.0, 'POTATO CHIPS': 124.0, 'APPLE JUICE': 1612.0, 'CAND Y': 50.0}
14.	Write a function to make use of variable length arguments.
15.	Write a Recursive function to generate ith term of a Fibonacci Series 0,1,1,2,3,5,8,13,... Generate n terms of Fibonacci Series using this recursive function.

Text Books:

1. E. Balagurusamy, *Introduction to Computing and Problem Solving Using Python*, McGrawHill Education
2. Yashavant Kanetkar, Aditya Kanetkar, *Let us Python*, BPB Publications

3. Bob Dowling, *An introduction to Python for absolute beginners*, Cambridge University Press.
4. Vamsi Kurama, *Python Programming: A Modern Approach*, Pearson Education
5. Sheetal Taneja, Naveen Kumar, *Python Programming A Modular Approach*, Pearson
6. Rao R. Nageswara , *Core Python Programming*, Dream Tech, New Delhi

Reference Books:

1. Mark Lutz, *Learning Python*, 5th edition, O'Reilly.
2. Martin C. Brown, *Python: The Complete Reference*, McGraw-Hill

Course Code	Course Title	L	T	P	Credits
BCA-260A(ii)	**Java Programming** (Pre-requisite: None)	3	0	0	3
		CIE	**SEE**		**Total**
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to	
BCA-260A(ii).1	Discuss the basic features of Java language.
BCA-260A(ii).2	Understand various object-oriented programming (OOP) principles.
BCA-260A(ii).3	Understand Java concepts of packages and exceptions handling.
BCA-260A(ii).4	Apply the knowledge of Java input output steams, and multithreading.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-260A(ii).1	3	-	-	-	-	-	-	-
BCA-260A(ii).2	3	2	2	2	-	-	-	2
BCA-260A(ii).3	3	-	2	2	-	-	-	2
BCA-260A(ii).4	3	2	2	2	-	-	-	2

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I — Contact Hours: 12

Fundamentals of Java

Introduction to Java: Java Features, Java Virtual Machine and bytecode, Basics of Java programming: syntax, variables data types, operators and expressions, statements

Control Flow: Decision-making statements (if, else-if, switch). looping statements (for, while, do-while) and branching statements (break, continue, return),

Arrays: Declaring, initializing and manipulating arrays, array operations

UNIT-II — Contact Hours: 12

Object oriented programming concepts of Java

Classes and Objects: Declaring Classes and creating Objects, constructors, Garbage Collection, finalize() Method, Access modifiers (public, private, protected, default), static and final modifier, ‘this’ keyword, Method overloading, Wrapper Classes.

Inheritance: Extending classes, Method Overriding, ‘super’ keyword, Abstract classes, Multiple Inheritance, Interfaces and Extending Interfaces

UNIT-III **Contact Hours: 11**

Working with Packages and handling Exceptions

Packages: Java API Packages, importing packages, creating a new packages and using classes from package

Exception Handling: Types of Errors, Understanding Exceptions, Built-in Exceptions, checked and unchecked exceptions, try-catch block, multiple catch clauses, nested try block, finally block, throw and throws keywords, user created exceptions.

UNIT-IV **Contact Hours: 10**

Input output streams and multithreading

Java I/O Streams: Character and Byte streams, Reading console Input using java.util.Scanner and Writing console Output, Reading from and writing to files using FileInputStream, and FileOutputStream, FileReader and FileWriter. Object serialization and de-serialization.

Multithreading: Process versus Threads, Creating threads using Thread class and Runnable interface, thread lifecycle methods, Thread Priorities.

Text Books:

1. Patrick Naughton, Herbert, Schild, *The Complete reference Java 2*, Tata Mc-Graw Hill.
2. E. Balaguruswamy *Programming with JAVA- A Primer*, Tata Mc-Graw Hill publication

Reference Books:

1. Nell Dale, Chip Weems, *Programming and Problem Solving with Java,* Jones and Bartlett Publishers
2. Harvey Deitel, Paul Deitel, *Java: How to Program*, Pearson

Course Code	Course Title	L	T	P	Credits
BCA-286A(ii)	**Java Programming Lab** (Pre-requisite: Java)	0	0	4	2
		CIE	**SEE**		**Total**
		50	50		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-286A(ii).1	Apply basic java features, control statements, and arrays
BCA-286A(ii).2	Construct object-oriented programs in Java
BCA-286A(ii).3	Implement exceptions handling.
BCA-286A(ii).4	Design Java programs for file handling, and multithreading

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-286A(ii).1	3	2	-	-	-	-	-	-
BCA-286A(ii).2	3	2	2	2	-	-	-	2
BCA-286A(ii).3	3	2	2	2	-	-	-	2
BCA-286A(ii).4	3	2	3	2	-	-	-	2

List of Experiments

No.	Experiment Detail
1.	Write a Java program that converts temperatures between Celsius and Fahrenheit based on user input.
2.	Implement a Java program to perform matrix multiplication using arrays.
3.	Write Java program to find the largest and smallest elements in an array.
4.	Implement a Java Program to sort an array of integers using Bubble sort.
5.	Write a program to implement method overloading.
6.	Develop a Java program to implement inheritance by creating a base class Animal and derived classes like Dog and Cat.
7.	Write a Java program to demonstrate method overriding by implementing a base class Shape, and derived classes Circle and Rectangle.
8.	Write a program to handle exceptions using try-catch.
9.	Write a program to demonstrate the use of ‘throws’ keyword.
10.	Write a program to handle user defined exceptions.
11.	Write a program to perform read and write operations on files using FileInputStream and FileOutputStream.
12.	Write a program to perform read and write operations on files using FileReader and FileWriter.
13.	Write a program to create and run multiple threads.
14.	Write a program to implement thread life-cycle methods.
15.	Write a program to implement thread priorities.

Text Books:

1. Patrick Naughton, Herbert, Schild, *The Complete reference Java 2*, Tata Mc-Graw Hill.
2. E. Balaguruswamy *Programming with JAVA- A Primer*, Tata Mc-Graw Hill publication

Reference Books:

1. Nell Dale, Chip Weems, *Programming and Problem Solving with Java,* Jones and Bartlett Publishers
2. Harvey Deitel, Paul Deitel, *Java: How to Program*, Pearson