Program Project Report (PPR)

of

Bachelor of Computer Applications (BCA)

Centre for Distance and Online Education

TEERTHANKER MAHAVEER UNIVERSITY
N.H.-24, Delhi Road, Moradabad, Uttar Pradesh 244001

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PROGRAMME PROJECT REPORT (PPR)–Online Mode

1. Introduction:

In an age defined by digital transformation and rapid technological advancement, foundational knowledge alone is no longer sufficient. The modern world demands an education that is dynamic, application-oriented, and deeply rooted in real-world relevance. The Online Bachelor of Computer Applications (BCA) programme offered by Teerthanker Mahaveer University (TMU), Moradabad, through its Centre for Distance and Online Education (CDOE), is strategically developed to fulfil this imperative.

This three-year, six-semester undergraduate programme empowers learners with comprehensive technical proficiency, analytical skills, and industry-aligned capabilities across the spectrum of computer applications. The programme is designed under the Choice-Based Credit System (CBCS) and consists of 136 credits, distributed among:

Core Courses
Ability Enhancement Compulsory Courses (AECC)
Skill Enhancement Courses (SEC)
Generic Elective Courses (GEC)
Department-Specific Electives (DSEC)
Laboratory Courses

The curriculum spans key and emerging domains such as programming and software development, web and mobile technologies, database systems, system software, networking and communication technologies, object-oriented programming, open-source platforms, and modern computing paradigms. These areas provide a solid academic foundation for pursuing careers in software engineering, IT services, system administration, and the broader digital technology landscape.

To meet the needs of a fast-evolving industry, the programme also incorporates broader exposure to high-impact areas such as data analytics, cybersecurity, artificial intelligence, cloud computing, and digital business solutions. This ensures that learners not only acquire core knowledge but are also prepared for contemporary and interdisciplinary roles within the digital economy.

Designed in accordance with the UGC (ODL & Online Education) Regulations, the programme emphasises self-paced, interactive, and outcome-driven learning. Students benefit from a holistic digital learning ecosystem that includes guidance from experienced faculty, structured online content, and technology-enabled evaluation.

This learner-centric and flexible programme enables students to study anytime, anywhere, with support from experienced faculty, online labs, e-resources, and interactive tools. It is particularly suitable for working professionals, remote learners, and aspirants aiming for career advancement or higher education in computing and related fields.

By fostering technical acumen, ethical responsibility, and a growth mindset, the Online BCA Programme at TMU prepares students to not just adapt to technological change—but to lead it with innovation, integrity, and impact.

Programme Mission and Objective:

The Online Mode BCA programme aims to provide contemporary education and training to meet the challenges of the evolving global scenario and changing environment in business administration. The objective of the project is to help the students develop the ability to apply multi-disciplinary concepts, tools and techniques to solve organisational problems.

The basic objective is to prepare highly skilled professionals, with a strong conceptual and theoretical background, in the field of Information Technology and Computing, in theory and its application

2. **Relevance of Programme with Teerthanker Mahaveer University, Moradabad - Mission and Goals:**

In alignment with the mission and objectives of Teerthanker Mahaveer University, Moradabad, the Online Mode BCA Programme is strategically designed to integrate a broad spectrum of subjects that have real-time applicability in the field of computer applications. The curriculum emphasises practical relevance and technological innovation, preparing students to excel in dynamic work environments across the IT sector. By equipping learners with industry-ready skills and digital competencies, the programme opens up diverse career opportunities in software development, systems management, data analytics, cybersecurity, and other fast-growing areas of the technology domain.

Vision:

"To be an internationally recognised online learning platform that delivers quality education in computer applications, fostering globally competent professionals guided by innovation, ethical values, and social responsibility."

Mission:

To provide inclusive, accessible, and flexible digital education in computer applications through state-of-the-art online learning platforms.

To develop a strong foundation in computing, software development, and data-driven technologies, fostering critical thinking and problem-solving skills.

To promote ethical values, digital entrepreneurship, and lifelong learning, enabling learners to contribute effectively to society and the global digital economy.

Programme Educational Objectives (PEOs)

PEO1: Graduates will possess a strong conceptual and practical foundation in computer applications, preparing them to thrive in national and international IT and digital technology

Domains.

PEO2: Graduates will be capable of analysing complex problems and designing innovative software solutions using modern tools and interdisciplinary knowledge relevant to real-world industry needs.

PEO3: Graduates will demonstrate ethical responsibility, teamwork, adaptability to technological changes, and a commitment to lifelong learning, entrepreneurship, and societal contribution.

Programme Outcomes (POs)

- **PO1. Computational Thinking: Apply computational thinking and software engineering principles to solve domain-specific problems.**
- **PO2. Programming Proficiency: Demonstrate proficiency in programming languages, algorithms, and data structures for problem-solving.**
- **PO3. Modern Tool Usage: Use modern computing tools and techniques effectively for application development, database management, and cloud computing.**
- **PO4. Industry Readiness: Demonstrate knowledge of current trends in IT and exhibit readiness for employment, entrepreneurship, or research in the digital domain.**
- **PO5. Environment and Sustainability: Understand the impact of computer applications on environmental and societal contexts and demonstrate awareness of sustainable development.**
- **PO6. Ethics: Apply ethical principles and commit to professional ethics, responsibilities, and norms in computing practice.**
- **PO7. Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and multidisciplinary environments.**
- **PO8. Communication: Communicate effectively on computing activities with the professional community and with society at large.**
- **PO9. Project Management and Finance: Demonstrate knowledge and understanding of management and financial principles applicable to software and IT projects.**
- **PO10.Lifelong Learning: Recognise the need for, and have the ability to engage in, independent and lifelong learning in the context of technological change.**

Programme Specific Outcomes (PSOs)

- **PSO1: Apply programming logic and data structures to design and develop efficient software applications in both standalone and distributed environments.**
- **PSO2: Demonstrate capabilities in managing databases, building web-based solutions, and integrating APIs using modern development tools and platforms.**
- **PSO3: Exhibit problem-solving and project management skills through real-time software projects, with an emphasis on digital entrepreneurship, ethical practices, and societal needs.**

3. Nature of Prospective Target Group of Learners:

The Online BCA Programme is thoughtfully designed to address the academic and professional aspirations of a diverse group of learners who may not be able to pursue traditional campus-based education. This includes:

•**Working professionals seeking to enhance their technical qualifications while continuing their employment**

•**Homemakers aiming to re-enter the workforce or upskill in digital technologies**

•**Students from rural or remote areas with limited access to regular academic institutions**

•**Learners with personal or financial constraints that prevent them from enrolling in conventional full-time programmes**

•**Students who prefer the flexibility of online learning to balance education with other responsibilities**

The programme's flexible structure, digital accessibility, and career-oriented curriculum make it an ideal choice for learners looking to build or advance their careers in the field of computer applications without compromising on quality or convenience.

4. Appropriateness of the programme to be conducted in Online Mode to acquire specific skills and competence:

The Online BCA Programme at Teerthanker Mahaveer University is meticulously designed to facilitate effective skill development and knowledge acquisition through a comprehensive digital learning ecosystem. The programme is delivered using Self-Learning e-Modules, which are structured to be self-explanatory, self-contained, and learner-directed, allowing students to learn at their own pace and convenience. These modules are aligned with the required learning outcomes and follow the UGC's Four-Quadrant Approach to online education, comprising:

(a) e-Tutorials: Faculty-led audio-video lectures that offer conceptual clarity and real-time academic engagement.

(b) e-Content: Digitally accessible textual resources, including PDFs and ePub materials, that provide in-depth subject understanding.

(c) Discussion Forums: Interactive discussion boards where learners can raise queries and receive timely responses and academic guidance from designated course coordinators or mentors.

(d) Self-Assessment: Regular quizzes, assignments, and unit-level tests to reinforce learning and support continuous self-evaluation.

Additionally, the programme recommends the latest reference books and supplementary materials, as outlined in the course syllabi, to deepen subject comprehension and broaden academic exposure.

The entire academic delivery is supported by a robust Learning Management System (LMS) that integrates content delivery, learner engagement, assessments, and performance tracking in a unified digital environment. The LMS ensures seamless interaction between faculty and learners and maintains the quality and integrity of academic delivery.

Given its structured digital pedagogy, interactive tools, and self-paced learning design, the Online BCA Programme is highly appropriate for online mode, enabling students to acquire relevant technical skills, computing knowledge, and professional competencies effectively—without compromising on learning outcomes or instructional quality.

5. Instructional Design:

Curriculum Design:

The curriculum of the Online BCA Programme has been thoughtfully developed by a panel of academic and industry experts in the field of computer applications. It ensures a strong theoretical foundation while incorporating contemporary topics and emerging technology trends relevant to the evolving digital landscape. Special emphasis has been placed on integrating components that promote digital ethics, environmental awareness, and social responsibility.

The curriculum and detailed syllabi have been rigorously reviewed and formally approved by the Board of Studies (BoS), the Centre for Internal Quality Assurance (CIQA), and the University Academic Council. These academic bodies include experienced professionals and subject matter experts from both academia and industry, ensuring that the programme remains academically robust, professionally relevant, and compliant with quality benchmarks outlined under UGC ODL Regulations.

Study & Evaluation Scheme

of

Bachelor of Computer Applications under the Centre for Distance and Online Education (CDOE)

[Applicable w.e.f. Academic Session-2025-26 till revised]

[As per CBCS guidelines given by UGC]

COLLEGE OF COMPUTING SCIENCES & INFORMATION TECHNOLOGY

TEERTHANKER MAHAVEER UNIVERSITY

N.H.-24, Delhi Road, Moradabad, UttarPradesh-244001

Website: www.tmu.ac.in

Bachelor of Computer Applications BCA(CDOE):Three-Year(6-Semester) Programme			
Basic Structure: Distribution of Courses & Credits			
S. No.	**Type of Course**	**Credit Hours**	**Total Credits**
1	Core Course (CC)	13 Courses of 4 Credit Hrs. each(Total Credit Hrs.13X4)	52
2	Ability-Enhancement Compulsory Course (AECC)	4 Courses of 4 Credit Hrs. each(Total Credit Hrs. 4X4) 2 Courses of 2 Credit Hrs. each (Total Credit Hrs. 2X2)	20
3	Skill Enhancement Course (SEC)	2 Courses of 4 Credit Hrs. each (Total Credit Hrs.2X4) 2 Courses of 1 Credit Hrs. each (Total Credit Hrs.2X1)	10
4	Generic Elective Course (GEC)	2 Courses of 3 Credit Hrs. each (Total Credit Hrs.2X3)	6
5	Departmental Specific Elective Course (DSEC)	1 Course of 4 Credit Hrs. each (Total Credit Hrs.1X4) 2 Courses of 6 Credit Hrs. each (Total Credit Hrs.2X6)	16
6	Laboratory Course (LC)	11 Courses of 2 Credit Hrs. each (Total Credit Hrs.11X2) 1 Course of 4 Credit Hrs. each (Total Credit Hrs. 1X4) 1 Course of 6 Credit Hrs. each (Total Credit Hrs.1X6)	32
Total Credits			**136**

Bachelor of Computer Applications BCA-CDOE Programme Matrix

Semester-I

S. No.	Category Name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-1	BCAOL101	Fundamentals of Computers and MS- Office	4	0	0	4	30	70	100
2	CC-2	BCAOL102	Digital Logic and basics of Computer Organization	4	0	0	4	30	70	100
3	AECC- 1	BCAOLAE103	English Communication-I	1	0	2	2	30	70	100
4	AECC- 2	BCAOLAE104	Environmental Studies	4	0	0	4	30	70	100
5	AECC- 3	BCAOLAE105	Fundamentals of Organisational Behaviours	4	0	0	4	30	70	100

6	LC-1	BCAOLLC106	MS-Office and Internet Lab	0	0	4	2	50	50	100
7	LC-2	BCAOLLC107	Digital Electronics Lab	0	0	4	2	50	50	100
			Total	**17**	**0**	**10**	**22**	**250**	**450**	**700**

Semester-II

S. No.	Category Name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-3	BCA OL 201	Programming in C	4	0	0	4	30	70	100
2	CC-4	BCAOL 202	Web Technologies	4	0	0	4	30	70	100
3	CC-5	BCAOL203	Linux Administration	4	0	0	4	30	70	100
4	SEC-2	BCAOLSE 204	Management Information System	4	0	0	4	30	70	100
5	AECC-4	BCOLAAE 205	English Communication–II	1	0	2	2	30	70	100
6	LC-3	BCAOLLC 206	C Language Lab	0	0	4	2	50	50	100
7	LC-4	BCAOLLC 207	Web Technologies Lab	0	0	4	2	50	50	100
			Total	**17**	**0**	**10**	**22**	**250**	**450**	**700**

Semester-III

S. No.	Category Name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-6	BCAOL301	Operating System	4	0	0	4	30	70	100
2	CC-7	BCAOL302	Data Structure using C++	4	0	0	4	30	70	100
3	CC-8	BCA3OL303	OOPs & C++	4	0	0	4	30	70	100
4	GEC-I	BCAOLGE304	System Analysis and Design	2	1	0	3	30	70	100
5	AECC-5	BCAOLAE305	Human Values & Professional Ethics	4	0	0	4	30	70	100

6	AECC-8	BCAOLAE306	Innovation & Entrepreneurship Development	4	0	0	4	30	70	100
7	LC-5	BCAOLLC307	Data Structure lab Using C++	0	0	4	2	50	50	100
8	LC-6	BCAOLLC308	OOPs & C++ Lab	0	0	4	2	50	50	100
			Total	**22**	**01**	**08**	**27**	**280**	**520**	**800**

Semester-IV

S. No.	Category Name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-9	BCAOL401	Software Engineering	4	0	0	4	30	70	100
2	CC-10	BCAOL402	Computer Network	4	0	0	4	30	70	100
3	CC-11	BCAOL403	Database Management System	4	0	0	4	30	70	100
4	GEC-II	BCAOLG404	Artificial Intelligence	2	1	0	3	30	70	100
5	SEC-6	BCAOLSE405	Soft Skills for Management Executive	-	-	2	1	50	50	100
6	LC-7	BCAOLLC406	DBMS Lab	0	0	4	2	50	50	100
7	LC-8	BCAOLLC407	Computer Networks Lab	0	0	4	2	50	50	100
			Total	**14**	**01**	**10**	**20**	**270**	**430**	**700**

Semester-V

S. No.	Category Name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-12	BCAOL501	Core Java Programming	4	0	0	4	30	70	100
2	SEC-7	BCAOLS502	Soft Skills at Work Place for Management Executive	0	0	2	1	50	50	100
3	LC-9	BCAOLLC503	Mini Project	0	0	8	4	50	50	100
4	LC-10	BCAOLLC504	Core Java Programming Lab	0	0	4	2	50	50	100
5	DSEC-I	BCAOLDS506	DSE from NPTEL Platform (MOOC 1)	4	0	0	4	30	70	100
6	DSEC-II		Any one from Specialization Group A1 & B1	4	0	4	6			200
	Specialization Group A1-Big Data and Visualization									
7	DSEC-1	BCAOLASP501	Big Data Analytics	4	0	0	4	30	70	100
8	DSEC-2	BCAOLASP502	Big Data Analytics Lab	0	0	4	2	50	50	100
	Specialization Group B1-Information Security &Cyber Security									
9	DSEC-3	BCAOLBSP503	Computer Security and Privacy	4	0	0	4	30	70	100
10	DSEC-4	BCAOLBSP504	Computer Security and Privacy Lab	0	0	4	2	50	50	100
Total				**12**	**00**	**18**	21	**290**	**410**	**700**

Semester-VI

S. No.	Category Name	Course Code	Subject	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-13	BCAOL601	Programming with C#	4	0	0	4	30	70	100
2	SEC-4	BCAOL602	Python Programming	4	0	0	4	30	70	100
3	LC-11	BCAOLLC603	In-house Project	0	0	12	6	50	50	100
4	LC-12	BCAOLLC604	Programming with C# Lab	0	0	4	2	50	50	100
5	LC-13	BCAOLLC605	Python Programming Lab	0	0	4	2	50	50	100
6	DSEC -III		Any one from Specialization Group A2 & B2	4	0	4	6			200
	Specialization Group A2-Big Data and Visualization									
8	DSEC-1	BCAOLASP601	Data Warehousing and Data Mining using R	4	0	0	4	30	70	100
9	DSEC-2	BCAOLASP602	Data Warehousing and Data Mining using R Lab	0	0	4	2	50	50	100
	Specialization Group B2-Information Security & Cyber Security									
10	DSEC-3	BCAOLBSP603	Concepts of Ethical Hacking	4	0	0	4	30	70	100
11	DSEC-4	BCAOLBSP604	Ethical Hacking Lab	0	0	4	2	50	50	100
Total				**12**	**0**	**24**	**24**	**290**	**410**	**700**

Detailed Syllabus:

SEMESTER - I

Course Code BCAOL101	**BCA- Semester I** Fundamental of Computers and MS-Office	L-4 T-0 P-0 C-4
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Understand peripheral devices and the evolution of computer generations.***	
CO2:	***Understand the basic concepts of operating systems and programming languages.***	
CO3:	***Understand the basic functions of Microsoft Word and Excel.***	
CO4:	***Understand the basic functions of Microsoft PowerPoint and create presentations.***	
CO5:	***Understand the categories of programs, system software, and application software.***	
Block 1	**Unit 1:** Introduction to Computers: Brief history & Basic components	
	Unit 2: Computer Hardware	
Block 2	**Unit 3:** Computer Languages	
	Unit 4: Number System	
Block 3	**Unit 5:** Algorithms, Flowcharts	
	Unit 6: MS-DOS	
	Unit 7: MS Word	
Block 4	**Unit 8:** MS Excel	
	Unit 9: MS Access	
Block 5	**Unit 10:** MS PowerPoint	
	Unit 11: Internet Basics	

Course Code BCAOL102	**BCA- Semester-I** Digital Logic and basics of Computer Organization	L-4 T-0 P-0 C-4
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Understand the operations of logic gates, Boolean algebra, and Karnaugh maps.***	
CO2:	***Understand the working of combinational and sequential circuits.***	
CO3:	***Understand the working of register organization and stack organization.***	
CO4:	***Understand the concept of Input-Output Organization.***	
CO5:	***Understand the layout of memory organization.***	
Block 1	**Unit 1:** Logic Gates	
	Unit 2: Boolean Algebra	
Block 2	**Unit 3:** Combinational Circuits	
Block 3	**Unit 4:** Sequential Circuits	
	Unit 5: Shift Registers:	
Block 4	**Unit 6:** Processor Organization	
Block 5	**Unit 7:** Input-Output Organization	
	Unit 8: Memory Organization	

Course Code: BCAOLAE103	BCA- Semester-I English Communication-I	L-1 T-0 P-2 C-2
Course Outcomes	**Upon completion of the course, students will be able to:**	
CO1.	Understand the basics of English communication.	
CO2.	Understand the fundamentals of listening skills.	
CO3.	Apply rules of grammar in sentence construction and paragraph writing.	
CO4.	Draft applications on common issues.	
CO5.	Demonstrate effective speaking skills.	
	Course Content:	
Unit 1:	**Basics of Communication:** Meaning and importance of communication, Importance of English communication, Process of communication, **Types of communication:** Verbal, Non-verbal, Formal, Informal, Flow and levels of communication, Strategies for effective communication: The 7 Cs of Communication, Language as a tool of communication, Barriers to communication.	**8 Hours**
Unit 2:	**Functional Grammar:** Sentence construction: Basic sentence pattern, subject and predicate, Tenses: Present, Past, and Future, Modals, concord, Common errors in sentences, Vocabulary building: Synonyms, antonyms, homophones, homonyms, one-word substitution.	**8 Hours**
Unit 3:	**Listening Skills:** Meaning and importance of listening, Difference between listening and hearing, Types and process of listening, Strategies for effective listening, Barriers to listening, Listening to TED Talks and speeches by eminent speakers.	**8 Hours**
Unit 4:	**Speaking Skills:** Principles of effective oral communication, Art of public speaking, Just A Minute (JAM) sessions: Describing pictures, places, situations, scenes, Common conversations, Debates, story narration, and role plays.	**8 Hours**
Unit 5:	**Writing Skills:** Paragraph writing: Meaning, structure, and essentials of a good paragraph, Methods of developing a paragraph, Writing applications on common issues.	**8 Hours**
Textbooks:		

Reference Books:	1- Kumar, Sanjay & Pushp Lata – *Communication Skills,* Oxford University Press 2- Nesfield, J.C. – *English Grammar, Composition & Usage*, Macmillan Publishers 3- Agrawal, Malti – *Professional Communication*, Krishna Prakashan Media Pvt. Ltd., Meerut 4- Wren & Martin – *High School English Grammar and Composition*, S. Chand & Co. Ltd., New Delhi 5- Joseph, Dr. C.J. & Myall, E.G. – *A Comprehensive Grammar of Current English*, Inter University Press, Delhi 6- Chaudhary, Sarla – *Basic Concept of Professional Communication*, Dhanpat Rai Publications, New Delhi 7- Taylor, Grant – *English Conversation Practice*, Tata McGraw Hill, New Delhi 8- Bansal, R.K. & Harrison, J.B. – *Spoken English*, Orient Longman, New Delhi 9- Sethi, J. & Dhamija, P.V. – *A Course in Phonetics and Spoken English*, Prentice Hall of India, New Delhi (1989) *Latest editions of all the suggested books are recommended.	

Course Code: BCAOLAE104	**BCA- Semester-I** **Environmental Studies**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes	**Upon completion of the course, students will be able to:**	
CO1.	Understand ecology and the environment to promote sustainable development.	
CO2.	Understand environmental policies, practices, and Acts and their application in industries.	
CO3.	Apply measures to control pollution effectively.	
CO4.	Analyse opportunities for the optimum use of natural resources and biodiversity.	
CO5.	Apply disaster management skills in case of emergencies.	
	Course Content:	
Unit 1:	**Introduction and Evolution of Environmental Studies:** Definition and scope of environmental studies, Multidisciplinary nature of environmental studies, Concept of sustainability and sustainable development, **Ecology and Environment:** Concept of an ecosystem: structure and functions, Energy flow in an ecosystem, Food chain, food web, ecological pyramids, ecological succession, **Study of major ecosystems:** Forest ecosystem, Grassland ecosystem, Aquatic ecosystem, Desert ecosystem.	**8 Hours**
Unit 2:	**Natural Resources:** Renewable and non-renewable resources, Land resources and land use changes, Land degradation, soil erosion, and desertification, Deforestation: causes and impacts due to mining, dam building on forest biodiversity, and tribal populations, Energy resources: renewable and non- renewable, Energy scenario and use of alternate energy sources (with case studies), **Biodiversity:** Hotspots of biodiversity in India and the world, Conservation and importance of biodiversity, Factors responsible for the loss of biodiversity, Bio-Geographical classification of India.	**8 Hours**
Unit 3:	**Environmental Pollution:** Types, causes, effects, and control of: Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards and their risks to human health, Solid waste management, Control measures for urban and industrial waste, Pollution case studies.	**8 Hours**
Unit 4:	**Environmental Policies and Practices:** Climate change and global warming (Greenhouse effect), Ozone layer depletion and control measures, Photochemical smog and acid rain, **Environmental laws**: Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, **International environmental agreements:** Montreal Protocol, Kyoto Protocol, Convention on Biological Diversity, Nature reserves, tribal populations, human-wildlife conflicts in the Indian context.	**8 Hours**

Unit 5:	**Human Communities and the Environment:** Human population growth and its impact on the environment, health, and welfare, Resettlement and rehabilitation of people affected by development projects (Case study), **Disaster Management:** Earthquakes, Floods, Droughts, Cyclones, Landslides, **Environmental movements:** Chipko Movement, Silent Valley Movement, Bishnoi Movement of Rajasthan, **Environmental Ethics:** Role of Indian and other regional cultures in environmental conservation, Environmental communication and public awareness (Case study).	**8 Hours**
Textbooks:	De, A. K. *Environmental Chemistry*. New Delhi: New Age Publishers Pvt. Ltd.	
Reference Books:	1. Bryant, P. J. *Biodiversity and Conservation*. New Delhi: Hypertext Book 2. Tewari, Khulbe & Tewari. *Textbook of Environmental Studies*. New Delhi: I.K. Publication 3. Masters, G. M. *Introduction to Environmental Engineering and Science*. New Delhi: Prentice Hall India Pvt. Ltd. 4. Odum, E. P. *Fundamentals of Ecology*. New Delhi: W.B. Saunders Co. **Latest editions of all the suggested books are recommended.*	

Course Code: BCAOLAE105	BCA- Semester I Fundamentals of Organization Behaviors	L-4 T-0 P-0 C-4
Course Outcomes	**Upon completion of the course, students will be able to:**	
CO1.	Understand the theories of organizational behavior for better management of human resources.	
CO2.	Analyze issues related to organizational behavior in various organizational contexts.	
CO3.	Develop learning strategies as per the organizational needs.	
CO4.	Analyze different personality traits to enhance human resource management.	
CO5.	Develop values and behaviors essential for building high-performance organizations.	
	Course Content:	
Unit 1:	**Understanding Organizational Behavior:** Historical background of organizational behavior: Scientific Management Approach, Bureaucratic Approach, Hawthorne Studies, Nature and importance of Organizational Behavior (OB), OB as an interdisciplinary approach, Scope and limitations of OB, **Models of Organizational Behavior:** Autocratic model, Custodial model, Supportive model, Collegial model, **Organization:** Meaning and definition, **OB:** Concept and significance.	8 Hours
Unit 2:	**Individual Behavior:** Nature of individual differences, **Key dimensions:** Self-concept, Personality traits, Abilities, Personal values and ethics, **Psychological processes of behavior:** S-R Model (Stimulus-Response Model), S-O-B-A Model (Stimulus–Organism–Behavior–Accomplishment Model), Factors influencing individual behavior.	8 Hours
Unit 3:	**Personality:** Meaning and definition of personality, **Personality traits:** Extroversion, Agreeableness, Conscientiousness, Emotional Stability, Openness to Experience, **Formation of personality:** Determinants, stages, and traits, **Influencing factors:** Cultural, family, social, and situational, **Personality factors in organizations:** Need pattern, Locus of control, Introversion and extroversion, Tolerance for ambiguity, Self-esteem and self-concept, Authoritarianism and dogmatism, Risk propensity, Machiavellianism, Type A and B personalities, Work- ethic orientation.	8 Hours
Unit 4:	**Attitude:** Meaning and definition, Components: Affective, cognitive, and behavioral, Attitude formation and change, Work-related attitudes: Job satisfaction, organizational commitment, and involvement, Measurement techniques: Opinion surveys, interviews, scaling techniques, Sources of attitudes, **Perception:** Meaning and definition, Basic perceptual process, Internal and external factors affecting perception.	8 Hours
Unit 5:	**Learning:** Meaning and definition, Components of the learning process, **Learning theories:** Classical Conditioning, Operant Conditioning, Observational Learning, Cognitive Learning, Social Learning, Application of learning theories in OB, **Group Behavior:** Definition and importance of groups, Types: Functional, task, and informal groups, Group formation and development, Stages of group development, Group norms: Meaning, definition, and types, Group cohesiveness: Meaning, advantages, and influencing factors	8 Hours

Textbooks:	Robbins, Stephen P. *Organizational Behavior*. New Delhi: Prentice Hall.	

Reference Books:	1. Luthans, Fred. *Organizational Behavior*. New Delhi: McGraw Hill. 2. Chandran, J.S. *Organizational Behavior*. New Delhi: Vikas Publishing House. Griffin, Ricky W. *Organizational Behaviour*. Boston: Houghton Mifflin Co. 3. Hellriegel, Don, John W. Slocum Jr., and Richard W. Woodman. *Organizational Behavior*. Ohio: South Western College Publishing. 4. Davis, Keith. *Human Behavior at Work: Organizational Behavior*. New Delhi: McGraw-Hill. 5. Pareek, Udai. *Behavioral Processes in Organizations*. New Delhi: Oxford and IBH. **Latest editions of all the suggested books are recommended.*	

Course Code BCAOLLC106	**BCA- Semester I** MS-Office and Internet Lab	L-0 T-0 P-4 C-2
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Apply the usage of system settings and Windows features.***	
CO2:	***Apply Microsoft Word to create professional and academic documentation.***	
CO3:	***Apply the basic functions of MS Excel to prepare worksheets.***	
CO4:	***Use MS PowerPoint to create effective presentations.***	
CO5:	***Create and edit databases using MS Access.***	
	LIST OF EXPERIMENTS 1. **Identification of Computer Components** o Familiarization with input, output, and storage devices o Opening the CPU cabinet and identifying internal hardware 2. **Practicing Windows Operating System** o File and folder management (Create, Rename, Copy, Move, Delete) o Personalization (Themes, Display Settings, Taskbar Customization) 3. **Basic MS-DOS Commands** o Internal: VOL, VER, DATE, TIME, CLS, DIR, CD, MD, PROMPT, TYPE, COPY, COPYCON o External: MOVE, MORE, FIND, ATTRIB, TREE, DELTREE, EDIT, FORMAT 4. **Creating and Formatting a Document** o Changing fonts, styles, line spacing, and page layout 5. **Table Operations** o Inserting tables, merging/splitting cells, applying borders and shading 6. **Working with Tools** o AutoCorrect, AutoText, Spell Check, Thesaurus 7. **Using WordArt, Charts, and Shapes** o Inserting and formatting objects in documents 8. **Mail Merge** o Creating address labels and personalized letters 9. **Spreadsheet Basics** o Data entry, formatting, sorting, and filtering 10. **Using Formulas and Functions** o SUM, AVERAGE, MAX, MIN, IF, VLOOKUP, etc. 11. **Charts and Graphs** o Creating and formatting bar, line, and pie charts 12. **Linking Data**	

	○ Linking Excel data with Word documents 13. **Creating Presentations** ○ Using AutoContent Wizard and blank templates 14. **Slide Management** ○ Inserting slides, using slide sorter, adding transitions and animations 15. **Multimedia in Presentations** ○ Inserting audio, video, ClipArt, and WordArt 16. **Slide Show and Timings** ○ Automating slides, setting durations, rehearsing timings 17. **Using Web Browsers** ○ Navigating websites, using bookmarks, downloading files 18. **Email Creation and Management** ○ Creating a Gmail/Yahoo account, sending, receiving, and organizing emails 19. **Internet Search Techniques** ○ Using Google operators, safe search, and scholarly content browsing
	20. Charts and Graphs 21. Creating and formatting bar, line, and pie charts. 22. Linking Data 23. Linking Excel data with Word documents. 24. Creating Presentations 25. Using Auto Content Wizard and blank templates. 26. Slide Management 27. Inserting slides, using slide sorter, adding transitions and animations. 28. Multimedia in Presentations 29. Inserting audio, video, ClipArt, and WordArt. 30. Slide Show and Timings 31. Automating slides, setting durations, rehearsing timings. 32. Using Web Browsers 33. Navigating websites, using bookmarks, downloading files. 34. Email Creation and Management 35. Creating a Gmail/Yahoo account, sending, receiving, and organizing emails. 36. Internet Search Techniques Using Google operators, safe search, and scholarly content browsing.

Course Code BCAOLLC107	**BCA- Semester I** Digital Electronics Lab	L-0 T-0 P-4 C-2
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Apply the concepts of logic gates and Boolean algebra to design combinational circuits.***	
CO2:	***Understand and implement the working of basic gates and sequential circuits.***	
CO3:	***Apply design procedures to create basic sequential circuits.***	
CO4:	***Apply the concepts of sequential circuits to design flip-flops and registers.***	
CO5:	***Understand basic digital circuits and verify their operation.***	
	LIST OF EXPERIMENTS 1. Design logic circuits to verify the truth tables of basic gates. 2. Implement Boolean expressions using basic gates. 3. Prove that the NAND gate is a universal gate using logic circuits. 4. Prove that the NOR gate is a universal gate using logic circuits. 5. Design an XOR gate using only NAND gates. 6. Design a half-subtractor using NOR gates. 7. Design a half-adder using NAND gates. 8. Design a full-adder using basic logic gates. 9. Design a full-subtractor using basic logic gates. 10. Design a 4×1 multiplexer using basic logic gates and implement it with an IC. 11. Design an 8×1 multiplexer using basic logic gates and implement it with an IC. 12. Realize the Boolean function using a suitable multiplexer: o $f(A, B, C) = \Pi(0, 1, 3, 5)$ 13. Design a half-adder using a suitable multiplexer. 14. Design a full-adder using a suitable multiplexer. 15. Design a half-subtractor using a suitable multiplexer. 16. Design a full-subtractor using a suitable multiplexer. 17. Implement a 1×4 demultiplexer using basic logic gates and implement it with an IC. 18. Design a 1×8 demultiplexer using two 1×4 demultiplexers and implement it with an IC. 19. Design a 2-to-4 line demultiplexer using basic logic gates. 20. Design a 3-to-8 decoder and implement it with an IC. 21. Design a BCD to Excess-3 code converter using NAND gates. 22. Design a 3-bit Gray code to binary code converter. 23. Design a 4-bit binary adder. 24. Design a logic circuit to check whether two 2-bit binary numbers are equal. 25. Study the RS flip-flop using NAND gates. 26. Study the RS flip-flop using NOR gates. 27. Study the D-type flip-flop using NAND gates. 28. Study the JK flip-flop using NOR gates. 29. Study the T flip-flop using NAND gates. 30. Design a 4-bit shift register.	

SEMESTER - II

Course Code BCAOL201	**BCA- Semester II** Programming in C	L-4 T-0 P-0 C-4
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Understand the basics of the C programming language, including functions and storage classes.***	
CO2:	***Understand the concepts of arrays, pointers, structures, unions, strings, and dynamic memory allocation.***	
CO3:	***Analyze file handling concepts along with C preprocessors.***	
CO4:	***Understand functional and hierarchical code organization.***	
CO5:	***Understand defensive programming concepts and develop the ability to handle possible errors during program execution.***	
Block 1	**Unit 1:** Introduction to C Programming	
	Unit 2: Data Types and Operators	
	Unit 3: Control Structures: Conditional Statements and Looping	
Block 2	**Unit 4:** Functions in C	
	Unit 5: Storage Classes and Library Functions	
Block 3	**Unit 6:** Arrays	
	Unit 7: Strings	
	Unit 8: Pointers	
	Unit 9: Dynamic Memory Allocation	
Block 4	**Unit 10:** Structures and Unions	
	Unit 11: User Defined Data Types and Preprocessor in C	
Block 5	**Unit 12:** File Handling in C	

Course Code BCAOL202	**BCA- Semester II** Web Technologies	L-4 T-0 P-0 C-4
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Understand the concepts of web technologies, HTML, and Cascading Style Sheets (CSS).***	
CO2:	***Understand the concepts of dynamic web pages using JavaScript, Extensible Markup Language (XML), and transformations using XSL and XSLT in XML documents.***	
CO3:	***Understand and analyze various concepts in designing web pages.***	
CO4:	***Create modern web pages using HTML and CSS with different layouts as per application requirements.***	
CO5:	***Create modern web applications using client-side and server-side technologies, applying web design fundamentals.***	
Block 1	**Unit 1:** Introduction of Internet and its Evolution in India	
	Unit 2: Web Architecture and Protocols	
	Unit 3: Mark up Languages	
Block 2	**Unit 4:** Basic HTML Elements	
	Unit 5: Forms and Input Handling	
	Unit 6: Introduction to DHTML	
Block 3	**Unit 7:** CSS Fundamentals	
	Unit 8: Styling with CSSs	
	Unit 9: Advanced CSS	
Block 4	**Unit 10:** Basics of JavaScript	
	Unit 11: JavaScript Arrays and Forms	
	Unit 12: Document and Form Manipulation	
Block 5	**Unit 13:** Introduction to XML	
	Unit 14: Creating and Validating XML	
	Unit 15: XML with Applications	

Course Code BCAOL203	**BCA- Semester II** Linux Administration	L-4 T-0 P-0 C-4
Blocks	**Units**	
Course Outcomes:	**On completion of the course, the students will be able to:**	
CO1:	***Understand the history, types, characteristics, and components of Linux operating systems, including the booting process, shell features, and multi-user environment.***	
CO2:	***Analyze basic Linux file system operations including directory management, file manipulation, file permissions, links, redirection, and documentation usage (e.g., man pages).***	
CO3:	***To apply Linux user and group accounts, software packages, and archive files using tools like RPM, YUM, tar, gzip, and bzip2.***	
CO4:	***To apply local storage and file systems by creating, mounting, and managing partitions, logical volumes, encrypted file systems, and access control lists (ACLs).***	
CO5:	***To apply essential system services and security configurations including SSH setup, remote system control, and configuration of network services like HTTP, FTP, NTP, and Samba.***	
Block 1	**Unit 1:** Introduction to Linux	
	Unit 2: Operating System Basics	
	Unit 3: Directories and Filesystem Basics	
Block 2	**Unit 4:** Package Management	
	Unit 5: User Account Management	
	Unit 6: Group Management and Permissions	
Block 3	**Unit 7:** Local Storage Configuration	
	Unit 8: Filesystem system	
	Unit 9: Access Control Lists (ACLs)	
Block 4	**Unit 10**: Managing System Services	
	Unit 11: Infrastructure services	
Block 5	**Unit 12:** OpenSSH Protocol and Server	
	Unit 13: SSH Key-Based Authentication	

Course Code: BCAOLSE204	BCA- Semester-II **Management Information System**	L-4 T-0 P-0 C-4
Course Outcomes	**Upon completion of the course, students will be able to:**	
CO1.	Understand the basic concepts and terminologies used in the field of Management Information Systems (MIS).	
CO2.	Compare the processes of developing and implementing information systems.	
CO3.	Understand various types of systems, MIS types, the decision-making process, and related tools.	
CO4.	Analyze how information technology impacts a firm.	
CO5.	Develop planning and decision-making skills using the Simon Model.	
	Course Content:	
Unit 1:	**Origin of Management Information System (MIS):** Concept and definition, role of MIS, process of MIS management, MIS as a tool for the management process.	8 Hours
Unit 2:	**Planning and Decision Making:** Tools of planning, MIS in business planning; decision-making concepts, Simon Model.	8 Hours
Unit 3:	**Information and System:** Concept of information, MIS and system concepts.	8 Hours
Unit 4:	**Types of MIS:** Success and failure of MIS, different types of MIS and their applications.	8 Hours
Unit 5:	**Decision Support System (DSS):** Concept and philosophy of DSS, deterministic systems, artificial intelligence (AI) systems, knowledge-based expert systems (KBES), MIS and the role of DSS, transaction processing system (TPS), enterprise management system (EMS), enterprise resource planning (ERP) systems, benefits of ERP, EMS, and ERP.	8 Hours
Textbooks:	Laudon, K.C. & Laudon, J.P., *Management Information Systems*, Galgotia Publishers.	
Reference Books:	1- Jawedkar, W.S., *Management Information System*, McGraw-Hill. 2- Mudrick, R.G., *An Information System for Modern Management*, Pearson. *Latest editions of all the suggested books are recommended.	

Course Code: BCAOLAE205	**BCA- Semester-II** **English Communication–II**	**L-1** **T-0** **P-2** **C-2**
Course Outcomes	**Upon completion of the course, students will be able to:**	
CO1.	Understand the basics of technical communication.	
CO2.	Understand the mechanics of writing.	
CO3.	Apply rules of grammar in sentence construction and essay writing.	
CO4.	Draft different types of reports.	
CO5.	Demonstrate presentation skills.	
	Course Content:	
Unit 1:	**Functional Grammar:** Transformation of Sentences: Active and Passive Voice, Direct and Indirect Speech, Degrees of Comparison, Affirmative to Negative, Negative to Affirmative, Assertive to Interrogative, Interrogative to Assertive, Synthesis of Sentences: Simple, Compound, and Complex Sentences, Vocabulary Building: Prefixes, Suffixes, Idioms, and Phrases.	**8 Hours**
Unit 2:	**Technical Communication**: Features of Technical Communication, Difference between Technical and General Communication, Report Writing: Features of a Good Report, Significance of Report Writing, Types of Reports, Format and Structure of Reports, Steps for Writing a Report.	**8 Hours**
Unit 3:	**Presentation Strategies:** Planning, Preparation, and Delivery, Defining Purpose, Organizing Content, Understanding the Audience, and Setting the Locale, Using Audio-Visual Aids, The 5 Ps of Voice Dynamics, The 5 Ws and 1 H of Presentation, Types of Presentations Strategies for Effective PowerPoint Presentations, Handling Queries, Stage Presence, and Modes of Speech Delivery.	**8 Hours**
Unit 4:	**Reading Comprehension**: Meaning and Importance of Reading Comprehension, Strategies for Reading Comprehension: The 4 Ss, Reading Techniques, Practice with Short Passages.	**8 Hours**
Unit 5:	**Mechanics of Writing:** Essay Writing: Types of Essays, Structure, and Steps, Essay Writing Practice on Various Topics.	**8 Hours**
Textbooks:	1- Kumar, Sanjay & Pushp Lata. *Communication Skills*. New Delhi: Oxford University Press.	
Reference Books:	2- Nesfield, J.C. *English Grammar, Composition & Usage*. Macmillan Publishers. 3- Agrawal, Malti. *Professional Communication*. Krishna Prakashan Media (P) Ltd., Meerut. 4- Wren & Martin. *High School English Grammar and Composition*. S. Chand & Co. Ltd., New Delhi. 5- Joseph, Dr. C.J. & Myall, E.G. *A Comprehensive Grammar of Current English*. Inter University Press, Delhi. 6- Chaudhary, Sarla. *Basic Concepts of Professional Communication*. Dhanpat Rai Publications, New Delhi. 7- Bansal, R.K. & J.B. Harrison. *Spoken English*. Orient Longman, New Delhi. 8- Sethi, J. & Dhamija, P.V. *A Course in Phonetics and Spoken English*. Prentice Hall of India, New Delhi, 1989. *Latest editions of all the suggested books are recommended.	

Course Code BCAOLLC206	**BCA- Semester II** C Language Lab	L-0 T-0 P-4 C-2
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Apply programming concepts of functions and arrays to write, compile, and debug C programs.***	
CO2:	***Apply programming concepts of pointers and strings to write, compile, and debug C programs.***	
CO3:	***Apply programming concepts of structures and unions to write, compile, and debug C programs.***	
CO4:	***Understand the concept of object-thinking within the framework of functional models.***	
CO5:	***Understand the concept of functional hierarchical code organization.***	

LIST OF EXPERIMENTS

Basics of C Programming

1. Rotate the values of three variables x, y, and z.
2. Display the right-most digit of the integral part of a floating-point number.
3. Convert a distance between two cities (in km) into meters, feet, inches, and centimetres.
4. Calculate the sum of digits of a five-digit number without using a loop.
5. Calculate the sum of the first and last digits of a four-digit number.
6. Find the largest and smallest numbers among four given numbers.
7. Check whether a year is a leap year or not.
8. Determine the grade of a student based on marks in 5 subjects.
9. Calculate a library fine based on the number of late return days.
10. Find the product of the digits of an entered number.
11. Find the sum of the digits of an entered number.
12. Convert a decimal number into a binary number.
13. Find the sum of the series: 1 + 2 + 4 + 7 + 11 + 16 + … up to n terms.
14. Print Armstrong numbers from 1 to 10,000.
15. Reduce the sum of digits of a number until a single digit is obtained.
16. Convert years into minutes, hours, days, months, and seconds using switch() statements.
17. Menu-driven program:

- Generate the Fibonacci series within a given range
- Print all prime numbers between 1 and 300
- Exit

18. Check whether a number is a perfect number.
19. Print the following patterns:

- Pattern 1: ABCDCBA, ABC CBA, AB BA, A A
- Pattern 2: (Create your own variation)

20. Currency denomination program: For a given amount, display the number of 100, 50, 20, 10, 5, 2, and 1 rupee notes required.

Programs Related to Functions

1. Calculate the factorial of a given number.
2. Menu-driven program using functions to perform:
    - Sum
    - Difference
    - Product
    - Division
    - Exit
3. Calculate the sum of the series using a function: $X – X^3/3! + X^5/5! – X^7/7! …$
4. Create a function prime () that returns 1 if a number is prime, otherwise 0.
5. Calculate nPr and nCr using separate functions.
6. Find the prime factors of a number using a function.
7. Use a function to check whether the 4th bit of a given number is ON or OFF.

Programs Related to Recursion

1. Calculate factorial using recursion.
2. Generate the Fibonacci series using recursion.
3. Print the reverse of an integer using recursion.

Programs Related to Arrays

1. Count positive, negative, and zero numbers in an array.
2. Swap two arrays element-wise.

	3. Input 10 elements and sort them in ascending order. 4. Perform array operations: o Display elements o Calculate sum and average o Find the largest, second largest, and smallest elements o Display in reverse order o Exit 5. Matrix operations using functions: o Generate and display n×n matrices o Addition, subtraction, and multiplication of two n×n matrices o Exit 6. Matrix operations using functions: o Transpose of a matrix o Sum of diagonal elements o Exit 7. Search for an element in an array using a function and return its position. **Programs Related to Strings and Pointers** 1. Read a name, find its length, and print ASCII values of its characters. 2. Remove all occurrences of the word "The" from a string. 3. Delete all vowels from a given line of text. 4. Copy the contents of one string to another using pointers and functions. 5. Check whether two strings are identical using pointers and functions. **Programs Related to Structures and Unions** 1. Student result table using structure (ID, name, marks of 3 courses, total marks); display the student with the highest total. 2. Store information of 10 persons using a union: o Children: full birthdate o Adults: age in years o Elderly: status “O” 3. Maintain library records for 100 books (book name, author, edition, year of publishing, price).

Course Code BCAOLLC207	**BCA- Semester II** Web Technologies Lab	L-0 T-0 P-4 C-2
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Apply concepts to create simple web pages using various HTML tags and attributes.***	
CO2:	***Apply CSS concepts to design the layout of web pages.***	
CO3:	***Use JavaScript to create dynamic web pages on the client side.***	
CO4:	***Employ various web technologies to build customized websites.***	
CO5:	***Understand CSS types and apply them to style web pages at various levels.***	
	LIST OF EXPERIMENTS **HTML Programs** 1. Create a simple HTML document about yourself or a topic of your choice using basic tags. 2. Add bold and italic words to your document. Save and view. 3. Add a header to your document. Save and view. 4. Add paragraphs and line breaks. Save and view. 5. Insert a horizontal rule where appropriate. Save and view. 6. Add an unordered list. Save and view. 7. Add an ordered list. Save and view. 8. Add a definition list. Save and view. 9. Create a new file named yournamefile2.htm. 10. Create a hyperlink to http://www.yahoo.com. 11. Link yournamefile2.htm to yournamefile1.htm. 12. Display all types of HTML headings on a single page. 13. Open any HTML file in an editor and add an image using <img src="image.gif">. 14. Align a short description below the image. Save and view. 15. Align the description to the top of the image. Save and view. 16. Add a simple 2×2 table without borders. Save and view. 17. Add a table border with a value of 1. Save and view. 18. Increase the table border to a value of 5. Save and view. 19. Set the top row as a table header. Save and view. 20. Align all table cell data to the centre. Save and view. 21. Center one of the headers. Save and view. 22. Center an image. Save and view. 23. Align the image to the right. Save and view. 24. Add a border of 1 around the image. Save and view. 25. Add a horizontal rule aligned to the left, with 50% width and size 5. Save and view. 26. Set non-header text to font size +3. Save and view. 27. Add a background and text color using hexadecimal values in the <body> tag. 28. Add a title and footer to all created pages. 29. Design a homepage for Teerthanker Mahaveer University using tables. 30. Design a website to display information about all courses offered by the university, with proper images and color schemes.	

31. Create a gallery page for the university with image thumbnails. Clicking a thumbnail should open the full image in a new window.
32. Create a contact page using various HTML input controls.

CSS Programs

1. Demonstrate inline CSS styling.
2. Demonstrate embedded CSS styling.
3. Demonstrate various CSS selectors.
4. Demonstrate external CSS styling using a .css file.
5. Show different CSS properties such as color, background, font, etc.
6. Format user information using inline CSS.
7. Use tags and a single stylesheet to apply multiple styles on a single page.
8. Demonstrate 10 different CSS properties (e.g., margin, float, text-align, padding, border, display, position, width, height, overflow).

JavaScript Programs

1. Write a JavaScript program to calculate the sum of the digits of a number entered in a textbox.
2. Write a JavaScript program to reverse a five-digit number entered in a textbox.
3. Write a JavaScript program to increment each digit of a five-digit number by 1 (e.g., 12391 → 23402).
4. Write a JavaScript program to determine the day of the week for January 1st of a given year (Gregorian calendar).
5. Write a JavaScript program to calculate library fines based on the number of late days.
6. Write a JavaScript program to check the type of triangle based on three side lengths.
7. Write a JavaScript program to find all prime numbers between 1 and 300 in reverse order.
8. Write a JavaScript program to display a reversed Fibonacci series for a given range.
9. Create a menu-driven program with the following options:
    - Factorial
    - Armstrong Number
    - Odd or Even
    - Magic Number
    - Perfect Number
10. Write a general-purpose JavaScript function to convert any given year (entered in a textbox) into its Roman numeral equivalent.

Decimal	Roman	Decimal	Roman
1	I	100	C
5	V	500	D
10	X	1000	M
50	L		

- Example: Roman equivalent of 1988 is MCMLXXXVIII, of 1525 is MDXXV.

11. Write a JavaScript program to find the prime factors of a number.
12. Write a JavaScript program to process an array of 25 numbers and count positives, negatives, evens, and odds.

	13. Implement Selection Sort, Bubble Sort, and Insertion Sort using JavaScript. 14. Write a JavaScript program to interchange odd and even elements of an array. 15. Create a JavaScript app with a text area and two buttons: one to count characters, another to display content. 16. Write a JavaScript program to determine the day of the week from the entered day, month, and year. 17. Write a JavaScript program to sum digits from 1 to the entered range and display the result in words. 18. Create a JavaScript countdown timer with a preset time and alert on completion. 19. Write a JavaScript program to validate a textbox with the following conditions: • Not blank • Length between 3 and 10 • Alert if invalid 20. Create a JavaScript count-up stopwatch matching a preset time. 21. Write a JavaScript program to show the number of days left in the current month. 22. Write a JavaScript program to show the time spent on the current webpage in real-time. 23. Alert the total time spent on the webpage when the user leaves it. 24. Perform checkbox validation using JavaScript. 25. Perform phone number validation using JavaScript. 26. Perform date validation using JavaScript. 27. Perform email address validation using JavaScript. 28. Perform credit card validation using JavaScript. 29. Write a JavaScript program to generate a User ID with the following rules: • First textbox: First Name • Second textbox: Last Name • Third textbox: Output (User ID = First 6 characters of last name + 1 character from first name) • Fill remaining characters with "–" if the last name is shorter than 6 characters • Validations: o No blank fields o Only characters allowed o User ID textbox should be read-only

SEMESTER III

Course Code BCAOL301	**BCA- Semester III** Operating System	L-4 T-0 P-0 C-4
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Understanding how to describe the functionality of an operating system.***	
CO2:	***Understanding to understand process, its management and synchronization.***	
CO3:	***Understanding concept of deadlock, how it is detected and prevented.***	
CO4:	***Understandingconceptofmemoryanditsmanagementandvariousprocessesto Manage it.***	
CO5:	***Understanding concept of file management and its various techniques.***	
Block 1	**Unit 1:** Introduction to the Operating System	
	Unit 2: Multi Programming	
	Unit 3: Distributed System	
	Unit 4: Functions and Services of OS	
Block 2	**Unit 5:** Process Management	
	Unit 5.1: Process Synchronization	
	Unit 6: CPU Scheduling	
	Unit 6.1: FCFS CPU Scheduling Algorithm	
	Unit 6.2: SJF CPU Scheduling Algorithm	
	Unit 6.3: RR CPU Scheduling Algorithm	
	Unit 6.4: Priority CPU Scheduling Algorithm	
	Unit 6.5: Comparison of all Algorithms	
Block 3	**Unit 7:** Characteristic of System model	
	Unit 8: Deadlock Prevention, Avoidance and Detection	
	Unit 9: Deadlock Recovery System	
	Unit 9.1: Implementation of Banker's Algorithm	
Block 4	**Unit 10:** Logical and Physical Address	
	Unit 11: Fragmentation	
	Unit 12: Concept of paging and its Types	
	Unit 12.1: Page Table Structure	
	Unit 12.2: Page Replacement Algorithms	
	Unit 12.3: Concept of Thrashing	
	Unit 12.4: Demand Paging	
Block 5	**Unit 13:** Concept of File and Directory Structure	
	Unit 13.1: File Access Methods	
	Unit 14: Device Management	
	Unit 14.1: FCFS disk Scheduling Algorithm	
	Unit 14.2: SSTF disk Scheduling Algorithm	
	Unit 14.3: SCAN disk Scheduling Algorithm	
	Unit 14.4: LOOK disk Scheduling Algorithm	
	Unit 14.5: C-SCAN disk Scheduling Algorithm	
	Unit 14.6: Comparison of Scheduling Algorithm	
	Unit 15: Device Management Part II	

Course Code **BCAOL302**	**BCA- Semester III** **Data Structure Using C++**	**L-4** **T-0** **P-0** **C-4**
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Understand and remember*** *basic terminologies, compute* ***time complexities****, and analyse the* ***usage of arrays****.*	
CO2:	***Analyse the concept of data structures*** *through Abstract Data Types (ADTs) such as* ***stacks, queues, and linked lists****. Understand their* ***basic operations*** *and* ***applications****.*	
CO3:	***Understand, analyse, and apply*** *learned concepts to solve problems related to various* ***sorting*** *and* ***searching algorithms****, and perform a* ***comparative analysis*** *of each.*	
CO4:	***Understand various representations of trees and graphs****, and analyse* ***different methods*** *used to solve related problems.*	
CO5:	***Apply algorithms*** *to solve problems involving* ***sorting, searching, insertion, and deletion*** *of data.*	
Block 1	**Unit 1:** Introduction to Data Structures Using C++	
	Unit 2: Algorithm, Complexity, and Time-Space Trade-off	
	Unit 3: Arrays and Character Strings in C++	
Block 2	**Unit 4:** Stack – Representation and Operations	
	Unit 5: Applications of Stack	
	Unit 6: Queue – Representation and Operations	
Block 3	**Unit 7:** Linked List	
	Unit 8: Linked List – Insertion with Examples	
	Unit 9: Linked List – Deletion with Examples	
	Unit 10: Doubly Linked List – Insertion	
	Unit 11: Doubly Linked List – Deletion	
	Unit 12: Circular Linked List – Insertion & Deletion	
	Unit 13: Linked List vs Array	
Block 4	**Unit 14:** Sorting – Bubble Sort	
	Unit 15: Sorting – Selection Sort	
	Unit 16: Sorting – Insertion Sort	
	Unit 17: Sorting – Quick Sort	
	Unit 18: Sorting – Merge Sort	
	Unit 19: Sorting – Heap Sort	

	Unit 20: Comparative Analysis of Sorting Algorithms
	Unit 21: Searching Algorithms
Block 5	**Unit 22:** Trees – Basic Terminology
	Unit 23: Binary Trees – Representation & Types
	Unit 24: Tree Traversal
	Unit 25: Binary Search Tree (BST) – Insertion, Deletion, Traversal
	Unit 26: Graph Representation – Adjacency Matrix & Adjacency List

Course Code BCAOL303	**BCA- Semester III** OOPs & C++	L-4 T-0 P-0 C-4
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Understanding the concept and underlying principles of Object-Oriented Programming.***	
CO2:	***Understanding how object-oriented concepts are incorporated using the C++ programming language.***	
CO3:	***Developing problem-solving and programming skills using object-oriented concepts.***	
CO4:	***Understanding the benefits of a well-structured program.***	
CO5:	***Developing the ability to solve real-world problems through software development in a high-level programming language like C++, including file handling concepts.***	
Block 1	**Unit 1:** Introduction to Object-Oriented Approach and Paradigm Comparison	
	Unit 2: Core OOP Concepts and C++ Programming Basics	
Block 2	**Unit 3:** Classes, Objects, and Encapsulation in C++	
	Unit 4: Class Declaration and Object Behaviour in C++	
	Unit 5: Constructors, Destructors, and Abstract Classes	
Block 3	**Unit 6:** Inheritance: Access specifiers, Types of inheritance	
	Unit 7: Ambiguity Resolution in Multiple Inheritance	
	Unit 8: Constructor Calling in Inheritance – Implicit and Explicit Calls to Base Class	
	Unit 9: Containership and inheritance, Virtual Base Class	
Block 4	**Unit 10:** Friend Functions, Friend Member Functions, and Friend Classes in C++	
	Unit 11: Polymorphism: Function Overloading, Operator Overloading	
	Unit 12: Operator overloading using Friend	
	Unit 13: Virtual function & Pure Virtual function	
Block 5	**Unit 14:** File Handling in C++ – Stream Classes, File Operations, and Data I/O	
	Unit 15: File Pointers, Error Handling, and Command-Line Arguments in C++	

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Course Code BCAOLGE304	**BCA- Semester III** System Analysis and Design	L-2 T-1 P-0 C-3
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Understand the basic concepts of systems, types, and environments.***	
CO2:	***Understand the role of a systems analyst and system development approaches.***	
CO3:	***Understand the phases of SDLC and the importance of documentation.***	
CO4:	***Analyse system requirements using appropriate tools like DFDs, ERDs, and data dictionaries.***	
CO5:	***Design data and process models to develop a system proposal using CASE tools.***	
Block 1	**Unit 1:** Introduction to Systems	
	- General Theory of Systems	
	- Manual and Automated Systems	
	- Business Subsystems, Environments & Boundaries	
	- Real-time and Distributed Systems	
	- Principles of Successful Systems	
	Unit 2: Approaches to System Development	
	- Structured Analysis & Design	
	- Prototyping	
	- Joint Application Development (JAD)	
	- Role and Need of System Analyst	
Block 2	**Unit 3:** System Development Life Cycle (SDLC)	
	- Phases: Analysis, Design, Development, Implementation, Maintenance	
	Unit 4: System Documentation	
	- Principles, Types, and Importance of Documentation	
Block 3	**Unit 5:** Fact Gathering Techniques	
	- Interviews, Questionnaires, Group Communication	
	Unit 6: Feasibility Analysis and Modern Requirement Gathering	
	- Technical, Economic, Operational Feasibility	
	- Prototyping, JAD, BPR	
	- System Selection Plan and Proposal	
Block 4	**Unit 7:** System Design Concepts	
	- Module Specifications	
	- Coupling and Cohesion	
	- Structure Charts	
	- Logical and Physical Design	
	Unit 8: Data and Process Modelling	
	- ER Modelling, ERDs, DFDs	
	- Structured English, Decision Tables, Trees, Data Dictionary	
Block 5	**Unit 9:** Input/Output & User Interface Design	
	- Forms Classification	
	- GUI Standards and Guidelines	
	Unit 10: Database Design and System Implementation	
	- Physical File Design, Conversion Methods, Testing, Validation	

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Course Code: **BCAOLAE305**	**BCA- Semester III** **Human Values and Professional Ethics**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the core values that shape the ethical behaviour of a Manager in functional areas of a fan organisation.	
CO2.	Understanding the morals & values that ought to guide the Management and resolve the moral issues in the profession	
CO3.	Analysing the role of moral and values in technological Development and its challenges.	
CO4.	Developing value based management system and work Environment in organisation.	
CO5.	Developing frame framework for management ethics and human Values.	
Course Content:		
Unit-1:	**Evolution and introduction of Human Values in the Indian context:** Values: Introduction, sources of value system, Types of values, Significance of values, Indian value system, values of Indian manager, Teaching from Indian scriptures like the Mahabharata, Bhagwad Gita, the Ramayana, the Quran and its applications in management.	**8Hours**
Unit-2:	**Business Ethics:** Definition of Ethics, nature of ethics, types of ethics, Ethics and morality, Need and significance of business Ethics, code of conduct and Ethics for managers.-	**8 Hours**
Unit-3:	**Ethical Dilemmas:** Ethical Dilemmas- sources and their resolutions. Ethical decision making, Work ethics, Ethical and unethical practices in India.	**8 Hours**
Unit-4:	**Impact of Ethics:** Ethical issues related with marketing, Human resource management, Finance, Intellectual property rights. Environmental	**8 Hours**

	Ethics.	
Unit-5:	**Understanding Harmony in the Family and Society –harmony in Human -Human Relationship and Gender issues:** Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship; Understanding harmony in the Family-the basic unit of human interaction; Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. **Gender Issues and Biases:** Gender Stereotyping and Gender Discrimination, Male Gaze and Objectivity, Remedial measures of gender bias.	**8 Hours**
Text Books:	1. Bhatia S.K., Business Ethics and managerial values, New Delhi: Deep and Deep publications Pvt. Ltd.	
Reference Books:	1. Velasquez, Business Ethics – Concepts and Cases, New Prentice Hall. 2. Mathur U.C., Corporate Governance & Business Ethics, New McMillan. 3. Govindarajan M., professional ethics and Human values, Delhi: PHI learning Pvt. Ltd. 4. Hartman, Laura P. & Abha Chatterjee, Business Ethics, New McGraw-Hill. 5. R. K. Sharma, Puneeta Goel, Corporate governance, and New Delhi: Kalyani Publication ***Latest editions of all the suggested books are recommended.**	

Course Code: BCAOLAE306	**BCA-Semester-III** **Innovation & Entrepreneurship Development**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basic concepts, role and importance of Entrepreneurship for economic development	
CO2.	Understanding the systematic process of selecting and screening A business idea.	
CO3.	Developing personal creativity and entrepreneurial initiative.	
CO4.	Understanding the concepts and schemes offered by various Commercial banks and financial institutions like IDBI, ICICI, SIDBI, SFC, etc.	
CO5.	Analyzing business environment in order to identify business opportunities.	
Course Content:		
Unit-1:	**Introduction to Innovation** and Entrepreneurial Idea Generation and Identifying Business Opportunities **Concepts of Entrepreneurship Development in Indian Context:** Evolution of the concept of Entrepreneur, Entrepreneur Vs. Intrapreneur, Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager, Attributes and Characteristics of a successful Entrepreneur.	**8Hours**
Unit-2:	**Creating Entrepreneurial Venture:** Business Planning Process, Environmental Analysis - Search and Scanning, Identifying problems and opportunities, Defining Business Idea.	**8Hours**
Unit-3:	**Project Management:** Technical, Financial, Marketing, Personnel and Management Feasibility, Estimating and Financing funds requirement - Schemes offered by various commercial banks and financial institutions like IDBI, ICICI, SIDBI, SFCs.	**8Hours**
Unit-4:	**Entrepreneur Development Programmes(EDP'S):** Types,7SModel, History of Entrepreneurship Development in India, Current Status of Entrepreneurship Development in India.	**8Hours**

Unit-5:	**Entrepreneurship Development and Government:** Role of Central Government and State Government in promoting Entrepreneurship - Introduction to various incentives, subsidies and grants - Export Oriented Units - Fiscal and Tax concessions available.	**8Hours**
Text Books:	1. Entrepreneurship: New Venture Creation - DavidH. Holt	
Reference Books:	1. Thought Leaders–Shrinivas Pandit 2. Entrepreneurship-Steven Brandt 3. Business Gurus Speak-S.N. Chary 4. Entrepreneurship - Hisrich Peters 5. The Culture of Entrepreneurship-Brigitte Berger 6. Project Management-K. Nagarajan 7. Dynamics of Entrepreneurship Development - Vasant Desai ***Latest edition so the suggested books are recommended.**	

Course Code BCAOLLC307	**BCA- Semester III** Data Structure Using C++ Lab	L-0 T-0 P-4 C-2
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Apply the learned concepts to evaluate operations on arrays, stacks, queues, and linked lists.***	
CO2:	***Analyse and apply techniques for solving problems related to searching and sorting.***	
CO3:	***Understand the use of array representation in data structures.***	
CO4:	***Understand the concept of Binary Search Trees (BST) and apply it to evaluate operations performed on them.***	
CO5:	***Understand and evaluate the time complexities of various algorithms and data structures implemented for problem-solving.***	
	LIST OF EXPERIMENTS **1. Array** • Insertion of an element in an array • Deletion of an element from an array **2. Sorting** • Selection Sort • Bubble Sort • Insertion Sort • Quick Sort • Two-Way Merge Sort • Heap Sort **3. Searching** • Sequential Search • Binary Search **4. Stack** • Array representation and implementation of a stack • Operations on stacks: Push & Pop • Conversion of Infix expressions to Prefix and Postfix expressions **5. Queue** • Array and linked representation and implementation of queues • Operations on queues: Create, Add, Delete • Circular Queue **6. Linked List** • Representation and implementation of a singly linked list • Traversing and searching • Inserting and deleting nodes in a singly linked list • Same operations in a doubly linked list and a circular linked list **7. Binary Search Tree (BST)** • Creation • Searching • Traversal	

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Course Code BCAOLLC308	**BCA- Semester III** OOPs & C++ LAB	L-0 T-0 P-4 C-2
Blocks	**Units**	
Course Outcomes:	***On completion of the course, the students will be able to:***	
CO1:	***Develop the ability to understand the basic concepts of Object-Oriented Programming. Students will be able to write programs in C++.***	
CO2:	***Become familiar with the fundamentals of C++ and acquire essential programming skills in the language.***	
CO3:	***Develop efficient programs demonstrating the concepts of operator overloading and function overloading.***	
CO4:	***Develop efficient programs using friend functions and virtual functions.***	
CO5:	***Demonstrate the use of various Object-Oriented Programming (OOP) concepts through practical programs.***	
	1- Program illustrating basic input/output operations using cin and cout. 2- Implementing classes and objects. 3- Implementing function overloading. 4- Implementing various types of constructors and destructors. 5- Program illustrating overloading of various operators. 6- Program illustrating the use of friend functions, inline functions, static member functions, and default arguments. 7- Program illustrating various forms of inheritance. 8- Program illustrating the use of virtual functions and virtual base classes. 9- Program illustrating the use of file handling.	

Semester -IV

Course Code: **BCAOL401**	**BCA- Semester-IV** **SOFTWARE ENGINEERING**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying the concepts of life cycle models to choose the appropriate model.	
CO2.	Analysing the requirements and design the software.	
CO3.	Creating or implementing the software based on the industry standards	
CO4.	Designing and developing test cases.	
CO5.	Designing software by applying the software engineering principles.	
Course Content:		
Unit-1:	**Introduction:** Software Engineering approach, Need of engineering aspect for Software Design, SDLC, Software Crisis, Software Process, Process models(Classical Waterfall Model, Build-nFix Model, Iterative Waterfall Model, Prototyping Model, Evolutionary Model and Spiral Model)	**7Hours**
Unit-2:	**Software Requirement Analysis and Specifications:** Software Requirement Specifications, Need of SRS, Steps for constructing good SRS, Behavioural and Non-Behavioral requirements, Analysis Model.	**7Hours**
Unit-3:	**Software Design:** Design Concepts & Principles, problem partitioning, abstraction, and top downand bottomup-design, Cohesion &Coupling, How to measure the degree of Cohesion and Coupling, Function Oriented Design, DFDs, Structure Chart, Object Oriented Design. Coding: Top-Down and Bottom–Up programming, Structured programming, Programming style, Do's and Don'ts for Coding.	**8Hours**
Unit-4:	**Coding**: Programming languages and development tools, selecting languages and tools, Good programming practices Coding Standards.	**7Hours**
Unit-5:	**Software Maintenance:** Software Maintenance Process and its types, Introduction to Reverse Engineering. Software Reliability & Quality Assurance: Software Reliability issues, Software quality, Overview of Quality Standards like ISO9001, SEI-CMM and its comparison with ISO, Introduction, scope and architecture of CASE.	**7Hours**
Text Books:	1.RajibMall, "Software Engineering", PHI.	
Reference Books:	1.IanSommerville, Software Engineering, Pearson Education(Addison Wesley).	

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	2. P. Jalote, "An Integrated Approach to Software Engineering", Narosa. 3. Waman S. Jawadekar," Software Engineering: Principles and Practice", McGraw-Hill. 4. K. K. Agrawal & Yogesh Singh, "Software Engineering", New Age Publication. 5. R. S. Pressman, "Software Engineering–Practitioner's approach", McGraw-Hill Int.Ed. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1.https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf 2.https://www.tutorialspoint.com/software_engineering/index.htm	

Course Code: BCAOL402	**BCA- Semester-IV** **Computer Networks**	L-4 T-0 P-0 C-4
Course Outcomes:	On completion of the course, the students will be:	
CO1.	Understand the basics of computer networks, models, and protocols.	
CO2.	Classify and compare network devices, transmission media, and switching techniques.	
CO3.	Apply subnetting and IP addressing schemes to design small networks.	
CO4.	Examine the functionalities of various network layers and their protocols.	
CO5.	Evaluate network services and identify basic security mechanisms and best practices.	
	Course Content	
Unit-1:	**Introduction to Computer Networks:** Data communication, types of networks (LAN, MAN, WAN), network topologies, protocols, OSI and TCP/IP models	**8 Hours**
Unit-2:	**Physical Layer:** Transmission media, analogue/digital signals, switching techniques (circuit, packet, message), bandwidth, throughput	**8 Hours**
Unit-3:	**Data Link Layer:** Framing, error detection/correction (CRC, Hamming), flow/error control, MAC protocols (ALOHA, CSMA/CD, CSMA/CA), Ethernet, wireless LANs	**8 Hours**
Unit-4:	**Network Layer:** IP addressing (IPv4/IPv6), subnetting/supernetting, routing algorithms (distance vector, link state), IP protocol, ICMP	**8 Hours**
Unit-5:	**Transport & Application Layers:** TCP/UDP, port addressing, DNS, FTP, HTTP, SMTP, POP3, basics of network security (firewalls, cryptography, SSL/TLS)	**8 Hours**
Textbooks:	**Andrew S. Tanenbaum** – *Computer Networks*, Pearson	
Reference Books:	**William Stallings** – *Data and Computer Communications*, Pearson **Behrouz A. Forouzan** – *Data Communications and Networking*, McGraw-Hill ***Latest editions of all the suggested books are recommended.***	

Course Code: **BCAOL403**	**BCA- Semester-IV** **DATABASE MANAGEMENT SYSTEM**	**L-4 T-0 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understandingthebasicsofdatabaseconceptsincludingdesignofdatamodels, database languages.	
CO2.	Analyzingtheperformanceofdatamodelsusingentityrelationshipmodeland relational model with the help of E-Rdiagram, extended E-Rdiagram, key concepts and integrity constraints.	
CO3.	Applying the relational database concept on relational tables with DDL, DML and DCL queries and operations like subqueries, join, union, and intersection using SQL.	
CO4.	Understanding and applying the concept of functional dependency and Normalisation up to 3NF and BCNF on relational tables with transaction processing, serializability, and recovery.	
CO5.	Understanding and analysing the concept of concurrency control protocols and locking on database transactions with recovery techniques and database security.	
Course Content:		
Unit-1:	**Introduction:** An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and database language and their interfaces, Data definition language, DML, Overall Database Structure.	**7Hours**
Unit-2:	**Data modelling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, generalisation, aggregation, reduction of an ER diagram to tables, extended ER model. **Relational data Model and Language:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, key constraints, Domain constraints, relational algebra.	**7Hours**
Unit-3:	**SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Insert, update and delete operations, sub queries, Aggregate functions, Joins, Unions, Intersection, Minus operations. Roles and Privileges.	**8Hours**
Unit-4:	**Data Normalization:** Functional dependencies, Normal form up to 3rd normal form & BCNF **Transaction Processing Concepts:** Transaction system, testing of serializability, Serializability of schedules, conflict & view-serializable schedule, recoverability, Recovery from transaction failures.	**7Hours**

Unit-5:	**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, timestamping protocols for concurrency control, validation-based protocol, multiple granularity. Overview of recovery techniques and Database Security.	**7Hours**
Text Books:	1. Silber Schatz Abraham, Korth Henry & Sudarshan, Database Systems Concepts, McGrawHill.	
Reference Books:	1. Melton Jim &Simon Alan, Understanding the New SQL: A Complete Guide, Morgan Kaufmann Publishers. 2. Majumdar A.K.& Battacharya P., Database Management Systems, Tata McGraw-Hill. 3. Bipin Desai, An Introduction to Database Systems, Golgotias Publications. 4. Elmarsi R. & Navathe S.B., Fundamentals of Database Systems, Addison Wesley. 5. Date C.J., An Introduction to Database Systems, Addison-Wesley. 6. Alexis Leon & Mathews Leon," Fundamentals of Database Management Systems ", Leon Vikas Publication. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.geeksforgeeks.org/introduction-of-dbms-database-management-system-set-1/	

Course Code: BCAOLGE404	BCA Semester - IV ARTIFICIAL INTELLIGENCE	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO -1	To understand the concept of classifying different knowledge and their representation	
CO-2	To understand the concept about intelligence and the different perspectives of researchers about artificial intelligence.	
CO-3	To apply the concept about expert systems, the process of their creation and usage.	
CO-4	To analyze the concept of intelligent agents, their structure and behavior.	
CO-5	To analyze the concept about various domains where artificial intelligence could be used.	
Course Content		
Unit-1	**Introduction**–Definition of Hypothesis, knowledge, knowledge type's, knowledge representation using propositional logic, predicate logic.	**8 Hours**
Unit-2	**Introduction to Intelligence**; Intelligent behavior; Various definitions of Artificial Intelligence; History of AI; Goals of Artificial Intelligence, Parts of Artificial Intelligence.	**8 Hours**
Unit-3	**Introduction, Knowledge Base**: Working Memory, Inference Engine, Expert System, Expert System Shells, Application of Expert Systems i.e. Mycin	**8 Hours**
Unit-4	**Definition of Intelligent Agents**; Software Agents Architecture for Intelligent Agents; Characteristics of Intelligent Agents; Types of Intelligent Agents; Application of Intelligent Agents.	**8 Hours**
Unit-5	Applications AI Information Retrieval; Information Extraction; Natural Language Processing; Machine Translation; Speech Recognition;	**8 Hours**
Textbooks:	1. S. Russell and P. Norvig,"Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009. 2. Artificial Intelligence: A Modern Approach,4thEdition, Stuart Russell, Peter Norvig, University of California at Berkeley, Pearson education, 2020. I. Ratko, ―Prologue: Programming for Artificial Intelligence, Fourth Edition, Addison-Wesley Educational Publishers Inc., 2011	
Reference Books:	**1.** Cloksin, W.F., Mellish, C.S., *Programming in Prologue*, Narosa Publishing House. **2.** Janakiraman, V.S., Sarukesi, K., *Foundation of Artificial Intelligence & Expert Systems*, Macmillan. *** Latest editions of all the suggested books are recommended.**	

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Course Code: **BCAOLSE405**	**BCA - Semester-IV** **Soft Skills for Management Executive**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course the students will be:**	
CO1.	**Exhibiting a good impression on others through right perception**, values, morals& ethics and body language	
CO2.	**Demonstrating emotional** intelligence, high during different situations.	
CO3.	**Creating** goals for self and organisation, making action plan to achieve it	
CO4.	**Exhibiting effective and assertive communication during presentations and time** management.	
CO5.	**Understanding various concepts of resume writing**, group discussion and panel interviews.	
Course Content:		
Unit-1:	**Individual Development:** Personal growth and improvement in personality, self-management skills Perception Values, Morals& Ethics Grooming for Professionals Body Language for Professionals	**9 Hours**

	Emotional Intelligence. Self-motivation and right attitude	
Unit-2:	**Vocational Progression:** Goal setting and action planning, effective and assertive communication, Time management Presentation Skills-Tools & Techniques Professionalism at Workplace Listening Skills	**9 Hours**

Unit-3:	**Basics of Selection Skills-** **Concepts:** Resume Building- Concept Professional Networking Group discussion(GD)and Personal Interviews-Concept	**12 Hours**
Text Books:	1. Robbins, Stephen P., Judge, Timothy A.Vohra, Neharika, Organisational Behaviour, Pearson Education 2. Tracy, Brian, Time Management, Manjul Publishing House 3. Hill, Napoleon, Think and Grow Rich, Amazing Reads 4. Scott, S.J., SMART goals made simple, Create space, Independent Pub 5. Anjali, Ghanekar, Organisational Behaviour, Everest Publishing House	
References/Books:	1. https://www.hloom.com/resumes/creative-templates/ 2. https://www.mbauniverse.com/group-discussion/topic.php 3. Rathgeber, Holger,Kotter,John,OurIcebergismelting,Macmillan 4. Burne, Eric, GamesPeoplePlay, PenguinUK 5. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression ***Latest edition, so the suggested books are recommended.**	

Course Code: **BCAOLLC406**	**BCA- Semester-IV** **DATABASE SYSTEMS LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding and applying DDL queries like Create, Alter, Drop, Truncate, and Rename on relational database tables.	
CO2.	Applying DML queries like Select, Insert, Update and Delete on relational database tables.	
CO3.	Understanding DCL queries like Grant and Revoke on relational database tables.	
CO4.	Applying aggregate functions with Group By and Having Clauses.	
CO5.	Applying and analysing queries for different types of joins and set operations, with the creation of nested sub-queries and views.	
Course Content:		
	1) Create Table, insert data into tables, Deletion, Updation **2)** Retrieval of data using SQL statement with all possible clauses. **3)** Using aggregate function **4)** Using group by and having clause **5)** Write a query for Join, set operations, and nested queries. **6)** Creating View	
Text Books:	1. S Abraham Ilberschatz, Korth Henry & Sudarshan S., Database Systems Concepts, McGraw-Hill.	
Reference Books:	1. Melton Jim &Simon Alan, Understanding the New SQL: A Complete Guide, Morgan Kaufmann Publishers. 2. Majumdar A.K. & Battacharya P., Database Management Systems, Tata McGraw Hill. 3. Elmarsi R. & Navathe S.B., Fundamentals of Database Systems, Addison Wesley. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/106/106106093/https://www.youtube.com/watch?v=1057YmExS-I&list=PLEbnTDJUr_Ic_9b4PcKmlae41cyxEefot	

Course Code: **BCAOLLC407**	**BCA Semester- IV** **Computer Networks (LAB)**	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be:	
CO1.	Identify and execute basic networking and diagnostic commands.	
CO2.	Configure and simulate small-scale networks using network simulation tools	
CO3.	Implement IP addressing, subnetting, and routing protocols in a lab environment.	
CO4.	Analyse packet flow and network behaviour using simulation and protocol tracing	
CO5.	Design and troubleshoot secure network scenarios with basic services	
	Course Content	
	1. **Experiment 1**: Study of basic networking commands (ipconfig, ping, tracert, netstat, nslookup) 2. **Experiment 2**: Simulate a LAN using Cisco Packet Tracer and perform basic configuration. 3. **Experiment 3**:Configure IP addressing (static and dynamic) for network devices 4. **Experiment 4**: Implement and test subnetting and supernetting on the given network 5. **Experiment 5**: Demonstrate the working of ARP and RARP protocols. 6. **Experiment 6**: Simulate and analyse the distance vector routing algorithm. 7. **Experiment 7**: Set up and configure a DNS and HTTP server using Packet Tracer 8. **Experiment 8**: Simulate and analyse link state routing algorithm. 9. **Experiment 9**: Simulate error detection techniques (CRC, checksum) 10. **Experiment 10**: Configure wireless access in Packet Tracer and simulate a secure Wi-Fi setup 11. **Experiment 11**: Study and configure firewall rules in a simulated environment 12. **Experiment 12**: Mini Project: Design a complete network with addressing, routing, and services	
Textbooks:	**Andrew S. Tanenbaum** – *Computer Networks*, Pearson	
Reference Books:	**William Stallings** – *Data and Computer Communications*, Pearson **Behrouz A. Forouzan** – *Data Communications and Networking*, McGraw-Hill ***Latest editions of all the suggested books are recommended.***	

	SEMESTER - V	
Course Code: **BCAOL501**	**BCA- Semester-V** **CORE JAVA PROGRAMMING**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the detailed concept of Java in real life.	
CO2.	Learning how the programming languages.	
CO3.	Analyze the relationship between Java and data analysis.	
CO4.	Understanding java with some modules.	
CO5.	Understanding how the data is predicted in Java.	
Course Content:		
Unit-1:	**An Introduction to Java**: Java Platform, Buzzwords, Short History on Java, Installing JDK, Setting the PATH. **Fundamental Programming Structures:** A Simple Java program, Data Types, Variables, Operators, Control Flow, Arrays, Big Numbers. **Objects and Classes:** Introduction to Object Oriented Programming, Defining Your Own class, Introducing Methods, Method Overloading, Constructors, The this Keyword, Garbage Collection, Object Destruction and Finalize, Argument Passing Mechanism, Using Object as Parameter, Returning Object, Recursion, Introducing Final, Understanding static, Introducing Nested and Inner Classes, Using Command Line Argument, Variable Length Arguments, and Ambiguity.	**7Hours**
Unit-2:	**Inheritance:** Base class, Super class and Sub class, The Object class, Using Super keyword, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final keyword with Inheritance. **Packages:** Finding Package and CLASSPATH, Access Protection, Importing Package **Interfaces**: Implementing Interfaces, Applying Interfaces, Variables in Interfaces, Interfaces can be extended. **Exception Handling**: Exception Type, using try and catch, multiple catch Clauses, Nested try Statements, Using throw keyword, Using throws keyword, Using Finally, Chained Exception. **Input/Output**: I/O Basic, The Stream Classes, Reading Console Input, Writing Console Output, The Print Writer Class, The Closeable and Flushable Interface, The Byte Stream Classes, The Character Streams Classes, Using a Stream Tokeniser, Serialisation.	**7Hours**
Unit-3:	**Graphics Programming:** Applet Fundamentals, Applet Architecture, An Applet Skeleton, Over riding update(), Applet	**8Hours**

	Display Method, Requesting Repainting, The HTML APPLET Tag, get Document Base () and get Codebase () Method. **Introducing AWT:** AWT Classes, Window Fundamentals (Component, Container, Panel, Window, Frame, Canvas), Working with Frame. Working with Graphics, working with Shapes, working with Colours, working with Fonts, and Displaying an Image. **Event Handling:** Basics of Event Handling, Delegation Event Model, Event Classes, Event Listener Interfaces, Handling Mouse Events. **AWT Controls:** Button, Label, Checkbox, Checkbox Group, Choice, List, Scrollbar, Text Field, Text Area, Menu Barand Menu, Dialog Boxes. **Introduction to Layout Management:** Flow Layout, Border Layout, Grid Layout, Grid Bag Layout.	
Unit-4:	**Swings:** Swings Overview, Creating a Swing Applet and Application. **Swing Components:** Icon, J Label, J Text Field, J Text Area, JPasswordField, JButton, JCheckBox, J Radio Button, J Combo Box, J List, J Progress Bar, J Menubar, J Menu, JToolBar, JScrollPane, JPanel, JTable, JSlider, J Internal Frame, Dialogue Boxes.	**7Hours**
Unit-5:	**Multithreading:** Threads, Interrupting Threads, Thread States, Thread Priorities, Synchronization, Suspending, Resuming and Stopping Threads, Using Threads and Swing. **JDBC:** Introduction to JDBC, Types of JDBC Drivers, JDBC- ODBC Bridge, connecting to a database, Inserting and Retrieving Data from the Database. **Utilities:** Using JAR and JAVADOC utilities.	**7Hours**
Text Books:	1. Patrick Naughton &Herbert Schildt, The Complete Reference JAVA2, Tata McGraw Hill.	
Reference Books:	1. Balagurusamy E., Programming in Java, Tata McGraw-Hill. 2. Steven Holzner, Java2 Black Book, Dreamtech. 3. Mark Wutica—Java Enterprise Edition‖, QUE. 4. Cay S. Horstmann &Gary Cornell, Core Java2 Volume I – Fundamentals, PHI. ***Latest editions of all the suggested books are recommended.**	

Additional Electronic Reference Material:	https://www.tutorialspoint.com/java/index.htm https://www.javatpoint.com/java-tutorialhttps://www.w3schools.com/java/	

Course Code: BCAOLSE502	**BBA - Semester-V** **Soft Skills at the Workplace for Management Executives**	**L-0** **T-0** **P-2** **C-1**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	**Applying** creativity and innovation skills for products or services development	
CO2.	**Understanding the** behaviour of people with the help of Johari window, feedback criticism, and managing stress at optimum levels for higher productivity and	
	Production	
CO3.	**Applying** interpersonal skills like conflict management, change management, negations and problem solving etc. to maintain Cordial relation at all levels	
CO4.	**Creating** cohesive teams using team building skills and desirable manners and Etiquette	
CO5.	**Applying** skills of Job seeking, resume writing, GD &PI for getting a suitable job	
Course Content:		
Unit-1	**Cognitive Skills:** Code sign, Creativity and Innovation, Johari window for understanding self and others, Stress Management Handling feedback and criticism.	**8Hours**
Unit-2	**People Skills:** Development of cordial interpersonal relations at all levels. Negotiation, Managing Teams, Manners, etiquette, Problem Solving, Conflict Management, Change Management	**12Hours**
Unit-3:	**Selection Skills-Practice:** Job Seeking Group discussion (GD)-Practice Personal, Interview -Practice Handling, Situational Questions	**10Hours**

Text Books:	1. Robbins, Stephen P Judge, Timothy A., Vohra, Neharika, Organizational Behaviour, Pearson Education 2. Tracy Brian, Time Management, Manjul Publishing House 3. Hill, Napoleon, Think and Grow Rich, Amazing Reads 4. Scott, S.J., SMART goals made simple, Create Space, Independent Pub 5. Anjali, Ghanekar, Organizational Behaviour, Everest Publishing House
References /Books:	1. https://www.hloom.com/resumes/creative-templates/ 2. https://www.mbauniverse.com/group-discussion/topic.php 3. Rathgeber, Holger, Kotter, John, Our Iceberg is melting, Macmillan 4. Burne, Eric, Games People Play, Penguin UK https://www.indeed.com/career-advice/interviewing/job-interview 6. tips-how-to-make-a-great-impression ***Latest editions of all the suggested books are recommended**

Course Code BCAOLLC503	BCA Semester V MINI PROJECT	L-0 T-0 P-8 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understand research and development on the latest technology.	
CO2.	Understand greater clarity about academic and career goals.	
CO3.	Understanding of administrative functions and company culture.	
CO4.	Analyse the capacity for critical reasoning and independent learning	
CO5.	Develop the ability to effectively communicate solution to problems(oral, visual, written).	

DESCRIPTION

Students will have to undergo industrial training of eight weeks in any industry or reputed organisation after the IV semester examination in the summer. The evaluation of this training shall be included in the V semester evaluation.

The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester and shall be the nodal officer for coordination of the training.

Students will prepare an exhaustive technical report of the training during the V semester which will be duly signed by the officer under whom training was undertaken in the industry/ organization. The covering format shall be signed by the concerned office in- charge of the training in the industry. The officer-in-charge of the trainee would also give his rating of the student in the standard University format in a sealed envelope to the Principal of the college.

The student at the end of the V semester will present his report about the training before a committee constituted by the Director of the College which would comprise of at least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director.

The marks by the external examiner would be based on the report submitted by the student which shall be evaluated by the external examiner and cross examination done of the student concerned.

Not more than three students would form a group for such industrial training/ project submission.

Internal: 50 Marks

By the faculty guide - 25 marks

By committee appointed by the director – 25 marks

External: 50 Marks

By officer-in-charge trainee in industry – 25 marks

By external examiner appointed by the university – 25 marks

Course Code: **BCAOLLC504**	**BCA- Semester-V** **CORE JAVA PROGRAMMING LAB**	**L-0** **T-0** **P-4** **C-2**
Course Out comes:	**On completion of the course, the students will be:**	
CO1.	Understanding the execution of java in real life.	
CO2.	Implementing the different modules to predict data.	
CO3.	Executing different functions to search pattern in the files.	
CO4.	Analyzing The data from different datasets with different modules.	
CO5.	Creating event handling on various components.	
Course Content:		
	1) Developing a simple console application in Java. **2)** Programs based on loops, arrays, operators and big numbers. **3)** Programs based on Classes andObjects. **4)** ProgramsbasedonMethodOverloading, Constructors. **5)** Simpleapplicationbasedonstatickeyword. **6)** ProgramsbasedonInheritance. **7)** ProgramsbasedonMethodOverriding,Dynamic Method Dispatch, Abstract Classes. **8)** ProgramsbasedonString Handling. **9)** SimpleapplicationtodemonstratetheworkingofPackages. **10)** DevelopingaSimpleApplet. **11)** Anapplettodemonstratethe workingofMouseEvents. **12)** ProgramsbasedontheusageofallAWTcontrols. **13)** Asimple applicationtodemonstratetheworkingofFrames. **14)** A simple swing application. **15)** Programstodemonstrateeventhandlingonvariousswing components. **16)** Programs based on applets and multithreading. **17)** Asimpleapplicationtoretrieveandinsertrecordsin MS-MS-Access database. **18)** A simple application to retrieve and insert records in My- MySQL database. **19)** UseofJARand JAVADOCutilities.	
Text Books:	1. PatrickNaughton&HerbertSchildt,TheComplete Reference JAVA2, Tata McGraw Hill.	
Reference Books:	1. BalagurusamyE.,ProgramminginJAVA,TataMcGraw Hill. 2. StevenHolzner,Java2Black Book,Dreamtech. 3. CayS. Horstmann&GaryCornell, CoreJava2VolumeI–Fundamentals, PHI. ***Latest editions of all the suggested books are recommended.**	

Course Code: **BCAOLASP501**	**BCA-Semester-V** **BIG DATA ANALYTICS**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the requirement of Big data with respect to 5V's.	
CO2.	Understanding the basic storage structure used in Big data with respect to clusters.	
CO3.	Understanding the Hadoop Eco system and its components.	
CO4.	Applying the data processing in Big data with HIVE,PIG and HBASE.	
CO5.	Analyzing the functionality and working of Zookeeper for monitoring Servers in Cluster.	
Course Content:		
Unit-1:	**Overview of Big Data:** Introduction, Structuring of Data, DBMS v/s Big Data, Characteristics of Big Data. Role of Big Data on Detection & Prevention in various fraud activities, Technologies handling for Big Data- Hadoop, HDFS, MapReduce.	**8Hours**
Unit-2:	**Introduction to Hadoop Eco System:** Architecture of Hadoop Eco System, Hadoop Distributed File System, HDFS Architecture, Name node & Data Node, HDFS Commands. CAP Theorem, Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists – Key roles for successful analytic project - Main phases of life cycle.	**8Hours**
Unit-3:	**Map Reduce:** Introduction, Framework of Map Reduce, Map Reduce functions, Techniques to Optimize MapReduce Jobs, Hadoop YARN, Introduction to HBase, HBase Architecture, installation & Programming with H Base, Functions of H Base, Zookeeper architecture, election process in zookeeper	**8Hours**
Unit-4:	**Hadoop YARN:** Introduction, YARN Architecture, YARN Scheduler, YARN Commands, YARN Containers & Registry. **HIVE:** Introduction, HIVE Services, Data Types in HIVE, Hive DDL & DML, Various Joins in HIVE. Introduction to Spark library used for big data.	**8Hours**

Unit-5:	**Data Analysis Using Pig:** Introduction, Pig Architecture, Pig Schema, Various Operations of Pig Programming. Flume & Sqoop: Flume & Sqoop Architecture, data importing into HDFS & HIVE. **Social Media Analytics & Text Mining:** Introduction to Social Media, Key Elements of Social Media & Text Mining, Sentiment Analysis.	**8Hours**
Text Books:	1.Boris Lublin sky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley,ISBN:9788126551071,2015.	
Reference Books:	1. Tom White, "HADOOP: The definitive Guide", O Reilly 2012. 2. Vignesh Prajapati, "Big Data Analytics with Rand Hadoop", PacketPublishing2013. 3. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014 4. JyLiebowitz, "Big Data and Business analytics", CRC press, 2013. 5. Chris Eaton, Dirk Deroos, Tom Deutsch et al., "Understanding Big Data",McGraw Hill, 2012. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic	https://nptel.ac.in/courses/106/104/106104189/https://www.youtube.com/watch?v=3SK9iJNYehg	

ourse Code: **BCA OLASP502**	**BCA-Semester-V** **BIG DATA ANALYTICS LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying the concept to work with basic linux commands.	
CO2.	Applying the concept to install a standalone Hadoop clusterNode.	
CO3.	Applying the concept to read and write data into HDFSfromLinux environment.	
CO4.	Analyzing the concept to solve a problem using MAP Reduce programming.	
CO5.	Analyzing the concept for data processing using HIVE.	
	LIST OF EXPERIMENTS	
	1. Basic commands of Linux. 2. Basic commands of HDFS. 3. Introduction, use and assessment of most recent advancements in Big Data technology alongwith their usage and implementation with relevant tools and technologies. 4. Map Reduce application for word counting on Hadoop cluster. 5. Unstructured data into NoSQL data and do all operations such as NoSQL query with API. 6. Getting maximum temp from temp data using mapreduce. 7. Page Rank Computation. 8. Use Hadoop related tools such as HBase,Cassandra,Pig,andHivefor big data Analytics	

Course Code: **BCAOLBSP503**	**BCA-Semester-V** **COMPUTER SECURITY AND PRIVACY**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes	**On completion of the course, the students will be:**	
CO1.	Understanding the concepts of confidentiality, availability and integrity in context of Information Assurance.	
CO2.	Understanding types of attackers as well as various types of attacks and their solutions.	
CO3.	Understanding various authentication mechanisms on email security and cryptographic methods for data security.	
CO4.	Understanding various network and ports canning tools.	
CO5.	Understanding legal and ethical issues in computer security.	
Course Content:		
Unit-1:	**Introduction**: What Is Computer Security-Values of Assets, The Vulnerability–Threat–Control Paradigm, Threats-confidentiality, integrity, availability, types of threats, types of attackers, Harm-Risk and Common Sense, Method–Opportunity–Motive, Vulnerabilities, Controls.	**8Hours**
Unit-2:	**Toolbox: Authentication, Access Control, and Cryptography:-** Authentication, Identification Versus Authentication, Multifactor Authentication, Secure Authentication, Access Control-Access Policies Implementing Access Control Procedure, Oriented Access Control, Role-Based Access Control, Cryptography.	**8Hours**
Unit-3:	**Networks: -** Network Concepts-Network Transmission Media, Protocol Layers ,Addressing and Routing Threats to Network Communications-Interception: Eavesdropping and Wiretapping, Modification, Fabrication: Data Corruption, Interruption: Loss of Service, Port Scanning, and Vulnerability Summary. Wireless Network Security-WiFi Background, Vulnerabilities in Wireless Networks, Failed Countermeasure: WEP (Wired Equivalent Privacy), Stronger Protocol Suite: WPA (WiFi Protected Access)	**8Hours**

Unit-4:	**Privacy:-**Privacy Concepts-Aspects of Information Privacy, Computer-Related Privacy Problems, Privacy Principles and Policies, Authentication and Privacy, Privacy on the Web, Email Security, Privacy Impacts of Emerging Technologies.	**8 Hours**
Unit-5:	**Legal Issues and Ethics:-**Protecting Programs and Data, Information and the Law, Rights of Employees and Employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, Incident Analysis with Ethics	**8 Hours**
Text Books:	1."IntroductiontoComputer Security", by M. Goodrich and R. Tamassia, Addison Wesley	
Reference Books:	1.SecurityinComputing, Fifth Edition by: Charles P .P fleeger; Shari Lawrence Pfleeger; Jonathan Margulies, Prentice Hall	
Additional Electronic Reference Material:	1.https://www.sciencedirect.com/topics/computer-science/security-and-privacy	

Course Code: **BCAOLBSP504**	**BCA-Semester-V** **COMPUTER SECURITY AND PRIVACY LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying various cryptographic methods for data security.	
CO2.	Applying expertise in configuring host and network level technical security controls.	
CO3.	Applying the various network and port scanning tools for data and network security.	
CO4.	Analyzing analytical skills in identifying and troubleshooting networking, security, and performance issues.	
CO5.	Analyzing network working with the configured host and controls.	
Course Content:		
	1. Understanding various types of attacks and their solutions 2. Implement cryptographic methods for data security 3. Implement various access controls 4. Implement various network scanning tools 5. Implement various port scanning tools 6. Learn about various attacks on wireless networks 7. Learn about various authentication mechanism on email security 8. Prepare a case study regarding the ethical issues in computer security.	**20 Hours**

	SEMESTER VI	
Course Code: **BCAOL 601**	**BCA- Semester-VI** **PROGRAMMING WITH C#**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basics of programming with C#.	
CO2.	Understanding the meaning and basic components of programming with C#.	
CO3.	Applying hands-on use of programming with C # applications in Web, Windows and Console Applications.	
CO4.	Identifying categories of programs, Web, Windows and Console Applications. Organize and work with many projects.	
CO5.	Develop programming with C# applications, knowledge and skills.	
Course Content:		
Unit-1:	**Architecture of the .NET Framework Development Platform:** Compiling Source Code into Managed Code, Metadata, Intermediate Language (IL), Common Language Runtime Services, Common Type System, Common Language Specification, .NET Framework Class Library, Just-In-Time Compilation, Unified Classes, Boxing and Unboxing. **C# Basics:** Data Types, Literals and Variables, Operator, Program Control Statements, Class and Object, Arrays and Strings.	**7Hours**
Unit-2:	**A Closer Look at Methods and Classes:** C# Access Modifiers, Use ref and out parameter, Variable number of Arguments, Concept of Return Object and Array. Method Overloading, Overloading Constructors, Optional Arguments, Named Arguments, Recursion, Understanding Static. Operator Overloading, Indexers and Properties. **Inheritance:** Member Access using Protected Access, Calling Base Class Constructor, Name Hiding, Virtual Methods and Overriding, Abstract Classes, Using sealed to Prevent Inheritance.	**7Hours**

Unit-3:	Interfaces, Exception Handling. Using I/O, Delegates and Events, Namespaces and Assemblies, Reflection, Unsafe Code, Networking and Socket. **Multithreading:** Thread Class, Determining when a Thread Ends, Thread Priorities, Synchronization.	**8 Hours**
Unit-4:	**Windows Forms Controls:** Working with Textbox, Buttons, Labels, Checkbox, Radio Buttons, List box, Combo Box, Picture Box, Menu, Events: The Change Event, The Click Event, The Key Down Event, The Form Load Event (IDE Environment). **Introduction to ADO.Net:** Connected v/s. Disconnected Data Access. ADO.Net Architecture, Connection Object, SQL Command Object, Data Adapter Object, Data Reader Object, Dataset Object. Developing a Simple ADO.NET Based Application with Inserting, Deleting, Retrieving & Updating Data. Implementing Procedure.	**7 Hours**
Unit-5:	**ASP.NET Web Form Controls:** Introduction to ASP.NET Web Forms, Implementation of ASP.NET controls: Dropdown List, Textbox, Button, Checkbox, Radio Button. Implementing Master Page, State Management, and Validation Control. Developing a Simple ADO.NET-Based Application. **Utilities:** Using JAR and JAVADOC utilities.	**7 Hours**
Text Books:	Wiley,‖ Beginning Visual C#‖, Wrox.	
Reference Books:	1. C#.Net Developers Guide-Greg Hack, Jason Werry, Saurabh Nandu, (Syng Ress). 2. Wrox Press Professional C#–SimonRobinson,JayGlynn. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/csharp/index.htmhttps:/ /www.programiz.com/csharp-programming/guide	

Course Code: BCAOL602	**BCA-Semester-VI** **PYTHON PROGRAMMING**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding and remembering programming skills in core Python.	
CO2.	Understanding Object Oriented Skills in Python.	
CO3.	Creating the skill of designing user defined functions in python.	
CO4.	Creating the ability to work on modules in python.	
CO5.	Understanding of important aspects related with string, lists and dictionary in python.	
Course Content:		
Unit-1:	Introduction History, Features, setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator Conditional Statements If, If-else, Nested if-else, Looping For, While, Nested loops, Control Statements Break, Continue, Pass.	**7Hours**
Unit-2:	String Manipulation Accessing Strings, Basic Operations, String slices, Function and Methods Lists: Introduction, Accessing list, Operations, Working with lists, Function and Methods Tuple Introduction, Accessing tuples, Operations, Working, Functions and Methods.	**7Hours**
Unit-3:	Dictionaries Introduction, Accessing values in dictionaries, Working with dictionaries, Properties, Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.	**8Hours**
Unit-4:	Modules Importing module, Math module, Random module, Packages, Composition Input Output Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files.	**7Hours**
Unit-5:	Exception Handling Exception, Exception Handling, Except clause, Try, Finally clause, User Defined Exceptions OOPs concept Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding.	**7Hours**
Text Books:	1.LearningPythonbyMarkLutz, David Ascher Shop O'Reilly -O'Reilly Media.	

ReferenceBooks:	1. LearnPythontheHardWay, ZedA. Shaw ,Goodreads. 2. PythonEssentialReference,DavidM.Beazley,Addison Wesley. 2. BeginningPython,MagnusLieHetland,Goodreads. 3. PythonProgrammingfortheAbsoluteBeginner,third edition, Ross Dawson,Goodreads. ***Latesteditionsofallthesuggestedbooksarerecommended.**	
Additional Electronic Reference Material:	https://www.geeksforgeeks.org/python-programming-examples/ https://www.tutorialspoint.com/python/index.htm	

Course Code:	BCA Semester VI **In-House Project**	L-0 T-0 P12 C-6
BCAOLLC603		
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understand the process of Project development.	
CO2.	Apply the knowledge to develop applications based on SRS Document.	
CO3.	Apply the learning to develop applications on different platforms like Window, Web based or Mobile based applications to specific set of problem and their solutions.	
CO4.	Evaluate the test cases results after testing of the project along with different roles.	
CO5.	Develop good quality project to solve real world problems.	
	Students should devote themselves to prepare something tangible, which could be a working model of their thoughts based on their subject of choice. In this semester student shall present the final project live as also using overheads project or power point presentation on LCD to the internal committee as also the external examiner. The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Principal. Refer TMU SOP 9.0 about project report template, evaluation scheme. **Click Here** **https://drive.google.com/file/d/1JDyqKktAFmDY6p2apwQQRh9CtCYIaoVP/view?usp=sharing** The marking shall be as follows. Internal: 50 Marks By The Faculty Guide - 25 Marks By Committee Appointed By the Director – 25 Marks External: 50 Marks By External Examiner Appointed By the University – 50 Marks	

Course Code: **BCAOLLC604**	**BCA- Semester-VI** **PROGRAMMING WITH C#LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes	**On completion of the course, the students will be:**	
CO1.	Recognizing when to use each of the programming with C# programs to create professional, academic, business and many software projects.	
CO2.	Understanding programming with C# programs to create personal, academic and business documents following current professional and/or industry standards.	
CO3.	Applying skills and concepts for basic use of computer hardware, software, networks and the internet in the workplace.	
CO4.	Applying course work as identified by the internationally accepted Internet and Microsoft Core programming with C# standards.	
CO5.	Creating window based application.	
Course Content:		
	1. The use of sequence, conditional and iteration construct. 2. Various operators like logical, arithmetical, relational, etc. 3. Overloading of various operators. 4. Use of Static Member functions, optional arguments. 5. Use of destructor and various types of constructor. 6. Various forms of Inheritance. 7. Use of Interface in multiple inheritance, virtual and override concept, delegates. 8. File operation. 9. Create windows based application with connected and disconnected architecture. 10. Simple web application using ASP Net.	
Text Books:	**1.** —Black Book .Net Framework 4.5‖,DreamTech.	
Reference Books:	**1.** C# .Net Developers Guide-Greg Hack, Jason Werry, Saurabh Nandu, (SyngRess). **2.** Wrox Press Professional C#–Simon Robinson, Jay Glynn. **3.** —C#4.0CompleteReference‖, by Herbert Scheldt. **4.** —ProfessionalASP.NET4.5inC#andVB‖byBillEvjen, Scott Hansel man, Devin Rader, Wrox. ***Latest editions of all the suggested books are recommended.**	

Additional Electronic Reference Material:	https://www.tutorialspoint.com/csharp/index.htmhttps://www.programiz.com/csharp-programming/guide	

Course Code: BCA 659	**BCA- Semester-VI** **PYTHON PROGRAMMING LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying core python programming like loop, if statement and other concept.	
CO2.	Applying different collections-list, tupple, dictionaries.	
CO3.	Creating class, in heritance and operator overloading.	
CO4.	Creating and importing modules.	
Course Content:		
	1. To write a program to calculate Sum & average of N numbers using all loops. 2. To write a program to find maximum and minimum out of3 numbers a, b &c. 3. To write a program to find sum of series upto n number, 3+5+8+.....+n. 4. To write a program to generate Fibonacci series upto n. 5. To write a program to implement a function to calculate area of a circle using functions. 6. To write a program to demonstrate the tupple. 7. To write a program to demonstrate the list, adding items in list, removing item and removing list. 8. To write a program to find addition of two matrix of n*n order using list. 9. To write a program to demonstrate the use of dictionary. 10. To write a program to demonstrate the different string operations. 11. To write a program to creating class. 12. To write a program to creating a blank class. 13. To write a program to implement different in heritance. 14. To write a program overload different operators. 15. To write a program to creating class. 16. To write a program to sockets. 17. To write a program to implement exception handling. 18. To write a program to creating and importing modules.	
Text Books:	1.LearningPythonbyMarkLutz, David Ascher Shop O'Reilly -O'Reilly Media.	
Reference Books:	1. Learn Python the HardWay, ZedA.Shaw, Goodreads. 2. Python Essential Reference, DavidM.Beazley, Addison Wesley. 3. Beginning Python, Magnus LieHet land, Goodreads. ***Latest editions of all the suggested books are recommended.**	

Additional Reference:	https://www.geeksforgeeks.org/python-programming-examples/	

Course Code: BCAOLASP601	BCA-Semester-VI **DATAWARE HOUSING AND DATA MINING USING R**	L-4 T-0 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the various components of data warehousing.	
CO2.	Understanding the construct and usage of R-Programming language for developers.	
CO3.	Understanding how to design the physical model of data warehouse.	
CO4.	Understanding various algorithms of Data Mining and its process.	
CO5.	Applying the programming concept to solve problems using R-Programming.	
CO6.	Analyzing the concept of data mining using R-Programming.	
CO7.	Developing skills for analyzing and cleaning of the data.	
Course Content:		
Unit-1:	**Introduction:** Motivation (for Data Mining), Data Mining-Definition& Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensional it reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.	**8Hours**
Unit-2:	**Concept Description:** Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases	**8Hours**

Unit-3:	**Classification and Predictions:** What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods KNN classifiers, Genetic Algorithm. **Cluster Analysis:** Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based: Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – Statistical Approach, Neural Network approach, Outlier Analysis.	**8Hours**
Unit-4:	**Overview of R programming:** Introduction to R, The S Philosophy, Basic Features of R, Free Software Design of the R, System Limitations of R, R Resources, Installation and getting started with the R interface. **Data Manipulation(dplyr,reshape2packages) and Scoping Rules of R:** Data Frames, The dplyr Package, dplyr Grammar, Installing the dplyr package, select(), filter(), arrange(), rename(), mutate(), group by(), Lexical Scoping: Why Does It Matter?, Lexical vs. Dynamic Scoping	**8Hours**
Unit-5:	**Data Warehousing:** Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Aggregation, OLAP Servers: ROLAP, MOLAP, HOLAP, Process Architecture, 3 Tier Architecture, Data Mart.	**8Hours**
Text Books:	1. Paul R.P., Fundamentals of Data Warehousing, John Wiley and Sons.	

Reference Books:	1. Anahony S., Data Warehousing In the Real World: A Practical Guide for Building Decision Support Systems, John Wiley and Sons. 2. Kamber and Han, "Data Mining Concepts and Techniques", Hartcourt India P.Ltd., 3. R Programming for Data Science, by Roger D. Peng, 4. Using R for Introductory Statistics, by John Verzani, Chapman & Hall/CRC, 2004, ISBN 1584884509 5. Advanced R, by Hadley Wickham, ISBN 9781466586963 ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/110/107/110107092/ https://www.youtube.com/watch?v=J326LIUrZM8	

Course Code: **BCAOLASP602**	**BCA-Semester-VI** **DATAWARE HOUSING AND DATA MINING USING R LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding modelling and design of data warehouse.	
CO2.	Understanding how to install and configure R Tool and R Studio.	
CO3.	Applying the concept to design a star and snowflake schema.	
CO4.	Analyzing R Explorer, Mining Techniques, and Attribute Relation File	
CO5.	Developing the data visualization using R.	
	LIST OF EXPERIMENTS	
	1. To develop an application to implement defining subject area, design of fact dimension table, data mart. 2. To develop an application to construct multidimensional data. 3. To develop an application to implement data generalization and summarization technique. 4. To develop an application to extract association rule of data mining. 5. To develop an application for classification of data. 6. To develop an application for decision tree. 7. To develop an application to implement RPROGRAMMING loops. 8. To develop an application to implement structure and components of an R-Programming	

Course Code: **BCAOLBSP603**	**BCA-Semester-VI** **CONCEPTS OF ETHICAL HACKING**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding basic terminology and the fundamentals associated with Hacking in good or bad perspective.	
CO2.	Understanding to commiserate with different ways and methodology of Hacking.	
CO3.	Understanding the nature, class and platforms to tackle for web and network-based Hacking.	
CO4.	Understanding to plan tracking and a vulnerability assessment for web-based applications.	
CO5.	Understanding to express the basic understanding of ethical hacking laws and tests.	
Course Content:		
Unit-1:	**Introduction to Ethical Hacking:** Hacking Methodology, Process of Malicious Hacking, Foot printing and Scanning: Foot printing, Scanning. Enumeration: Enumeration. System Hacking and Trojans: System Hacking, Trojans and Black Box Vs White Box Techniques	**8Hours**
Unit-2:	**Hacking Methodology:** Denial of Service, Sniffers, Session Hijacking and Hacking Web Servers: Session Hijacking, Hacking Web Servers. Web Application Vulnerabilities and Web Techniques Based Password Cracking: Web Application Vulnerabilities, Web Based Password Cracking Techniques	**8Hours**

Unit-3:	**Web and Network Hacking:** SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security. Linux Hacking: Linux Hacking. Evading ID Sand Firewalls: Evading ID Sand Firewalls.	**8Hours**
Unit-4:	**Report writing & Mitigation:** Introduction to Report Writing & Mitigation, requirements for low level reporting &high level reporting of Penetration testing results, Demonstration of vulnerabilities and Mitigation of issues identified including tracking.	**8Hours**
Unit-5:	**Ethical Hacking Laws and Tests :** An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking, ethical responsibilities, professional integrity and making appropriate use of the toolsand techniques associated with ethical hacking – Social Engineering, Host Reconnaissance.	**8Hours**
Text Books:	1. Michael T. Simpson, Kent Backman, James E.“Corley, Hands-On Ethical Hacking and Network Defense ”, Second Edition, CENGAGE Course.	
Reference Books:	1. Steven DeFino, Barry Kaufman, Nick Valenteen, “Official Certified Ethical Hacker Review Guide”, CENGAGE Course. 2. Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, Syngress Basics Series– Elsevier. 3. Whitaker & Newman,“PenetrationTestingand Network Defense” , Cisco Press, Indianapolis.	
Additional Electronic Reference Material:	1. https://www.eccouncil.org/ethical-hacking/	

Course Code: **BCAOLBSP604**	**BCA-Semester-VI** **ETHICAL HACKING LAB**	**L-0** **T-0** **P-4** **C-2**
Course Out comes:	**On completion of the course, the students will be:**	
CO1.	Understanding skills of Scanning, Foot-printing & Reconnaissance.	
CO2.	Applying skills over enumeration tools, social engineering, and simulation of system hacking.	
CO3.	Applying demonstration application/network-level Session Hijacking.	
CO4.	Analysing different attacks and backdoor plantation.	
CO5.	Creating different network application demonstrated on network levels.	
	LISTOFEXPERIMENTS	
	1. Identifying Live System 2. Performing a Check for Open Ports 3. Implementing Scanning Techniques 4. OS Fingerprinting 5. Banner Grabbing 6. Performing Malware Attacks 7. Implementing Application-level Session Hijacking 8. Hacking Web Applications 9. Planting a Backdoor 10. Using Enumeration Tools 11. Implementing Network-level Session Hijacking 12. Conduct Social Engineering Attack	**20Hours**

5.3 Duration of the Programme

Study Scheme	
SUMMARY	
Institute Name	Centre for Distance and Online Education, TMU, Delhi Road, Moradabad
Programme	**BCA**
Duration	Three Years (Online Mode) (Six Semesters)
Medium	English
Minimum Contact Classes	75%
Credits	
Minimum Credits Required for Degree	136
Eligibility for the program	10+2 pass in any stream from recognized board.

5.4 Faculty and Support Staff Requirement

Academic Staff	Name of Faculty Member
Programme Coordinator	Dr. Shalini Nenoria
Course Coordinator	All Faculty Members
Course Mentor	1 Member per batch of 250 students (Course mentor will be assigned on reaching the 250 admission in the Program)

5.5 Instructional Delivery Mechanisms

The Centre for Distance and Online Education, TMU comprises of faculty members and staff who are well versed in Online Education and Online delivery.

An Academic calendar depicting dates for all major events during each semester will be prepared by faculty members and shared with students through LMS, at the beginning of each academic session.

Apart from providing content in the form of Self Learning Material, enough e-learning resources in the form of audio and video content will be provided to students. Regular engagement of students will be ensured through the following means:

- Conduct of Webinars/live lectures/online lectures/Virtual Class
- By encouraging them to participate in mandatory Discussion Forums to stimulate their thinking, and to be able to fearlessly express their views in forums. These discussion forums will be moderated by faculty to provide equal opportunity for everyone to participate, as well as to ensure maintenance of decorum of the forum.
- Through periodic formative assessments

Regular evaluation of content learnt will be provided for through Self-Assessment Questions within the SLM, as well as quizzes on the LMS. The quizzes can be taken any number of times, so that they reach a stage of being able to answer questions without errors, which is a reflection of their understanding of the concept.

Effort will be made to provide case studies to enhance their analytical ability and make right decisions.

Link to National Portals (SWAYAM/NPTEL) will be provided, as also link to the University's digital library portal.

All links to additional reading will be provided in the LMS. Interested students can study beyond the confines of the syllabus.

5.6 Identification of Media–Print, Audio or Video, Online, Computer Aided

LMS provides for all audio video content (e-learning material, e-pubs, faculty-led video sessions, virtual classrooms and discussion boards), dashboard of their progress in learning, comparison with their peers in terms of learning, regular notifications regarding upcoming Webinars/virtual classes, Assignments, Discussion Forum participations and Examinations. It also provides an opportunity for raising queries if any, and seek answers to the same, by chat bot or course mentors.

5.7 Student Support Services

The Student Support services will be facilitated by the Centre for Distance and Online Education, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh which includes the pre-admission student support services like counseling about the programme including curriculum design, mode of delivery, fee structure and evaluation methods. Post-admission student support services include guiding students towards accessing e-identity card, LMS portal, Academic calendar and academic delivery. Examinations support staff shall answer queries pertaining to conduct of end-semester examinations, evaluation and issue of certificates.

6 Procedure for Admission, Curriculum Transaction and Evaluation

The purpose of Centre for Distance and Online Education by Teerthanker Mahaveer University, Moradabad, Uttar Pradesh is to provide flexible learning opportunities and to Attain qualification, wherever learners are not able to attend the regular classroom teaching. Academic programmes offered for such candidates under Online and Online Learning mode will be conducted by Centre for Distance and Online Education- Teerthanker Mahaveer University, Moradabad, Uttar Pradesh with support of the various University schools. The programmes/courses may be termed Online Mode for award of Degree. Eligibility criteria, programme/course structure, curriculum, evaluation criteria and duration of programme shall be approved by Board of Studies and Academic Council which are based on UGC guidelines.

Candidates seeking admissions in any programme offered by Centre for Distance and Online Education- Teerthanker Mahaveer University, Moradabad, Uttar Pradesh shall fill up Online and Online application form available on CDOE- TMU website. Before applying, candidates must check eligibility criteria for programme that they are interested in. Details about Eligibility criteria, programme structure, curriculum, duration, and fee structure are available on the website.

6.1 Procedure for Admission:

Minimum Eligibility Criteria for admission:10+2pass in any stream from recognized board.

Important Instructions:

All admissions shall be provisional until and unless candidates meet the eligibility criteria.

Admission will stand cancelled if a candidate does not meet eligibility criteria, or there is failure to pay programme/course fees.

Admission will stand cancelled, if candidate does not submit proof of eligibility within stipulated time given by Centre for Distance and Online Education- Teerthanker Mahaveer University, Moradabad, Uttar Pradesh.

Centre for Distance and Online Education - Teerthanker Mahaveer University, Moradabad, Uttar Pradesh has the right to make necessary changes from time to time as deemed fit in Eligibility criteria, programme/course structure, curriculum, duration, fee structure and programme announcement dates. All changes will be notified on website.

Candidates should carefully read all instructions given in Programme prospectus before start of application form.

Fee Structure and Financial Assistance policy:

Suggested Tuition Fee for BCA programme is Rs.12600 per semester along with Rs. 1000/ as registration charges (One Time) & Rs. 1000/- per semester as examination will paid by the Learners.

A scholarship as per Teerthanker Mahaveer University norm on tuition fees will be provided to eligible students.

6.2 Curriculum Transactions:

Programme Delivery:

Teerthanker Mahaveer University, Moradabad, Uttar Pradesh has state-of-the-art mechanism for Online and Online mode of academic delivery to ensure quality education. Faculty members at TMU offer expert guidance and support for holistic development of the students. Faculty members are not mere facilitators of knowledge but they also mentor students to make learning more engaging and maintain high retention level. The programme will be delivered with an aim to provide expertise and ensure that students excel in their domains. The features of programme delivery are:

- Online and Online Mode of Academic Delivery
- Periodic review of Curriculum and Study material
- Live Interactive lectures from faculty/Course coordinators
- Continuous Academic and Technical support
- Guidance from Course Coordinators
- Learning and delivery support from Course Mentors

Norms for Delivery of Courses in Online and Online Mode:

S. No.	Credit value of the course	No. of Weeks	No. of Interactive Sessions		Hours of Study Material		Self-Study hours including Assessment etc.	Total Hours of Study (based on 30 hours per credit)
			Synchronous Online Counseling /Webinars/ Interactive Live Lectures (1hourper week)	Discussion Forum/ a synchronous Mentoring(2 hours per week)	e-Tutorial in hours	e-Content hours		
1.	1 Credits	3 weeks	3 hours	6 hours	5	5	11	30
2.	2 Credits	6 weeks	6 hours	12hours	10	10	22	60
3.	3 Credits	9 weeks	9 hours	18hours	15	15	33	90
4.	4 Credits	12weeks	12hours	24 hours	20	20	44	120
5.	6 Credits	18 weeks	18 Hours	36 Hours	30	30	66	180

And Mobile devices. Its simple interface makes it easy for instructors to design courses, create content and grade assignments. It provides a great mobile experience due to the responsive design which is paired with purpose-built native apps. It provides seamless accessibility to ensure all tools are standards-compliant and easy for students to navigate using assistive technologies. It provides 24 X7 learning experience to facilitate learning as per the pace chosen by learners. Digital portfolio functionality allows students to document and share their learning journey as it happens, on both web and mobile platforms.

6.3 Evaluation Scheme

<table>
<tr><th colspan="6">Evaluation Scheme:</th></tr>
<tr><th colspan="3">Assessment</th><th>Internal</th><th>External</th><th>Total</th></tr>
<tr><td colspan="3">Theory</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="3">Practical/Dissertations/Project Reports</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td>Class Test-1</td><td>ClassTest-2</td><td>ClassTest-3</td><td rowspan="2">Assignment(s)</td><td rowspan="2">Attendance</td><td rowspan="2">Total</td></tr>
<tr><td colspan="3">Best two out of three</td></tr>
<tr><td>10</td><td>10</td><td>10</td><td>05</td><td>05</td><td>30</td></tr>
<tr><td colspan="3" rowspan="2">Duration of Examination</td><td>External</td><td colspan="2">Internal</td></tr>
<tr><td>3 Hours</td><td colspan="2">1.5Hours</td></tr>
<tr><td colspan="6">To qualify the course a student is required to secure a minimum of 35% marks in aggregate including the semesterendexaminationandteacherscontinuousevaluation.(i.e.bothinternalandexternal).Acandidate who secures less than 35%of marks in a course shall be deemed to have failed in that course.</td></tr>
</table>

Question Paper Structure	
	The question paper shall have Three section – ***Section A, Section B and Section C****. The examiner shall set questions specific to respective sections. Section wise details are as under mentioned:*

2	**Section A:** It shall consist of Multiple Choice Questions (MCQ) This section will essentially assess CO's related to stimulating learning, enhancing memory retention in order to thinking skills (Remembering& Understanding). It will contain 20 questions with at least one question from each unit with multiple choice question from the same unit. Each question shall have equal weightage of one marks and total weightage of this section shall be twenty marks.
3	**Section B:** It shall consist of short-answer type Questions (approx. 50 - 75words). This section will essentially assess CO's related to lower order thinking skills (Remembering & Understanding). It will contain five questions with at least one question from each unit with internal choice having "or" option with an optional question from the same unit. Each question shall have equal weightage of two marks and total weightage of this section shall be 20 marks.
4	**Section C** It shall comprise long-answer type questions (approx. 150 – 200 words). This section shall specify the higher order thinking as well as lower order thinking skills (Analyzing, Applying, Evaluating & Creating or Remembering & Understanding) to be assessed and mapped with the course outcomes stated. It shall contain Four questions with at least one question from each unit with an internal choice having "or" option with optional question from the same unit. Each question shall have equal weightage of 10 marks and total weightage of this section shall be thirty marks
5	***Note: Incase where the course content does not have the scope of assessing higher order thinking skills, questions may be framed to assess the lower order thinking skills as per the course outcomes stated.***
IMPORTANT NOTES:	
1	The purpose of the examination will be to assess the Course Outcomes (CO) that will ultimately lead to assessment of attainment of Programme Specific Outcomes (PSO). A question paper must assess the following aspects of learning: Remembering, Understanding, Applying, Analyzing, and Evaluating &Creating (reference to Bloom's Taxonomy).
2	Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.
3	There shall be continuous evaluation of the student and there will be a provision of fortnight progress report.

7 Requirement of the Laboratory Support and Library Resources: Laboratory Support

The Online BCA Programme is designed to ensure that learners receive practical, hands-on exposure to computing concepts through virtual and simulation-based laboratory environments. While physical labs are not required for online delivery, adequate virtual laboratory infrastructure has been established to meet the practical needs of the programme.

Key laboratory support features include:

Virtual Lab Access: Online programming and computing environments are integrated within the Learning Management System (LMS), allowing students to compile, execute, and debug code in languages such as C, C++, Java, Python, and C#.

Preconfigured Lab Kits: Software simulation tools and open-source environments are made available for database management, networking, web development, and operating system experiments.

Recorded Lab Demonstrations: Faculty-curated audio-visual tutorials demonstrating lab exercises and software installations enhance learner understanding.

Interactive Lab Assignments: Each practical course is supported with structured lab assignments and self-assessment modules embedded in the LMS.

Assessment & Evaluation: Practical performance is evaluated through project submissions, real-time demonstrations during online viva sessions, and LMS-based lab assessments.

24x7 Access: Cloud-based labs and remote desktop services are made available on-demand to ensure anytime-anywhere access.

This virtual lab ecosystem ensures that students gain the required practical competencies and software development skills without needing physical access to on-campus labs, fully meeting the objectives of outcome-based education in online mode.

Library Resources

Centre for Distance and Online Education, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh has E- Library facility with an adequate number of books in relevant titles for BCA programme. The Central Library of University is also having good source of reference books. The books available at both the libraries are only for reference purpose and lending services. In addition, reference books as prescribed will be procured. The Digital library access will also be made available to students who are enrolled into Online Mode education. In addition, the university membership on Swayam/ NPTEL/ edX will also be made available to students. Complete e-Learning resources to course would be made available on Learning Management System for learning along with e-tutorial lectures. Further, expert lectures/workshops/ webinars by industry experts would also be conducted for the students.

8 Cost Estimate of the Programme and the Provisions

S. No.	Expenditure Heads	Approx. Amount
1	Programme Development (Single Time Investment	10, 00,000 INR
2	Programme Delivery (Per Year)	12,00,000INR
3	Programme Maintenance (Per Year)	50,00,000 INR

9. **Quality Assurance Mechanism and Expected Programme Outcomes**

The quality of the programme depends on scientific construction of the curriculum, strong- enough syllabi, sincere efforts leading to skillful execution of the course of the study. The ultimate achievement of BCA programme of study may reflect the gaining of knowledge and skill in management area. Gaining of knowledge and skills in management may help the students to get new job opportunities, upgrading their position not only in employment, but also in the society.

The benchmark qualities of the programme may be reviewed based on the performance of students in their end semester examinations. Also, the feedback from the alumni, students, parents and employers will be received and analyzed for further improvement of the quality of the programme. Teerthanker Mahaveer University has constituted Centre for Internal Quality Assurance (CIQA), which will assist Director, Centre for Distance and Online Education to conduct periodic review and assessments

and assist the Directorate to implement necessary quality measures and effectiveness in programme delivery. CIQA is constantly involved in reviewing all materials prepared by DOE, including syllabus, SLMs and e-learning content. CIQA will be involved in conducting studies to measure effectiveness of methods adopted for learning. As we proceed further, CIQA will involve in benchmarking quality of academic delivery, and perform various analyses, and guide all stakeholders towards upgrading quality constantly.

Centre for Internal Quality Assurance (CIQA) chaired by the Vice Chancellor consisting of internal and external experts oversees the functioning of Centre for Internal Quality Assurance and approve the reports generated by Centre for Internal Quality Assurance on the effectiveness of quality assurance systems and processes.

The guidelines on quality monitoring mechanism prescribed by the UGC have been adopted by the Centre for Internal Quality Assurance for conducting institutional quality audits, to promote quality assurance and enhance as well as spread best-in-class practices of quality assurance. University has setup an effective system for collecting feedback from the stakeholders regularly to improve its programmes. The University will conduct self- assessments regularly and use the results to improve its systems, processes etc. and finally quality of programmes.