JAIPUR NATIONAL UNIVERSITY

A venture of The Seedling Group of Educational Institutions

Bachelor of Computer Application (BCA)

Distance Mode

PROGRAM PROJECT REPORT – BCA

Contents

BCA – Distance Mode

1. Program Overview

1.1 Program's Mission and Objectives

The objective is to support students aspiring for careers in the IT sector, aiming for prominent roles in technology-driven multinational corporations (MNCs) and various other entities like e-commerce firms, banks, government agencies, networking companies, stock exchanges, and more across corporate sectors.

Our goals include:

- Offering a comprehensive and interdisciplinary educational foundation.
- Fostering social investigative skills and encouraging contributions from diverse individuals and communities.
- Guiding eager learners to engage in social responsibilities within both private and public sectors.
- Supplying knowledgeable and skilled workforce adaptable to the IT and IT-enabled services (ITES) industry.
- Meeting global demands by providing adept professionals to professional, industrial, and service sectors.
- Advocating for learners to gain extensive knowledge in humanities and social sciences for enhanced employment prospects.
- Providing opportunities for higher education to working professionals.

The BCA Programme is structured with the following distinct aims:

a) Attracting young individuals to the promising and lucrative realm of computer applications.
b) Establishing a foundational undergraduate Programme that serves as a precursor for advanced studies in Computer Science/Applications.
c) Cultivating proficiency in software development, empowering BCA graduates to pursue entrepreneurship opportunities in both the Indian and global software markets.
d) Providing training and resources to students, ensuring they meet the standards demanded by various industries.

1.2 Relevance of the Program with JNU's Vision and Mission

Jaipur National University (JNU) was established in 2007. JNU provides a world-class learning experience, with a highly accomplished faculty, numerous extracurricular activities, and a wide range of academic pursuits. The university fosters holistic development of students.

JNU with its vision to transform the Education Landscape of India and contribute to the maximum to improve the GER of India has plans to launch affordable and flexible education programs. Distance programs are an excellent way to launch affordable and flexible education programs in sync with the vision and mission of the university stated below:

University Vision:

To be a leader in creating unique and exclusive learning opportunities in all disciplines of study that ultimately lead to the advancement of learning and creation of a sustainable society and environment.

University Mission:

- Provide global opportunities of learning through broad and balanced academic programmes.
- Explore and hone the potential of stakeholders, develop their human and intellectual capacities to the fullest.
- Create and maintain excellence with high standard driven activities, universal significance and acknowledgement.
- Inculcate and keep track of the current trends and finest practices in education for constant growing and evolving.
- Leverage diversity of thoughts, ideas, and perspectives to enrich the stake holders.

1.3 Nature of Prospective Target Group of Students

The curriculum of B.C.A. is designed in such a way that it helps the students to become not only more employable but also encourage them to become entrepreneurs. Primarily the target group of learners will be:

- Population living in remote areas where higher education institutes are not easily accessible.
- Learners who could not get admission in the regular mode due to limited intake capacity.
- Learners who are working and who desire to pursue higher education as a means for movement up the ladder.
- Learners who are unable to pursue Higher education due to social, financial and economic compulsions as well as demographic reasons.

1.4 Appropriateness of programs to be conducted in Distance mode to acquire specific skills and competence

The Bachelor of Computer Applications (BCA) program holds significant value for students aspiring to pursue professional opportunities in diverse industries, businesses, finance, and the civil service. Additionally, employers highly regard the BCA degree for various roles where proficiency in logical and quantitative reasoning is essential, such as software development, database management, and information technology consulting.

2. Procedure for Admission and Curriculum Transaction

The academic programs catered to candidates enrolled in the Distance mode of learning are facilitated by CDOE-JNU, with the backing of various faculties within the University. Eligibility criteria, course structure, detailed curriculum, program duration, and evaluation criteria are subject to approval by the Board of Studies and Academic Council, adhering to UGC guidelines for programs falling under the purview of Distance mode for degree conferment.

Below are the details of the admission procedure, eligibility criteria, fee structure, curriculum, program delivery, information about the Learning Management System (LMS), and assessments and evaluations.

2.1Procedure for Admission

Students who are seeking admission in programs offered by CDOE-JNUneed to apply through https://online.jnujaipur.ac.in/in the courses offered.

2.1.1 Minimum Eligibility Criteria for Admission

The minimum eligibility criteria for admission to the Distance BCA program require candidates to 10+2 (12th Standard) from a recognized Board, in accordance with UGC norms. Additionally, candidates must have secured at least 40% marks in the qualifying examination.

Candidates must also fulfill all documentation requirements as specified on the program's website for admission purposes. Failure to submit proof of eligibility within the stipulated timeframe specified by CDOE-JNU will result in the cancellation of admission. Prospective candidates are encouraged to carefully review all instructions provided on the website before proceeding with the application process.

2.1.2 Admission Process and Instructions: Learner Communication

The admission process for the students is provided below:

Step	Process	Particulars
Step 1	**Counselling**	Prospective students will receive guidance and counseling for their chosen program from designated and authorized counselors.
Step 2	**Registration on admission portal to get access to My Account.**	To initiate the registration process, prospective students are required to complete the application form by providing all necessary details and uploading mandatory documents.
Step 3	**Details of Document upload**	Student Uploads document as follows- <u>Personal Documents</u> Passport-size Photograph Student's Signature Aadhar Card (Back & Front) <u>Academic Documents</u> *UG Student -* 10th Marksheet 12th Marksheet *PG Student -* 10th Marksheet 12th Marksheet UG Marksheet Other Certificates (detailed list of documents is provided in **Annexure II**)
Step 4	**Verification of documents by the Deputy Registrar**	The Deputy Registrar is responsible for verifying all documents uploaded by prospective students on the admission portal. Within a timeframe of 48 hours, the Deputy Registrar will review and either approve or disapprove the eligibility of the prospective student for the chosen program.
Step 5	**Undertaking**	Student will sign Undertaking after Approval in Application.

Step 6	**Payment of fees**	All eligible students, duly approved by the Deputy Registrar, will get fees payment link activated in their My Account for payment. The Fee is payable through any of the following means: (a) UPI (b) Credit/Debit Card (c) Net-banking Note: Cash, bank demand draft and Cheques are not accepted
Step 7	**Enrolment**	After the payment of program fee, the eligible student will get the Enrolment number and access to the LMS within 21 days.
Step 8	**Access to Learning Management System (LMS)**	

General Instructions:

1. Prior to applying for programs, all students are advised to thoroughly read and comprehend the eligibility conditions provided in the student handbook document and outlined on the university website.
2. It is the responsibility of prospective learners to ensure that their educational or qualifying degree has been issued by a recognized university or board only. For learners from Indian higher education institutions, recognition by the regulatory authority of the Government of India is necessary. To verify degrees from recognized boards of education, refer to www.cobse.org.in/. For Polytechnic Diploma, check the respective State Board of Technical Education. Verification of degrees from recognized universities can be done at www.ugc.ac.in/. Foreign prospective learners should verify their institutions at www.aiu.ac.in/.
3. Prospective learners must verify their eligibility on the date of admission and ensure that they have passed the qualifying exams before the commencement of the admission batch.

Upon enrollment, students must register with the Academic Bank of Credits (ABC), a central scheme for depositing credit formulated by the Ministry of Education, Government of India. Creation of an Academic Bank of Credits (ABC) ID is mandatory for all students. (Refer to Annexure V for details).

2.1.3 Program Fee for the Academic Session beginning July 2024

Program fees for students pursuing BCA offered by CDOE-JNU is mentioned below:

Program	Academic Total Fees (INR)	Exam Fee
BCA	54000	1500 per Semester

2.2 Curriculum Transactions

2.2.1 Program Delivery

The curriculum is delivered through Self Learning Materials (SLMs) in the form of e-Contents, supplemented by a variety of learning resources including audio-video aids via the Learning Management System (LMS). Furthermore, the program includes contact hours featuring synchronous live interactive sessions conducted through the LMS, adhering to the current UGC norms for course delivery.

2.2.2 Learning Management System to support Distance mode of Course delivery

The Learning Management System (LMS) is available on URL https://lms.jnujaipur.ac.in/is meticulously developed to offer students a truly global learning experience. With a user-friendly interface, the LMS simplifies the learning process and ensures it meets the highest global standards. Utilizing audio-visual teaching methods, self-learning materials, and evaluation patterns, the platform stands out as unique and aligns seamlessly with both industry requirements and the UGC Guidelines.

Students can engage in uninterrupted learning 24x7 via web and mobile devices, allowing them to progress at their preferred pace. The LMS boasts a simple and intuitive user interface, facilitating easy navigation through the e-learning modules. Designed in accordance with standard norms, all learning tools are easily accessible, ensuring a perfect learning experience for all users.

2.2.3 Course Design

The curriculum is designed by a committee comprising experts from the parent department of the University and Industry experts, keeping in view the needs of the diverse groups of learners.

2.2.4 Academic Calendar for Academic Session beginning July 2024

Sr. No.	Event	Session	Month (Tentative)
1.	Commencement of semester	January	January
		July	July
2.	Enrol learner to Learning Management system	January	Within 21 working days from fee deposit and Eligibility confirmation
		July	
3.	Interactive Live Lectures for query resolution	January	February to May
		July	August to November
4.	Assignment Submission	January	By April
		July	By October
5	Project Report Submission (Wherever applicable during Final semester)	January	Last week of April
		July	Last week of November
6	Term End Examination	January	May onwards
		July	December onwards
7	Result Declaration of End Term Examination	January	By June
		July	By January

3. Instructional Design

3.1 Curriculum Design

The curriculum is meticulously designed by experts in the field of Computer Science, incorporating contemporary topics and fostering environmental awareness. It has received approval from the Board of Studies, the Centre for Internal Quality Assurance (CIQA), and the University Academic Council.

3.2 Program Structure and detailed Syllabus

3.2.1 Program Structure

SEMESTER-I										
Theory					Contact Per week			Evaluation		
Semester	**Course Code**	**Course Category/(Core/ Elective)**	**Paper Title**	**Credits**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**
I	DBCACO101T24	CORE	'C' Programming Fundamentals	3	3	0	0	30	70	100
	DBCACO102T24	CORE	Fundamentals of Computers and PC Tools	3	3	0	0	30	70	100
	DBCACO103T24	CORE	Elementary Mathematics	3	3	0	0	30 30	70 70	100
	DBCASE104T24	SEC	Digital Electronics	3	3	0	0	30 30	70 70	100
	DBCAAE105T24	AEC	English-I	3	3	0	0	30 30	70 70	100
	*OE/GE	OE/GE	OE/GE	2	2	0	0	30	70	100
Practical										
I	DBCACO106P24	CORE	C Programming Lab	2	0	0	4	30	70	100
	DBCACO107P24	CORE	Office Automation Tool Lab	2	0	0	4	30	70	100
	DBCASE108P24	SEC	Digital Electronics Lab	2	0	0	4	30	70	100
TOTAL				**23**	**17**	**0**	**12**			**900**
	*Students can choose any one of the subject from the following list of subjects or can pursue a MOOC course in order to get equal credits in Semester 1.									

Sr. NO.	Subject Code	Name of Subject
1	DBCAGE101T24	Understanding Prescription, Doses and doses forms
2	DBCAGE102T24	Dining etiquettes
3	DBCAGE103T24	Basics of Photography
4	DBCAGE104T24	Crime and society
5	DBCAGE105T24	Industrial Mathematics

SEMESTER-II										
Theory					Contact Per week			Evaluation		
Sem.	Course Code	Course Category/(Core / Elective)	Paper Title	Credits	L	T	P	Int.	Ext.	Total
II	DBCACO201T24	CORE	Database Management System	3	3	0	0	30	70	100
	DBCACO202T24	CORE	Discrete Mathematics	3	3	0	0	30	70	100
	DBCACO203T24	CORE	Analysis of Algorithms and Data Structures	3	3	0	0	30	70	100
	DBCAVA204T24	VAC	Environment Science	2	2	0	0	30	70	100
	DBCASE205T24	SEC	HTML Programming	3	3	0	0	30	70	100
	*OE/GE	OE/GE	OE/GE	2	2	0	0	30	70	100
Practical										
II	DBCACO206P24	CORE	Database Management System Lab	2	0		0	4	30	70	100
	DBCACO207P24	CORE	Data Structures Using 'C' Lab	2	0		0	4	30	70	100
	DBCASE208P24	SEC	HTML Programming Lab with projects	2	0		0	4	30	70	100
TOTAL				22	16		2	12			900

*Students can choose any one of the subject from the following list of subjects or can pursue a MOOC course in order to get equal credits in Semester 2.

Sr. NO.	Subject Code	Name of Subject
1	DBCAGE201T24	Introduction to Epidemiology
2	DBCAGE202T24	Basics of Baking
3	DBCAGE203T24	Videography
4	DBCAGE204T24	Sociology of Health
5	DBCAGE205T24	Nanotechnology

Semester III										
Semester	**Course Code**	**Course Category**	**Paper Title**	**Credits**	**Contact Per week**			**Evaluation**		
					L	**T**	**P**	**Int.**	**Ext.**	**Total**
Theory										
III	DBCACO301T24	CORE	Operating System	3	3	0	0	30	70	100
	DBCACO302T24	CORE	OOPS Using C++	3	3	0	0	30	70	100
	DBCACO303T24	CORE	Software Engineering	3	3	0	0	30	70	100
	DBCACO304T24	CORE	Computer Networks	3	3	0	0	30	70	100
	DBCASE305T24	SEC	MySQL (SQL/PL-SQL)	3	3	0	0	30	70	100
	GE3*	GE3	GE3*	2	2	0	0	30	70	100
Practical										
III	DBCACO306P24	CORE	Operating Systems Lab	2	0	0	4	30	70	100
	DBCACO307P24	CORE	OOPs Using C++ Lab	2	0	0	4	30	70	100
	DBCACO308P24	CORE	Software Engineering Lab	1	0	0	2	30	70	100
	DBCASE309P24	SEC	MySQL (SQL/PL-SQL) Lab with Projects	1	0	0	2	30	70	100
TOTAL				**23**	**17**	**0**	**12**			**1000**

*Students can choose any one of the subject from the following list of subjects or can pursue a MOOC course in order to get equal credits in Semester 3.

S. No.	Subject Code	Name of Subject
1	DBCAGE301T24	Public Health Pharmacy
2	DBCAGE302T24	Rajasthan and Punjabi cuisine
3	DBCAGE303T24	Script writing for film
4	DBCAGE304T24	Sociology of Media
5	DBCAGE305T24	Research Methodology

Semester IV										
Semester	**Course Code**	**Course Category**	**Paper Title**	**Credits**	**Contact Per week**			**Evaluation**		
					L	**T**	**P**	**Int.**	**Ext.**	**Total**
Theory										
IV	DBCACO401T24	CORE	Computer Architecture	3	3	0	0	30	70	100
	DBCACO402T24	CORE	Programming in Java	3	3	0	0	30	70	100
	DBCACO403T24	CORE	Internet and Web Design	3	3	0	0	30	70	100
	DBCACO405T24	CORE	Shell Programming and System Administration	3	3	0	0	30	70	100
	DBCASE404T24	SEC	E-Commerce Technologies	3	3	0	0	30	70	100
	GE4*	GE4	GE4*	2	2	0	0	30	70	100
Practical										
IV	DBCACO407P24	CORE	Java Programming Lab	2	0	0	4	30	70	100
	DBCACO408P24	CORE	Internet and Web Design	1	0	0	2	30	70	100
	DBCACO409P24	CORE	Shell Programming and System Administration	1	0	0	2	30	70	100
Total				21	19	0	8			900
	DBCAAE406T24	AEC	English-II	0	2	0	0	30	70	100

*Students can choose any one of the subject from the following list of subjects or can pursue a MOOC course in order to get equal credits in Semester 4.

S. No.	Subject Code	Name of Subject
1	DBCAGE401T24	Social Pharmacy
2	DBCAGE402T24	Reception management
3	DBCAGE403T24	Radio Jockey
4	DBCAGE404T24	Corporate Social Responsibility And Social Entrepreneurship
5	DBCAGE405T24	Industrial Safety & Hazard Management.

Semester V										
Sem.	Course Code	Course Category	Paper Title	Credits	Contact Per week			Evaluation		Total
					L	T	P	Int.	Ext.	
Theory										
V	DBCACO501T24	CORE	Computer Graphics and Multimedia	3	3	0	0	30	70	100
	DBCACO502T24	CORE	Programming in .NET	3	3	0	0	30	70	100
	DBCACO503T24	CORE	Data Warehousing and Data Mining	3	3	0	0	30	70	100
	DBCACO505T24	CORE	Android Programming	3	3	0	0	30	70	100
	DBCAVA506T24	VAC	Management Process & Organization Behaviour	2	2	0	0	30	70	100
	DBCASE504T24	SEC	Management Information System	3	3	0	0	30	70	100
	GE5*	GE5	GE5*	2	2	0	0	30	70	100
Practical										
V	DBCACO507P24	CORE	Computer Graphics and Multimedia Lab	2	0	0	4	30	70	100
	DBCACO508P24	CORE	.NET Programming Lab	2	0	0	4	30	70	100
	DBCACO509P24	CORE	Android Programming Lab & Minor Project	1	0	0	2	30	70	100
TOTAL				24	19	0	10			1000

*Students can choose any one of the subject from the following list of subjects or can pursue a MOOC course in order to get equal credits in Semester V.

S. No.	Subject Code	Name of Subject
1	DBCAGE501T24	Ayurvedic and Traditional Medicine
2	DBCAGE502T24	Basics of Hospitality and Tourism Marketing
3	DBCAGE503T24	Basics of TV Production
4	DBCAGE504T24	Sociology of Tribal Societies
5	DBCAGE505T24	Digital Marketing

Semester VI										
Sem.	Course Code	Course Category	Paper Title	Credits	Contact Per week			Evaluation		
					L	T	P	Int.	Ext.	Total
Theory										
VI	DBCACO601T24	CORE	PHP Programming	3	3	0	0	30	70	100
	DBCACO602T24	CORE	Cloud Computing	3	3	0	0	30	70	100
	DBCACO604T24	CORE	'R' Programming and Python Programming	3	3	0	0	30	70	100
	DBCASE603T24	SEC	Software Testing Concepts	3	3	0	0	30	70	100
	GE6*	GE6	GE6*	2	2	0	0	30	70	100
Practical										
VI	DBCACO605P24	CORE	PHP Lab	2	0	0	4	30	70	100
	DBCACO606P24	CORE	Cloud Computing Lab	2	0	0	4	30	70	100
	DBCACO607P24	CORE	'R' Programming and Python Programming Lab	2	0	0	4	30	70	100
	DBCAPS608P24	CORE	Project	4	0	0	8	30	70	100
TOTAL				24	14	0	20			900

*Students can choose any one of the subject from the following list of subjects or can pursue a MOOC course in order to get equal credits in Semester 6.

S. No.	Subject Code	Name of Subject
1	DBCAGE601T24	Pharmaco-economics
2	DBCAGE602T24	Interior Decoration
3	DBCAGE603T24	Global Media Scenario
4	DBCAGE604T24	Contemporary Social Issues
5	DBCAGE605T24	Industrial IOT and Automation

3.2.2 Detailed Syllabus of BCA

Detailed syllabus of BCA is attached in Annexure-I.

3.3 Duration of the Program

Program	Level	Duration	Maximum duration for completion	Credits
BCA	Bachelor's Degree	3 years (6 Semesters)	6 Years	137

3.4 Faculty and Support staff requirements (Refer Regulation Document for all Staff Details)

Academic Staff	Number available to meet the norms
Program Coordinator	1 Member
Course Coordinator	36
Course Mentor	1 Member per batch of 250 students

3.5 Instructional delivery mechanisms

JNU boasts a fully dedicated team of faculty members and staff proficient in delivering lectures through CDOE – JNU. At the commencement of each session, students will receive the academic calendar via the Learning Management System (LMS). The distribution of self-learning material, audio, and video content to students will be facilitated through the LMS via the following delivery channels:

- Self-Learning Material (Hard Copy will be provided to student)
- EBooks
- Study Guide
- Question Bank in Learning Management system - For Practice Test through LMS
- Audio / Video Component in Learning Management System
- Assignments (Submitted through Assignment Response Sheet)
- Personal Contact Program would be conducted at University Campus.

3.6 Identification of media-print, audio, or video, online, computer aided

The Learning Management System (LMS) serves as a comprehensive digital platform, offering a multitude of features including recorded faculty video lectures, live sessions, e-content comprising study material, open source materials, and graded assessments.

For each module within a course, there will be one live session conducted by the respective faculty member, focusing on a specific topic. CDOE-JNU has curated study material that is clear and easily comprehensible, complete with concise summaries, self-assessment questions, and case studies.

Access to these course materials is facilitated through:

- Login credentials provided in the welcome email sent by the university
- Students can also log on the University website at https://lms.jnujaipur.ac.in/ .

Courseware

Through the Learning Management System (LMS), students will have access to a comprehensive array of course materials mentioned above.

The Dashboard feature of the LMS serves to track and monitor students' learning progress. It includes functionalities such as:

- Monitoring progress in learning
- Comparing progress with peers
- Receiving regular notifications about upcoming Live Sessions, assignments, and examinations

3.7 Student Support Services

Students will have access to support services provided by CDOE-JNU through the Student Relationship Management (SRM) system for queries related to administration and general technical issues. A ticketing system integrated into the LMS will enable learners to connect with the CDOE-JNU technical team for support services, with resolutions handled by the appropriate authority. Notifications will also be sent to the Deputy Registrar to ensure queries are addressed within 24 hours or sooner.

For academic course-related queries, students can raise queries directly with the Course Coordinator, Program Coordinator, and Deputy Director. Queries should be resolved within 48 hours of being raised, with the Program Coordinator responsible for managing and resolving any unresolved matters. The Deputy Director will ensure the timely resolution of academic queries.

In addition to academic excellence, CDOE-JNU prioritizes the holistic development of its students. The department supports various initiatives to broaden students' opportunities and shape them into future leaders.

4. Assessment and Evaluation

4.1 Overview

The evaluation of students' learning will encompass internal assignments, quizzes, learner response sheets, and end-of-term examinations. CDOE-JNU follows a rigorous process in the development of question papers, creation of question and quiz banks, preparation and moderation of assignments, administration of examinations, analysis of answer scripts by qualified academics, and declaration of results. Question papers are meticulously framed to ensure comprehensive coverage of the syllabus.

The evaluation process will include two types of assessments:

Examination Name	Marks Division
Continuous internal assessment	30%
Summative assessment in the form of end-term examination. End-term examination will be held with proctored examination tool technology (follow **Annexure VI** for guidelines and pre-requisites for Proctored Examination)	70%

The examinations are designed to evaluate the knowledge acquired during the study period.

For theory courses, internal evaluation will be conducted through Continuous Internal Assessment (CIA), which includes assignments and quizzes in form of MCQ type of questions. The internal assessment will contribute a maximum of 30 marks for each course.

At the end of each semester, an end-of-semester examination will be held for each course, lasting two hours.

Guidelines issued by the Regulatory Bodies from time-to-time about conduct of examinations shall be considered and new guidelines if any will be implemented.

4.2 Question Paper Pattern

Exam Time: 2 Hours

Max. Marks: 70

Exam will be comprising of 70 Multiple-Choice Questions (1 Mark Each) – 70 Marks

4.3 Distribution of Marks in Continuous Internal Assessments

The following procedure shall be followed for internal marks for theory courses. Weightage for Assignment is provided below:

Particular	A1 (MCQ Type)	A2 (MCQ Type)
Marks	15	15

Note: Refer to **Annexure VI** and **VII** for reference to the question paper pattern and formats of documents accepted.

Students may re-appear for CIA up to next two semesters and has to follow the same procedure. For the last semester the academic rules shall apply.

4.4 Statistical Method for the Award of Relative Grades

Letter Grade	Grade point	Range of Marks(%)
O (Outstanding)	10	90-100
A+ (Excellent)	9	80-89
A (Very good)	8	70-79
B+ (Good)	7	60-69
B (Above average)	6	50-59
C (Average)	5	40-49
P (Pass)	4	35-39
F (Fail)	0	0-34
Ab (Absent)	0	Absent

Abbreviations:

CO	Core Course	MM	Maximum Marks
DSC	Discipline Specific Course	MO	Marks Obtained
GE	Generic Elective Course	SE	Skill Enhancement
AE	Ability Enhancement	DSE	Discipline Specific Elective

4.4.1 Cumulative Grade Point Average (CGPA) and Semester Grade Point Average

Semester Grade Point Average (SGPA):

It is the summation of product of Credit Points and Grade Points divided by the summation of Credits of all Courses taught in a semester.

SGPA = $\Sigma C_i G_i / \Sigma C$

Where, G is grade and C. is credit for a Course.

Cumulative Grade Point Average (CGPA): $CGPA = \Sigma(C_i \times Si)/\Sigma c$.

Where, Si is the SGPA of the semester and Ci is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Note:

- In case of any mistake being detected in the preparation of the Grade Statement at any stage or when it is brought to the notice of the concerned authority the University shall have the right to make necessary corrections.

4.4.2 Cumulative Grade Point Average (CGPA)

CGPA will be used to describe the overall performance of a student in all courses in which letter grades are awarded since his entry into the University or transferred from other University upto the latest semester as per the procedure provided in JNU Academic Regulations. It is the weighted average of the grade points of all the letter grades received by the student from his entry into the University or transferred from other University. Since multiple performance in a course in which the student has already received a grade is possible, whenever through such a process a new grade is obtained, it will replace the earlier one in the calculation of CGPA. On the other hand, if through this process merely a report emerges, this event by itself will not alter the CGPA.

A student's grades, reports, CGPA, etc. at the end of every semester/term will be recorded on a grade card, a copy of which will be issued to him. The grade card will be withheld if a student has not paid his dues or when there is a pending case of breach of discipline or a case of unfair means against him.

The faculty members also responsible for maintaining the complete records of each student's attendance, performance in different components of evaluation. If a scrutiny or statistical analysis becomes necessary, the above records and any other pertinent information should be made available by the faculty member of the course.

4.4.3 Conversion Factor

Formula for Conversion of CGPA to Percentage:

Percentage of marks = CGPA ^{x} 10

4.5 Grade card

All grades and reports and other pertinent information for a semester are given in a grade card which is a complete record of the outcome of what was intended in the original registration. The various grades and reports would be appropriately used to tally the grade card with the original registration.

Chronologically organized information from the grade cards of a student with the necessary explanation constitutes is transcript which is issued at the time the student leaves the University or at an intermediate point on request.

4.5.1 Grade cards and Certification – Student Communication

- The student can get soft copy of grade cards through the University website, the hard copy grade card would be provided only after successfully completion of full program along with degree certificate.
- Once the student completes all the mandated assignments, examinations and projects (if applicable) the final mark sheet/grade card and certificate would be dispatched by the University to the student registered address.
- All pending payments/dues need to be cleared by the student, before the final certification.
- If required, the University may request the mandatory documents from student as submitted during admission time, the students may have to re-submit the same if required during final degree certification.
- Students need to apply for degree by filling the degree application form and submit all the required documents and the applicable degree processing application fees as mentioned in this document.

4.5.2 Results, grade card and Degree Logistics–Internal Process

- After verification of all data by the Controller of Examination, the results would be published on the CDOE-JNU website.
- Students need to download and save the copy of semester / year wise results.

CDOE-JNU would provide hard copy grade cards and degree certificate at the end of the program to students who have successfully completed the program. Students who successfully completed the program will receive hard copy mark sheet/grade cards and a degree certificate from the University at the end of the program. A provision for On Demand Mark Sheets can be provided wherein student

would have to fill the requisition and pay postal charges enabling university to dispatch the hard copy marksheets as requested by the student; prior to completion of the overall program.

5. Requirement of the Laboratory Support and Library Resources

5.1 Laboratory Support

Jaipur National University offers access to state-of-the-art laboratories equipped with the latest tools and resources necessary for research and analytical work. The laboratory support at JNU aims to foster a robust research environment, encouraging students to develop essential skills required for their academic and professional growth.

5.*2 Library Resources*

The Central Library at CDOE-JNU offers a comprehensive range of sections, including reference, circulation, audio-visual, periodical, book-bank, digital library, and reprographic sections. With a collection exceeding 1,00,000 books, the library also provides access to e-journals, online databases such as Scopus and Web of Science, and institutional repositories featuring rare book collections. University has 449 subscriptions of online and offline Journals. Equipped with modern facilities like reading rooms, computer labs, and quiet study areas, the library fosters a conducive environment for learning and intellectual growth. Additionally, the library frequently organizes workshops, seminars, and exhibitions to enhance academic engagement and promote a culture of continuous learning.

All electronic resources can be accessed seamlessly through the Local Area Network (LAN) on campus, as well as remotely via login credentials. This ensures convenient access to resources for students, faculty, and researchers both on-site and off-site.

6. Cost Estimate of the Program and the Provisions

The Estimate of Cost & Budget could be as follows (all figures on Annual basis) :

Sl. No.	Expenditure Heads	Approx. Amount
1	Program Development (Single Time Investment)	43,00,000 INR
2	Program Delivery (Per Year)	8,00,000 INR
3	Program Maintenance (Per Year)	28,00,000 INR

7. Quality Assurance Mechanism

The quality of a program hinges upon the course curriculum, syllabus, and academic delivery, all of which are meticulously designed to bridge the gap between industry standards and academia. To uphold this standard, the Centre for Internal Quality Assurance (CIQA) and the Academic Council play crucial roles.

The Academic Council is entrusted with ratifying the curriculum and any proposed changes recommended by CIQA to ensure the continual enhancement and maintenance of quality in education at CDOE-JNU.

The Centre for Internal Quality Assurance (CIQA) is tasked with several responsibilities:

(i) Conducting periodic assessments of learning course materials and audio-video tutorials to maintain the quality of learning.

(ii) Soliciting stakeholder feedback and implementing recommended changes to meet the evolving needs of course delivery and industry requirements.

(iii) Evaluating the quality of assignments, quizzes, and end-term assessments and providing suggestions for enhancements to sustain the learning program's standards.

(iv) Ensuring that the learning experience is truly global, aligning with program outcomes and reflecting the vision and mission of JNU.

The Chief Operating Officer (CoE) of the University oversees examinations and the evaluation system to ensure fairness and integrity in the assessment process.

CDOE-JNU is committed to continual improvement, striving to enhance processes, assessments, teaching methodologies, and e-learning materials in line with the implementation of the New Education Policy (NEP). The University is dedicated to delivering exceptional education across all learning modes while adhering to NEP, UGC, and other regulatory guidelines, fostering a truly global educational environment.

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Annexure I _Detailed syllabus of BCA Program

Semester I

Course Code DBCACO101T24	Core Course – 1 BCA Semester I **'C' Programming Fundamental**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Understand the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming	
CO2	Illustrate concept of compile and debug programs in C language and use different data types for writing the programs.	
CO3	Design programs connecting decision structures, loops and functions.	
CO4	Distinguish between call by value and call by address.	
CO5	Understand the dynamic behavior of memory by the use of pointers.	
CO6	Use different data structures and create / manipulate basic data files and developing	
Course Content		
Block 1	Planning the Computer Program, Debugging, Types of errors, Documentation, Techniques of Problem Solving, Problem solving aspects, Implementation of algorithms, Program verification, Flowcharting, decision table, algorithms and Structured programming concepts; Programming methodologies: Top down and Bottom up programming.	
Block 2	Programming Language, C Standard Library, Introduction to C Programming , Memory Concepts, Decision Making , Secure C Programming , Structured Program Development in C, Algorithms, Pseudocode, Control Structures, if Selection Statement, while Repetition Statement , Assignment Operators, Increment and Decrement Operators. C Program Control: for Repetition Statement, switch Multiple Selection Statement, do...while Repetition Statement, break and continue Statements, Logical Operators.	
Block 3	C Functions, Program Modules in C, Math Library Functions, Functions: Function Definitions, Function Prototypes: A Deeper Look , Function Call Stack and Stack Frames, Passing Arguments By Value and By Reference, Recursion vs. Iteration, C Arrays: Defining Arrays, Passing Arrays to Functions, Sorting Arrays, Searching Arrays and Multidimensional Arrays.	

Block 4	Structure & Union, C Pointers: Pointer Variable, Definitions and Initialization. Pointer Operators, Passing Arguments to Functions by Reference, size of Operator, Pointer Expressions and Pointer Arithmetic, Relationship between Pointers and Arrays, Pointers to Functions, C Characters and Strings, Character Handling Library, String, Conversion Functions, Standard Input/output Library Functions, String, Manipulation Functions ,C Formatted Input/output	
Block 5	C File Processing: Files and Streams, Creating a Sequential, Access File, Reading Data from a Sequential, Access File , Random, Access Files , Creating a Random, Access File and Writing Data Randomly to a Random Access File, Reading Data from a Random Access File, C Pre-processor.	
Text Books	1. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill Education, 2008 2. Yashavant Kanetkar, Let us C, BPB	
Reference Books	1. P. K. Sinha & Prtti Sinha "Computer '5' Fundamentals" BPB Publications 2007. 2. R.G. Tromey "How to solve it by computer" Prentice Hall 1982. 3. Paul Deital & Harvey Deital "C How to Program" 7 edition Pearson Education 2013. 4. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO102T24	Core Course – 2 BCA Semester I **Fundamentals of Computers and PC Tools**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identify the important role of computers and why computers are essential components in business and society along with their various components.	
CO2	Demonstrate the building up of Sequential and combinational logic from basic gates.	
CO3	Apply different categories of programs, system software and applications. Organize and work with files and folders. Utilize the Word Processor, Worksheet and PowerPoint for various applications.	
CO4	Assess the emerging technologies in the area like Big Data, Data Mining and Cloud Computing.	
CO5	Bridge the fundamental concepts of computers with the present level of knowledge of the students.	
Course Content		
Block 1	Computer and its characteristics, application of computers, digital and analog computers, Generation of computers. Storage devices: primary storage devices (RAM, ROM, PROM, EPROM and EEPROM), secondary storage devices (Floppy disk Hard disk optical disk magnetic tapes), Input and output devices (keyboard mouse light pen joystick scanner monitor printers, etc.). Number system and its types conversion from one base to another and vice versa arithmetic operations r's (r - 1)'s complement methods.	
Block 2	Software and its types (System Software, Application Software, Firmware Software), Computer Languages and its types (Machine Language, Assembly Language, High Level Language. Advantages and disadvantages of computer languages) Translators: Compiler Linker Interpreter	
Block 3	Overview of Emerging Technologies: Bluetooth, cloud computing, big data ,data mining , mobile computing and embedded systems	
Block 4	Operating system and its functions, types of operating system (Single user, multi-user, multitasking, time sharing, distributed). Fundamental of DOS, internal and external commands, Windows fundamentals: Anatomy of windows, desktop elements, managing files and folders, installing software	
Block 5	Word Processor and its features, editing of Text, Find and Replace, Bullets and Numbering, Spell Checker, Grammar Checker, Auto Correct, Auto Complete, Auto Text, Header and footer, tables, mail merge, border and shading, page setup printing. Spread sheet and its features, Entering Information in Worksheet, Editing Cell, Entry Moving and Copying Data, deleting or Inserting Cells Rows and Columns. Custom Numeric Formats Using Formulas and functions, Creating charts. Presentation Software and its uses, steps for creating PowerPoint Presentation, PowerPoint Views Assigning Slide Transitions Using Preset Animations, Hiding Slides, Slide	

	Show, Controlling the Slide Show with a Keyboard and Setting Slide Show Timings.	
Text Books	1. P.K Sinha & Priti Sinha Computer Fundamentals BPB Publications. 2. V. Rajaraman Fundamentals of Computers EEE. 3. Peter Nortan Introduction to Computers Tata Mcgraw Hill.	
Reference Books	1. Alexix Leon Mathewes Leon Fundamentals of Information Technology. 2. Suresh K. Basandra Computer Systems Today Gatgotia Publications. 3. Joyce Coax Joan Preppernau Steve Lambert and Curtis Frye 2007 Microsoft Office System step by step Microsoft Press. 4. R.K. Taxali PC Software for Windows. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO103T24	Core Course – 3 BCA Semester I **Elementary Mathematics**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Use elementary algebra, geometry, number concepts, probability and problem solving.	
CO2	Demonstrate familiarity with number theory and statistics.	
CO3	Think mathematically and exhibit confidence in their mathematical ability.	
CO4	Explain why mathematical thinking is valuable in daily life.	
CO5	Represent and statistically analyze data both graphically and numerically.	
Course Content		
Block 1	Matrices, Types of Matrices, Operations of addition, Scalar Multiplication and Multiplication of Matrices, Determinant of a Square Matrix, Minors and Cofactors, Transpose adjoint and inverse of a matrix, solving system of linear equations in two or three variables using inverse of a matrix	
Block 2	Sets Relation & Functions: Introduction , Definition of Set, Type of Sets, Operations on Sets, Venn diagram, Cartesian Product, Relations, Functions, Types of function, Some elementary functions with their graphs (Exponential logarithmic modulus), Limit & continuity of a function (Simple Problems).	
Block 3	Differentiation: Introduction, Derivative and its meaning, Differentiation of algebraic trigonometric exponential & logarithmic functions, Rules of Differentiation, Differentiation by Substitution, Higher Order Differentiation, Maxima and Minima of Simple Functions	
Block 4	Integration: Introduction, Integral as Anti-derivative process, Indefinite Integrals, Rules of Integration, Integration by substitution. Definite Integration properties of Definite Integral, Finding areas of Simple Closed Curves	
Block 5	Coordinate Geometry: Introduction, 2D Cartesian Co-ordinate system, Straight line: (Equation & Slope of a line) Circle: Equation of Circle Equation to Tangent, Conic Sections: Focus Eccentricity Directrix, Axis of a conic section, Parabola & Ellipse: (Definitions equations and shape of curve only).	
Text Books	1. Mathematics Vol-2, R. D. Sharma, Dhalpat Raj & Sons. 2018 2. The Elements of Co-ordinate Geometry Part-I, S. L. Loney, Book Palace, New Delhi, 2016	
Reference Books	1. Mathematics for Elementary Teachers by Michelle Manes, Publication Year: 2017 Publisher: American Mathematical Society 2. Everyday Mathematics by McGraw Hill, Publication Year: 2018 (4th Edition) Publisher: McGraw Hill Education *Latest Editions of all the suggested books are recommended	

Course Code DBCASE104T24	Skill Enhancement Course - 1 BCA Semester I **Digital Electronics**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Recall fundamentals and principles of analog circuits and electronic devices in electrical and electronic engineering. Acquire basic knowledge of physical and electrical conducting properties of semiconductors. Develop the ability to understand the design and working of BJT / FET amplifiers.	
CO2	Employ the codes and number systems converting circuits and compare different types of logic families which are the basic unit of different types of logic gates in the domain of economy, performance, and efficiency.	
CO3	Understand different types of digital electronic circuits using various mapping and logical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematical methods.	
CO4	Analyze, design and implement sequential logic circuits. Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real-world applications.	
CO5	Design different types of with and without memory element digital electronic circuits for a particular operation, within the realm of economic, performance, efficiency, user-friendly and environmental constraints	
CO6	Evaluate frequency response to understand the behavior of Digital electronic circuits. Create and analyze electronic circuits	
Course Content		
Block 1	**Introduction to Basic Electronics:** Semiconductors, Intrinsic & Extrinsic semiconductors, P Type & N Type semiconductors, PN Junction & Biasing. Semiconductor Diode: Diode, PN junction diode, forward/reverse, current symbol ratings, forward & reverse bias characteristics, Transistor (Introductory concepts): PNP & NPN Transistor, CBCC CE configurations and Transistor as an Amplifier, Introduction to FET MOSFET & construction	
Block 2	**Data and number representation and Logic Gates:** Binary, complement representation, BCD, ASCII, conversion of numbers from one system to the other, 2's complement, representation and binary arithmetic. Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive OR and Exclusive NOR. Implementations of Logic Functions using gates, NAND, NOR implementations, Multi level gate implementations, Multi output gate implementations, Tristate gates	
Block 3	**Minimization Techniques:** Boolean postulates and laws, De Morgan's Theorem, Principle of Duality, Boolean expression, Minimization of Boolean expressions, Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS), Karnaugh map,	

	Minimization, Don't care conditions, Quine McCluskey method of minimization.	
Block 4	**Combinational Circuits:** Design procedure, Half adder, Full Adder, Half subtractor, Full subtractor, Parallel binary adder, parallel binary Subtractor, Fast Adder, Carry Look Ahead, adder-Serial Adder/ Subtractor, BCD, adder, Binary Multiplier, Binary Divider Multiplexer/ Demultiplexer, decoder encoder. **Sequential Circuits:** Latches, Flipflops, SR, JK, D, T and Master Slave, Characteristic table and equation Application table, Edge triggering - Level Triggering, Introduction to Asynchronous and Synchronous counters and shift registers	
Block 5	**Memory Devices:** Classification of memories, ROM organization, PROM, EPROM, EEPROM, EAPROM, RAM organization, Write operation, Read operation, Memory cycle, Timing wave forms, Memory, decoding memory expansion, Static RAM Cell, Bipolar RAM cell, MOSFET RAM cell, Dynamic RAM cell	
Text Books	1. M. Morris Mano Digital Design 3rd Edition Prentice Hall of India Pvt. Ltd. 2003 Pearson Education (Singapore) Pvt. Ltd. New Delhi 2003. 2. S. Salivahanan and S. Arivazhagan Digital Circuits and Design 3rd Edition. Vikas Publishing House Pvt. Ltd New Delhi 2006.	
Reference Books	1. John F.Wakerly Digital Design Fourth Edition Pearson/PHl 2006. 2. John.M Yarbrough Digital Logic Applications and Design Thomson Learning 2002, 3. Charles H.Roth. Fundamentals of Logic Design Thomson Learning 2003. 4. Donald P.Leach and Albert Paul Malvino Digital Principles and Applications 6thEdition TMH 2003. 5. William H. Gothmann Digital Electronics 2nd Edition PHI 1982. 6. Thomas L. Floyd Digital Fundamentals 8th Edition Pearson Education Inc New Delhi 2003. 7. Donald D. Givone Digital Principles and Design TMH 2003. *Latest Editions of all the suggested books are recommended	

Course Code DBCAAE105T24	Ability Enhancement Course - 1 BCA Semester I **English-I**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Recall various grammatical concepts like tenses, modals, active & passive etc.	
CO2	Differentiate between tenses, modals, prepositions etc.	
CO3	Apply the knowledge of grammar in their day to day conversation.	
CO4	Develop language proficiency by practicing speaking, listening, reading and writing skills.	
CO5	Build a capacity to learn new words to enhance their vocabulary.	
Course Content		
Block 1	**Grammar - I** Sentence Structure Subject & Predicate Tenses	
Block 2	**Grammar - II** Prepositions Modals Active & Passive Voice	
Block 3	**Grammar - II** Subject-Verb Agreement Punctuations Common Errors	
Block 4	Paragraph Writing Job Applications (Solicited Unsolicited and Layout)	
Block 5	Reading Comprehension (Reading at various speeds (slow fast very fast) reading different kinds of texts for different purposes (e.g. for relaxation for information for discussion at a later stage etc.); reading between the lines). Effective Listening (Techniques)	
Text Books	1. Quirk & Greenbaum "Advanced English Usage" Pearson Education.	
Reference Books	1. Banerjee Meera & Mohan Krishna "Developing Communication Skills" Macmillan Publications 1990. 2. Chaturvedi P.D. "Business Communication" Pearson Publications. *Latest Editions of all the suggested books are recommended	
Online Reading/Supporting Material:	1. www.englishcfub.com - Vocabulary Enrichment/ Speaking 2. www.ispeakyouspeak.blogspot.com - Vocabulary Enrichment/ Speaking 3. www.teachertube.com - Writing Technically www.Dictionary.com – Semantic / Grammar. 4. www.usingenglish.com- Writing/ Grammar	

Course Code DBCACO106P24	Core Course – 1 BCA Semester I **'C' Programming Fundamental Lab**	**C-2**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identifysituations where computational methods and computers would be useful.	
CO2	Summarize the programming tasks using techniques learned and write pseudo-code.	
CO3	Choose the right data representation formats based on the requirements of the problem.	
CO4	Use comparisons and limitations of the various programming constructs and choose the right one for the task in hand.	
CO5	Implement file Operations in C programming for a given application.	
Exercises		
Experiment 1	Write a C program print Addition / Multiplication of integers.	
Experiment 2	Determining if a number is +ve /, ve / even / odd.	
Experiment 3	Find maximum of 2 numbers from 3 numbers.	
Experiment 4	Construct a program to implement a calculator that reads in integers and operations from the keyboard such as 7 * 3 + 6 = print the answer and exit. Just as on a cheap calculator addition and multiplication have the same precedence and evaluation is strictly left to right. For example 4+5*6 = prints 54 because 4+5=9 is computed before the multiplication.	
Experiment 5	Write a C program to give sum of first n numbers from given n numbers etc.	
Experiment 6	Write a C program to print Integer division.	
Experiment 7	Write a C program for Digit reversing of a number.	
Experiment 8	Write a C program to give factorial of a number.	
Experiment 9	Write a C program to find the sum of individual digits of a positive integer.	
Experiment 10	A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.	
Experiment 11	Write a C program to generate all the prime numbers between 1 and n where n is value supplied by the user's) Write a program which checks a given integer is Fibonacci number or not.	
Experiment 12	Write a C program to find LCM and HCF of a number.	
Experiment 13	Write a C program to generate sine series cosine series etc.	
Experiment 14	Write a C program in C for Pascal Triangle Prime number.	

Experiment 15	Factors of a number. Other problems such as Perfect number GCD of 2 numbers etc. (Write algorithms and draw flowcharts)	
Experiment 16	Write a C program to check whether the number is Palindrome or not.	
Experiment 17	Write a C program in C to check whether the number is leap or not.	
Experiment 18	Write a C program in C to print various diamond patterns.	
Experiment 19	Write a C program in C whether the number is Armstrong or not.	
Experiment 20	Write a program to shift input data by 2 bits left and right.	
Experiment 21	Write a program to use bitwise "&" operator between 2 integer and display the result.	
Experiment 22	Write a program to input 6 numbers and find the biggest and smallest using nested if.	
Experiment 23	Write a program to find the sum of even and odd numbers using switch if else nested if between 1 and 20.	
Experiment 24	Write a program to find the sum of its digits till the result is in single digit	
Experiment 25	Write a program to print the series: x-x3/3!+x5/5!-x7/7...an/n! 1 + x2/2!-x3/3! + x4/4... xn/n!	
Experiment 26	Write a program to perform Arithmetic operation on an array i.e. Addition Subtraction Multiplication and Division and store the result in another array.	
Experiment 27	Write a program to perform following string operation: with string functions and without string functions. Reverse a string, Compare two string, Concatenate two strings	
Experiment 28	Write a program to detect the occurrence of a number in a string.	
Experiment 29	Write a program to accept a string up to 15 character and display the position of a character in a separate line.	
Experiment 30	Write a program to display and count the number of vowels in a string.	
Experiment 31	Write a program to add to pointer addresses of a pointer variable.	
Experiment 32	Write a program to find the factorial of a number using recursion.	
Experiment 33	Write a program to perform different arithmetic operations using pointers	
Experiment 34	Write a program to obtain prime factors of any integer number using functions.	
Experiment 35	Write a program to find the sum of 5 digit number: Without using recursion and with using recursion.	
Experiment 36	Write a program to obtain Fibonacci series by using recursion.	
Experiment 37	Write a program to create, display, modify and append a file (sequential file).	
Experiment 38	Write a program to copy the content of one file to another.	

Experiment 39	Write a program to calculate space in a file (number of blank spaces and not the file size).	
Experiment 40	Write a program to print out the lines from a file that have 50 or more characters in them.	
Experiment 41	Display the initials of first and the middle name separated by "." i.e. Input - Krishna Kumar Singh Output - K .K. Singh Now create a main structure that will contain name age salary of an employee.	
Experiment 42	Write a program to call sum ( ) function recursively and perform sum of 1 to 5 numbers.	
Experiment 43	Write a program to find the larger of the two numbers using macro with argument.	
Experiment 44	Write a program to count the number of character, word and lines in a text.	
Experiment 45	Write a program to arrange a list by using any sorting method.	
Reference	1. Subburaj, R.Programming in C. Vikas Publishing House Pvt. Ltd. 2014 2. NPTEL. (n.d.). Programming in C. Retrieved from https://nptel.ac.in/courses/106101060 3. BTech Smart Class. (n.d.). C Preprocessor Commands. Retrieved from http://www.btechsmartclass.com/c_programming/C-Preprocessor-Commands.html 4. Tutorials Point. (n.d.). What are the Pre-Processor Commands in C Language. Retrieved from https://www.tutorialspoint.com/what-are-the-pre-processor-commands-in-c-language 5. CProgramming.com. (n.d.). Preprocessor. Retrieved from https://www.cprogramming.com/reference/preprocessor/ 6. PW Skills. (n.d.). What are Preprocessor Directives in C?. Retrieved from https://pwskills.com/blog/what-are-preprocessor-directives-in-c/ *Latest Editions of all the suggested books are recommended	

Course Code DBCACO107P24	Core Course – 2 BCA Semester I **Office Automation Tools Lab**	C-2
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identify and recall the use of CUI and GUI based operating systems.	
CO2	Summarize the working of various application software's such as MS Word, MS Excel and MS PowerPoint.	
CO3	Apply the various features and functionalities of MS Word, MS Excel and MS PowerPoint.	
CO4	Design and develop various Word files, spreadsheets and PowerPoint presentations.	
Exercises		
	Exercises for WORD	
Experiment 1	Create a **telephone directory.** • The heading should be 16-point Arial Font in bold • The rest of the document should use 10-point font size • Other headings should use 10-point Courier New Font. • The footer should show the page number as well as the date last updated.	
Experiment 2	Design a time-table form for your college. • The first line should mention the name of the college in 16-point Arial Font and should be bold. • The second line should give the course name/teacher's name and the department in 14-point Arial. • Leave a gap of 12-points. • The rest of the document should use 10-point Times New Roman font. • The footer should contain your specifications as the designer and date of creation.	
Experiment 3	Create the following one page documents. (a) Compose a note inviting friends to a get-together at your house, including a list of things to bring with them. (b) Design a certificate in landscape orientation with a border around the document.	
Experiment 4	4. Create the following document: A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.	

<table>
<tr><td>Experiment 5</td><td>5. Convert following text to a table, using comma as delimiter
Type the following as shown (do not bold).
Color, Style, Item
Blue, A980, Van
Red, X023, Car
Green, YL724, Truck
Name, Age, Sex
Bob, 23, M
Linda, 46, F
Tom, 29, M</td><td></td></tr>
<tr><td>Experiment 6</td><td>Prepare a grocery list having four columns (Serial number, the name of the product, quantity and price) for the month of April, 06.
• Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.
• The headings of the columns should be in 12-point and bold.
• The rest of the document should be in 10-point Times New Roman.
• Leave a gap of 12-points after the title..</td><td></td></tr>
<tr><td>Experiment 7</td><td>XYZ Publications plans to release a new book designed as per your syllabus. Design the first page of the book as per the given specifications.
b. The title of the book should appear in bold using 20-point Arial font.
c. The name of the author and his qualifications should be in the center of the page in 16-point Arial font.
d. At the bottom of the document should be the name of the publisher and address in 16-pomt Times New Roman.
e. The details of the offices of the publisher (only location) should appear in the footer</td><td></td></tr>
<tr><td>Experiment 8</td><td>Create the following one page documents.
a) Design a Garage Sale sign.
b) Make a sign outlining your rules for your bedroom at home, using a numbered list.</td><td></td></tr>
<tr><td>Experiment 9</td><td>Enter the following data into a table given on the next page.

<table><tr><th>Salesperson</th><th>Dolls</th><th>Trucks</th><th>Puzzles</th></tr><tr><td>Amit</td><td>1327</td><td>1423</td><td>3193</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td>Shivi</td><td>1421</td><td>3863</td><td>2934</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td>Om</td><td>5214</td><td>3247</td><td>5467</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td>Ananya</td><td>2190</td><td>1275</td><td>1928</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td>Anupama</td><td>1201</td><td>2528</td><td>1203</td></tr></table></td><td></td></tr>
</table>

Maharshi	4098	3079	2067	

Add a column Region (values: S, N, N, S, S, S) between the Salesperson and Dolls columns to the given table. Sort your table data by Region and within Region by Salesperson in ascending order

Exercises for EXCEL

Experiment 10

Create a student worksheet containing roll numbers, names and total marks. Open a document in Word and insert the excel worksheet using:-

i) Copy/Paste
ii) Embedding
iii) Linking

Experiment 11

The term wise marks for APS class of 20 students are stored in 3 separate sheets named term 1, term 2 and term 3. Create 4th worksheet that contains student names and their total and average marks for the entire year. Give proper headings using headers. Make the column headings bold and italic. The 4th worksheet should contain college name as the first line. Make it bold, italic and center it..

Experiment 12

Using a simple pendulum, plot 1-T and 1-T^2 graph.

	t1	t2	t3	Mean(t)	T=t/20	T^2

Experiment 13

Consider the following employee worksheet:-

Name Last)	Grade 1/2/3	Basic Salary	HRA	PF	Gross	Net	(VA Veh Allo

HRA is calculated as follows:

Grade	HRA % (of Basic)
1	40%
2	35%
3	30%

i) Find max, min and average salary of employees in respective Grade
ii) Count no. of people where VA>HRA

<table>
<tr><td></td><td>iii) Find out most frequently occurring grade.
iv) Extract records where employee name starts with "A" has HRA>10000
v) Print Grade wise report of all employees with subtotals of net salary and also grand totals. Use subtotal command.
vi) Extract records where Grade is 1 or 2 and salary is between 10000 and 20000 both inclusive.</td><td></td></tr>
<tr><td>Experiment 14</td><td>In a meeting of a marketing department of an organization it has been decided that price of selling an item is fixed at Rs40. It was resolved to increases the sell of more of more items and getting the profit of Rs40,000/.Use Goal Seek of find out how many items you will have to sell to meet your profit figure</td><td></td></tr>
<tr><td>Experiment 15</td><td>To study the variation in volume with pressure for a sample of an air at constant temperature by plotting a graph for P - V and P-I/V. Sample observations are:-
<table>
<tr><th>Pressure(P)</th><th>Volume (V)</th><th>I/V</th><th>PV</th><th>P/V</th></tr>
<tr><td>75</td><td>20</td><td></td><td></td><td></td></tr>
<tr><td>78.9</td><td>19</td><td></td><td></td><td></td></tr>
<tr><td>83.3</td><td>18</td><td></td><td></td><td></td></tr>
<tr><td>88.2</td><td>17</td><td></td><td></td><td></td></tr>
</table></td><td></td></tr>
<tr><td>Experiment 16</td><td>Plot the chart for marks obtained by the students (out of 5) vs. frequency (total number of students in class is 50).</td><td></td></tr>
<tr><td>Experiment 17</td><td>Create the following worksheets) containing an year wise sale figure of five salesmen in Rs.
<table>
<tr><td>Salesman</td><td>2002</td><td>2003</td><td>2004</td><td>2005</td></tr>
<tr><td>MOHAN</td><td>10000</td><td>12000</td><td>20000</td><td>50000</td></tr>
<tr><td>MITRA</td><td>15000</td><td>18000</td><td>50000</td><td>60000</td></tr>
<tr><td>SHIKHA</td><td>20000</td><td>22000</td><td>70000</td><td>70000</td></tr>
<tr><td>ROHIT</td><td>30000</td><td>30000</td><td>100000</td><td>80000</td></tr>
<tr><td>MANGLA</td><td>40000</td><td>45000</td><td>125000</td><td>90000</td></tr>
</table>
Apply the following Mathematical & Statistical functions:
i) Calculate the commission for each salesman under the condition :-
a) If total sales is greater than Rs. 3, 00,000/-, then commission is 10% of total sale made by the salesman.
b) Otherwise, 4% of total sale.
ii) Calculate the maximum sale made by each salesman.
iii) Calculate the maximum sale made in each year,
iv) Calculate the minimum sale made by each salesman.
v) Calculate the minimum sale made in each year.</td><td></td></tr>
</table>

vi) Count the no. of sales persons.
vii) Calcu1ate the cube of sales made by Mohan in the year 2002.
viii) Find the difference in sales by salesman Mitra between the year 2002 and 2003. Find the absolute value of difference.
ix) Also calculate the Mode, Std dev, Variance, and Median for the sale made by each salesman.
x) Calculate the year wise Correlation coefficient between the sales man Mohan and Mitra year wise not.

Experiment 18

The following table gives a year wise sale figure of five salesmen in Rs.

Salesman	2000	2001	2002	2003
S1	10000	1200	20000	50000
S2	15000	1800	50000	60000
S3	20000	2200	70000	70000
S4	30000	3000	[00000	80000
S5	40000	4500	12500	90000

i) Calculate total sale year wise.
ii) Calculate the net sales made by each salesman
iii) Calculate the commission for each salesman under the condition :-
   a. If total sales is greater than Rs. 4,00,000/-, then commission is 5% of total sale made by the salesman.
   b. Otherwise, 2% of total sale.
iii) Calculate the maximum sale made by each salesman.
iv) Calculate the maximum sale made in each year.
v) Draw a bar graph representing the sale made by each salesman,
vi) Draw a pie graph representing the sale made by salesmen in year 2001.

Experiment 19

Consider the following worksheet for APS 1st year students:-

S. No.	**Name**	**PH**	**CH**	**BY**	**MT**	**CS**	**Total**	**%**	**Grade**
1									
2									

Grade is calculated as follows:-

If % >=90

Grade A

If % >=80&<90 Grade B

If % >=70&<80 Grade C

If % >=60 &<70 Grade D

	i. Calculate Grade using if function ii. Sort the data according to total marks iii. Apply filter to display the marks of the students having more than 65% marks. iv. Draw a pie chart showing % marks scored in each subject by the topper of the class. v. Draw the doughnut chart of the data as in (iv) vi. Enter the S. No. of a student and find out the Grade of the student using VLOOKUP. vii. Extract all records where name a. Begins with "A" b. Contains "A" c. Ends with "A"	
Experiment 20	Create five Power point slides. Each slide should support different format. In these slides explain areas of applications of IT. Make slide transition time as 10 seconds.	
Experiment 21	Create five Power Point slides to give advantages/disadvantages of computer, application of computers and logical structure of computer.	
Experiment 22	Create five Power Point slides detailing the process of internal assessment. It should be a self-running demo.	
Reference	1. Shelly, G. B., Vermaat, M. E., & Sebok, S. L. *Microsoft Office 365 & Office 2019 Introductory*. Cengage Learning, 2019. ISBN: 978-0357025692. 2. Gookin, D. *Word 2019 For Dummies*. Wiley, 2018. ISBN: 978-1119514033. 3. Harvey, G. *Excel 2019 All-in-One For Dummies*. Wiley, 2018. ISBN: 978-1119517942. 4. Lambert, J., & Frye, C. *Microsoft PowerPoint 2019 Step by Step*. Microsoft Press, 2018. ISBN: 978-1509307069. 5. Reding, E. E., & Wermers, L. *Microsoft Office 365 & Office 2019 Intermediate*. Cengage Learning, 2019. ISBN: 978-0357026460. 6. Lambert, J. *MOS Study Guide for Microsoft Excel Exam MO-200*. Microsoft Press, 2020. ISBN: 978-0136628172. *Latest Editions of all the suggested books are recommended	

Course Code DBCASE108P24	Skill Enhancement Course – 1 BCA Semester I **Digital Electronics Lab**	**C-2**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Recall and learn the basics of logic gates & code conversion.	
CO2	Develop design capability in the binary arithmetic logic circuit	
CO3	Apply knowledge in Combinational Logic Problem formulation and verify their functionalities.	
CO4	Examine design capability in synchronous and asynchronous sequential circuits like flip flops, Shift registers, and counters	
CO5	Evaluate the basic understanding of digital circuits and to verify their operation.	
Exercises		
Experiment 1	To study and verify the truth table of logic gates.	
Experiment 2	Design and implementation of 4-Bit Adder and Subtractor using logic gates.	
Experiment 3	Design and implementation of BCD to excess-3 code converter using logic gates,	
Experiment 4	Design and implementation of Binary to gray code converter using logic gates.	
Experiment 5	Design and implementation of 4 bit binary Adder/ Subtractor using IC 7483	
Experiment 6	Design and implementation of 4 bit binary BCD adder using IC 7483	
Experiment 7	Design and implementation of 2 bit Magnitude Comparator using logic gates.	
Experiment 8	Design and implementation of 16 bit odd/even parity checker generator.	
Experiment 9	Design and implementation of multiplexer using logic gates IC74150 and IC74154.	
Experiment 10	Design and implementation of De-multiplexer using logic gates IC74150 and IC74154	
Experiment 11	Design and implementation of encoder using logic gates IC7445 and IC74147	
Experiment 12	Design and implementation of decoder using logic gates 1C7445 and IC74147	
Experiment 13	Construction and verification of 4 bit ripple counter,	
Experiment 14	Design and implementation of 3-bit synchronous up/down counter.	
Experiment 15	Implementation of SISO SIPO PISO and PIPO shift registers using Flip-flops	
Reference	**1. Malvino, A. P., & Leach, D. (2020).** *Digital Principles and Applications* (9th ed.). McGraw-Hill Education. **2. Morris Mano, M. (2017).** *Digital Design* (6th ed.). Pearson Education. 3. **Givone, D. (2020).** *Digital Electronics: A Practical Approach with*	

	VHDL (2nd ed.). Pearson. **4. Wakerly, J. F. (2018).** *Digital Design: Principles and Practices* (5th ed.). Pearson Education. 5. **Khandpur, R. S. (2017).** *Handbook of Digital Electronics* (2nd ed.). McGraw-Hill Education. 6. **Pillai, S. (2019).** *Digital Electronics and Logic Design* (2nd ed.). Wiley India. 7. **Liu, D. (2019).** *Digital Electronics: Principles and Applications* (5th ed.). McGraw-Hill. *Latest Editions of all the suggested books are recommended	

Semester – II

Course Code DBCACO201T24	Core Course – 1 BCA Semester II **Database Management System**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identify and organize the information from a DBMS and maintain and retrieve efficiently, and effectively.	
CO2	Illustrate the role of Database Management Systems in information technology applications within organizations and structured query languages to extract information from large datasets	
CO3	Applying contemporary logical design methods and tools for databases and derive a physical design for a database from its logical design.	
CO4	Analyze and design a real database application.	
CO5	Evaluate a real database application using a database management system.	
Course Content		
Block 1	**Introduction to Database Management Systems**: File-based system, drawbacks of file-Based System, Data and information, Database, Database management System, Characteristics of database approach, data models, DBMS architecture and data independence.	
Block 2	**Entity Relationship and Enhanced ER Modeling:** Entity types, relationships, SQL: Schema Definition, constraints, and object modeling.	
Block 3	**Relational Data Model :** Basic concepts, ACID property, CODD Rules, concept of key, relational integrity, primary key, foreign key, normalization, 1st normal form, 2nd normal form & 3rd normal form, 4th Normal Form and 5th Normal Form, relational algebra	
Block 4	**Structured Query Language:** Introduction, Commands in SQL, Data Types in SQL, Data Definition Language, Data Manipulation Language, Data Control Language, Table Modification Commands, primary & foreign keys.	
Block 5	**Database design**: ER and EER to relational mapping, functional dependencies, normal forms up to fifth normal form, Introduction to OODBMS and ORDBMS	
Text Books	1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010. 2. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.	
Reference Books	1. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw- Hill, 2002. 2. R, Elmasri, S.B. Navathe Database Systems Models. Languages, Design and application Programming, 6th Edition, Pearson Education, 2013. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO202T24	Core Course – 2 BCA Semester II **Discrete Mathematics**	C-3
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Simplify and evaluate basic logic statements including compound statements, implications, inverses, converses, and contra positives using truth tables and the properties of logic.	
CO2	Express a logic sentence in terms of predicates, quantifiers, and logical connectives	
CO3	Apply the operations of sets and use Venn diagrams to solve applied problems; solve problems using the principle of inclusion-exclusion.	
CO4	Determine the domain and range of a discrete or non-discrete function, graph functions, Identify one-to-one functions, perform the composition of functions, find and/or graph the inverse of a function, and apply the properties of functions to application problems.	
CO5	Verify that a simple program segment with given initial and final assertions is correct using the rule of inference for verification of partial correctness and loop invariants.	
Course Content		
Block 1	Introduction: Introduction to Sets, Finite and Infinite Sets, Unaccountably Infinite Sets. Introduction to Functions and relations, Properties of Binary relations, Closure, Partial Ordering Relations	
Block 2	Pigeonhole Principle, Permutation and Combinations, Mathematical Induction, Principle of Inclusion and Exclusion	
Block 3	Asymptotic Notations, Recurrence Relations: Introduction, Generating Functions, Linear Recurrence Relations with constant coefficients and their solution	
Block 4	Graphs Theory: Basic Terminology of Graphs, Models and Types, Multigraphs, Weighted Graphs, Graph Representation, Graph Isomorphism, Graph Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Basic Terminology of Trees, Properties of Trees, Spanning Trees	
Block 5	Inference Theory: Introduction, Logical Connectives, Well Formed Formulas, Tautologies, Equivalence	
Text Books	1. C, L Liu and D.P. Mohapatra, Elements of Discrete Mathematics, Third Edition, Tata McGraw Hill, 2008. 2. K. Rosen, Discrete Mathematics and Its Applications, Sixth Edition, Tata McGraw Hi 11, 2007.	
Reference Books	1. T.H. Gormen, C.E. Leiserson, R.L. Rivest, Introduction to Algorithms, Third Edition,Prentice Hall of India,2010. 2. J.P. Trembley, R. Manohar, Discrete Mathematical Structures with Application to Computer Science, First Edition, Tata McGraw Hilt, 2001. 3. David Gries, Fred B. Schneider, A Logical Approach to Discrete Math, Springer; 2010. *Latest Editions of all the suggested books are recommended	
Online Reading/Supporting Material:	**1.** http://ocw.mit.edu/course5/electrical-engineering-and--computer science/6-042j-mathematics-fpr-computer- science-fal 1-2005/	

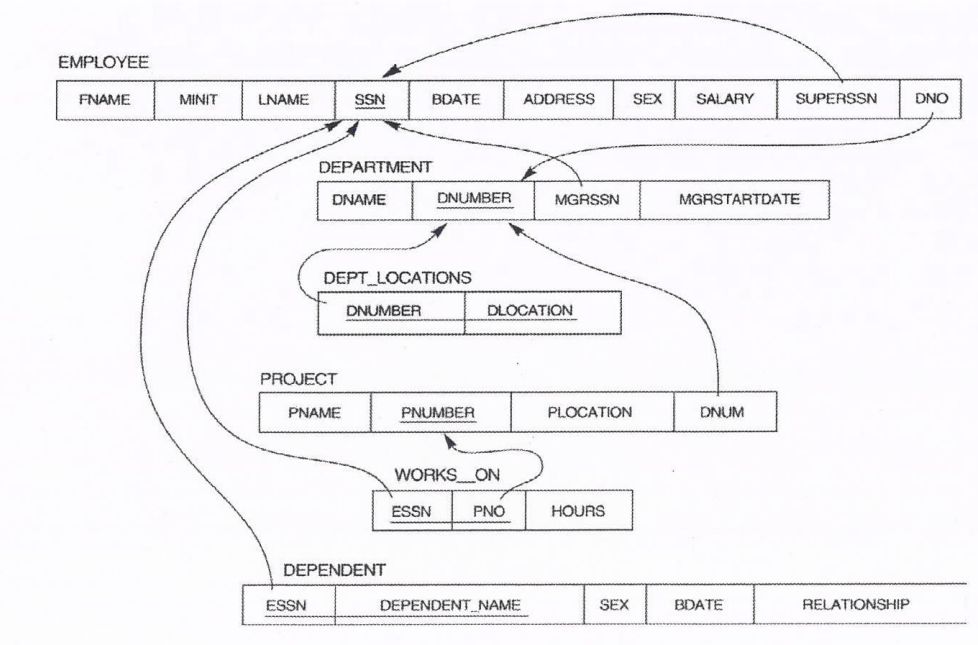
Course Code DBCACO203T24	Core Course – 3 BCA Semester II **Analysis of Algorithms and Data Structures**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Understand basic data structures (such as an array based list, linked list, stack, queue, binary search tree) and algorithms.	
CO2	Acquire the knowledge to analyze, design, apply and use data structures and algorithms to solve engineering problems	
CO3	Evaluate the solutions of problems by implementing them using the advance data structures.	
CO4	Apply modern tool to solve engineering problems using C.	
CO5	Describe an understanding of analysis of algorithms.	
CO6	Synthesize an algorithm or program code or segment that contains iterative constructs and analyze the code segment.	
Course Content		
Block 1	**Introduction:** Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm **Algorithm Design Techniques:** Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms, Asymptotic Notations	
Block 2	**Sorting Techniques:** Elementary sorting techniques-Bubble Sort, Insertion Sort, Merge Sort, Advanced **Sorting techniques:** Heap Sort, Quick Sort, Sorting in Linear Time-Bucket Sort, Radix Sort and Count Sort. **Searching Techniques:** Linear and Binary search **Complexity Analysis:** Medians & Order Statistics.	
Block 3	**Data Structures**: Arrays Single and Multi-dimensional Arrays, Sparse Matrices, Stacks Implementing stack using array and linked list, Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another.	
Block 4	Queues: Array and Linked representation of Queue, De-queue, Priority Queues Linked Lists: Singly, Doubly and Circular Lists, representation of Stack and Queue as Linked Lists.	
Block 5	Recursion Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion. Trees Introduction to Tree as a data structure; Binary Trees, Binary Search Tree, (Creation, and Traversals of Binary Search Trees), Heaps, Red-black trees	
Text Books	1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction to Algorithms, PHI, 3rd Edition 2009. 2. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson. 3. Seymour Lipschutz, Data Structures with C, Mcgraw Hill	
Reference Books	1. Sarabasse & A.V. Gelder Computer Algorithm-Introduction to Design and Analysis, Publisher - Pearson 3rd Edition 1999. 2. Adam Drozdek, "Data Structures and algorithm in C++", Third	

	Edition, Cengage Learning, 2012. 3. SartajSahni, Data Structures, “Algorithms and applications in C++", Second Edition, Universities Press, 2011. 4. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using C and C++:, Second edition, PHI, 2009. 5. D.S Malik, Data Structure using C++,Second edition, Cengage Learning, 2010 *Latest Editions of all the suggested books are recommended	

Course Code DBCAVA204T24	Value Added Course – 1 BCA Semester II **Environment Science**	C-2
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identify and justify key stakeholders in humanities and social sciences that need to be a part of sustainable solutions.	
CO2	Articulate the interdisciplinary context of environmental issues.	
CO3	Formulate an action plan for sustainable alternatives that integrate science, humanist, and social perspectives.	
CO4	Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.	
CO5	Access the qualitative and quantitative research methods to gain empirical evidence bearing on evaluation of environmentally sustainable alternatives	
Course Content		
Block 1	**Introduction To Environmental Sciences:** Natural Resources: Environmental Sciences, Relevance, Significance of Public awareness, Forest resources, Water resources, Mineral resources, Food resources, conflicts over resource sharing, Exploitation, Land use pattern, Environmental impact, fertilizer, Pesticide Problems, case studies.	
Block 2	**Ecosystem, Biodiversity and Its Conservation:** Ecosystem, concept, structure and function producers, consumers and decomposers, Food chain, Food web, Ecological pyramids, Energy flow, Forest, Grassland, desert and aquatic ecosystem Biodiversity, Definition genetic, species and ecosystem diversity, Values and uses of biodiversity, biodiversity at global, national (India) and local levels Hotspots, threats to biodiversity conservation of biodiversity Insitu & Exsitu	
Block 3	**Environmental Pollution And Management:** Environmental Pollution, Causes, Effects and control measures of Air, Water, Marine, soil, solid waste, Thermal, Nuclear pollution and Disaster Management, Floods, Earth quake, Cyclone and Landslides. Role of individuals in prevention of pollution, pollution case studies.	
Block 4	**Social Issues, Human Population:** Urban issues, Energy water conservation, Environmental Ethics, Global warming, Resettlement and Rehabilitation issues, Environmental legislations, Environmental production Act. 1986 Air, Water, Wildlife and forest conservation Act, Population growth and Explosion, Human rights and Value Education Environmental Health HIV/AIDS - Role of IT in Environment and Human Health, Women and child welfare, Public awareness, Case studies.	
Block 5	Visit to a local area / local polluted site / local simple ecosystem Report submission.	
Text Books	1. Kumarasamy, k., A Alagappa Moses and M.Vasanthy, 2004, Environmental studies, Bharathisadan University Publication, Trichy. 2. Kalavathy, s. (ed.) 2004, Environmental studies, Bishop Heber College Publication, Trichy. *Latest Editions of all the suggested books are recommended	
Reference Books	1. Rajamannar, 2004, environmental studies, Ever College Publication, Trichy.	

Course Code DBCASE205T24	Skill Enhancement Course – 1 BCA Semester II **HTML Programming**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Remember about the concept of web application.	
CO2	Illustrate d concepts of interactive web page(s) using HTML, CSS and JavaScript.	
CO3	Build a responsive web site using HTML5 and CSS3.	
CO4	Assess role of HTML and CSS in effective web development.	
CO5	Develop an effective web application using HTML and CSS as per the plan.	
Course Content		
Block 1	**HTML** Introduction: Introduction to the Internet, History of HTML, The Head, the Body, Colors, Attributes, Lists, ordered and unordered. HTML Basic Tags, HTML Formatting Tags, HTML Color Coding, Unicode Transformation Format (UTF), Metadata.	
Block 2	**Page Formatting:** Adding a New Paragraph, Adding a Line Break, Inserting Blank Space, Preformatted Text, Changing a Page's Background Color, Div Element. **Links:** Introduction, Relative Links, Absolute Links, Link Attributes, Using the ID Attribute to Link Within a Document.	
Block 3	**Images:** Putting an Image on a Page Using Images as Links, Putting an Image in the Background. **Tables:** Creating a Table, Table Headers, Table Borders, Table Headers, Captions, Spanning Multiple Column, Styling Table.	
Block 4	**Forms:** Basic Input and Attributes Other Kinds of Inputs, Styling forms with CSS. IFrames: Inserting IFrames, Setting Height and Width, Using an IFrame for a link target. Video and Audio: About Video and Audio Files, Linking to Video and Audio Files, Adding Video, Adding Audio, Using YouTube to Display Video.	
Block 5	Overview of Meta tags and SEO (Search Engine Optimization), Using a search engine to find information, Create and publish a multi-page web site using these technologies.	
Text Books	1. Introduction to HTML and CSS-O'Reilly, 2010 2. Jon Duckett, HTML and CSS, John Wiely, 2012 3. Steven Holzner, HTML Black Book, 2000 *Latest Editions of all the suggested books are recommended	
Reference Books	1. Lynch, P. J., & Horton, S. (2016). *Web Style Guide: Basic Design Principles for Creating Web Sites* (4th ed.). Yale University Press. 2. Shirley, S. (2021). *HTML and HTML5: The Complete Guide to Web Development* (3rd ed.). Apress. 3. Tate, T. (2022). *Responsive Web Design with HTML5 and CSS3* (2nd ed.). Packt Publishing.	

Course Code DBCACO206P24	Core Course – 1 BCA Semester II **Database Management System Lab**	C-2
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Demonstrate an understanding of the elementary & advanced features of DBMS & RDBMS.	
CO2	Develop a clear understanding of the conceptual frameworks and definitions of specific terms that are integral to the Relational Database Management.	
CO3	Understand the basic concepts of Concurrency Control & database security	
CO4	Understand the basic concept how storage techniques are used to backup data and maintain data access performance in peak hours	
CO5	Attain a good practical understanding of the SQL.	
CO6	Develop clear concepts about Relational Model.	
CO7	Examine techniques pertaining to Database design practices and prepare various database tables and joins them using SQL commands	
CO8	Evaluate options to make informed decisions that meet data storage, processing, and retrieval needs.	
Exercises		
Experiment 1	**DDL Commands** • Create table, after table, drop table	
Experiment 2	**DML Commands** • Select, update, delete, insert statements • Condition specification using Boolean and comparison operators (and, or, not, =,<>, >, <, >=, <=,) • Arithmetic operators and aggregate functions{Count, sum, avg, Min, Max) • Multiple table queries (join on different and same tables) • Nested select statements • Set manipulation using (any, in, contains, all, not in, not contains, exists, not exists, union, intersect, minus, etc.) • Categorization using group by……..having • Arranging using order by	
Experiment 3	**Relational Database Schema – COMPANY**	



Exercises to be performed on above schema

1. Create tables with relevant foreign key constraints

2. Populate the tables with data

3. Perform the following queries on the database :

i. Display all the details of all employees working in the company.

ii. Display ssn, lname, fname, address of employees who work in department no 7.

iii. Retrieve the birthdate and address of the employee whose name is 'Franklin T. Wong'

iv. Retrieve the name and salary of every employee

v. Retrieve all distinct salary values

vi. Retrieve all employee names whose address is in 'Bellaire'

vii. Retrieve all employees who were born during the 1950s

viii. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000(inclusive)

ix. Retrieve the names of all employees who do not have supervisors

x. Retrieve SSN and department name for all employees

xi. Retrieve the name and address of all employees who work for the 'Research' department

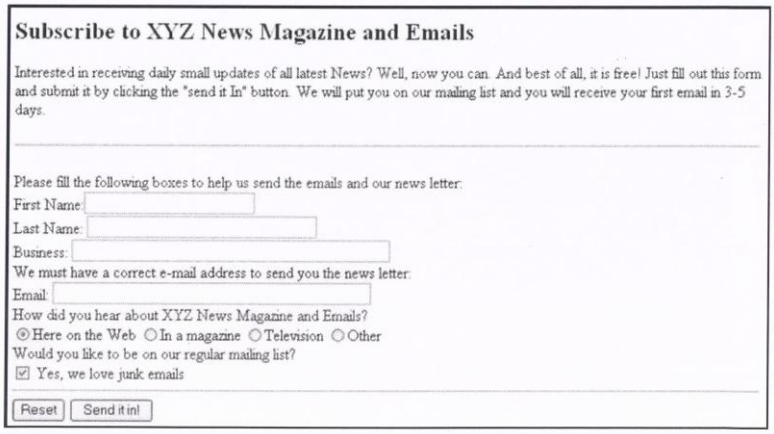
	xii. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birth date. xiii. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor. xiv. Retrieve all combinations of Employee Name and Department Name xv. Make a list of all project numbers for projects that involve an employee whose last name is 'Narayan' either as a worker or as a manager of the department that controls the project. xvi. Increase the salary of all employees working on the 'Product' project by 15%. Retrieve employee name and increased salary of these employees. xvii. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employee first name. xviii. Select the names of employees whose salary does not match with salary of any employee in department 10. xix. Retrieve the name of each employee who has a dependent with the same first name and same sex as the employee. xx. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford. xxi. Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary. Display with proper heading xxii. Find the sum of the salaries and number of employees of all employees of the 'Marketing' department, as well as the maximum salary, the minimum salary, and the average salary in this department. xxiii. Select the names of employees whose salary is greater than the average salary of all employees in department 10. xxiv. For each department, retrieve the department number, the number of employees in the department, and their average salary. xxv. For each project, retrieve the project number, the project name, and the number of employees who work on that project. xxvi. Change the location and controlling department number for all projects having more than 5 employees to 'Bellaire' and 6 respectively. xxvii. For each department having more than 10 employees, retrieve the department no, no of employees drawing more than 40,000 as salary. xxviii. Insert a record in Project table which violates referential integrity constraint with respect to Department number. Now remove the violation by making necessary Insertion in the Department table.	

	xxix. Delete all dependents of employee whose ssn is '123456789'. xxx. Delete an employee from Employee table with ssn = '12345' (make sure that this employee has some dependents, is working on some project, is a manager of some department and is supervising some employees), Check and display the cascading effect on Dependent and Works on table. In Department table MGRSSN should be set to default value and in Employee table SUPERSSN should be set to NULL xxxi. Perform a query using alter command to drop/add field and a constraint in Employee table.	
Experiment 4	Design and implementation of Binary to gray code converter using logic gates.	
Experiment 5	Design and implementation of 4 bit binary Adder/ Subtractor using IC 7483	
Experiment 6	Design and implementation of 4 bit binary BCD adder using IC 7483	
Experiment 7	Design and implementation of 2 bit Magnitude Comparator using logic gates.	
Experiment 8	Design and implementation of 16 bit odd/even parity checker generator.	
Experiment 9	Design and implementation of multiplexer using logic gates IC74150 and IC74154.	
Experiment 10	Design and implementation of De-multiplexer using logic gates IC74150 and IC74154	
Experiment 11	Design and implementation of encoder using logic gates IC7445 and IC74147	
Experiment 12	Design and implementation of decoder using logic gates 1C7445 and IC74147	
Experiment 13	Construction and verification of 4 bit ripple counter,	
Experiment 14	Design and implementation of 3-bit synchronous up/down counter.	
Experiment 15	Implementation of SISO SIPO PISO and PIPO shift registers using Flip- flops	
Reference	1. **Ramakrishnan, R., & Gehrke, J.** (2015). *Database Management Systems* (3rd ed.). McGraw-Hill Education. **2. Elmasri, R., & Navathe, S. B.** (2021). *Fundamentals of Database Systems* (7th ed.). Pearson. 3. **Kroenke, D. M., & Auer, D. J.** (2018). *Database Processing: Fundamentals, Design, and Implementation* (14th ed.). Pearson. 4. **Hernandez, M. J.** (2020). *Database Design for Mere Mortals: A Hands-On Guide to Relational Database Design* (4th ed.). Addison-Wesley. 5. **Chaudhuri, S., & Dayal, U.** (2020). *Database Management Systems: A Practical Approach* (1st ed.). Wiley. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO207P24	Core Course – 2 BCA Semester II **Data Structures Using 'C' Lab**	**C-2**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Recall how to analyze algorithms and estimate their worst-case and average-case behavior (in easy cases).	
CO2	Illustrate a given problem and develop an algorithm to solve the problem	
CO3	Determine the fundamental data structures and with the manner in which data structures can be best be implemented	
CO4	Design the description of algorithms in both functional and procedural styles.	
CO5	Implement theoretical knowledge in practice (via the practical component of the course).	
Exercises		
Experiment 1	Write a program to implement Simple array.	
Experiment 2	Write a program to input N element into a 1-d array and insert an item at particular position.	
Experiment 3	Write a program to input N element into 1-d array and delete an item from particular position.	
Experiment 4	Write a program to input N element into an array, find the location of an item using linear search.	
Experiment 5	Write a program to input N element into an array, find the location of an item using Binary search.	
Experiment 6	Write a program to perform addition of two matrices.	
Experiment 7	Write a program to perform multiplication of two matrices.	
Experiment 8	Write a program to perform transpose of a matrix.	
Experiment 9	Implementation of Recursive function.	
Experiment 10	Write a program to implement bubble sort on an array.	
Experiment 11	Write a program to implement selection sort on an array.	
Experiment 12	Implement Insertion Sort (The program should report the number of comparisons)	
Experiment 13	Implement Merge Sort(The program should report the number of comparisons)	
Experiment 14	Implement Heap Sort (The program should report the number of comparisons)	
Experiment 15	Implement Randomized Quick sort (The program should report the number of comparisons).	
Experiment 16	Implement Radix Sort.	
Experiment 17	Write a program to implement of stack operations using array.	
Experiment 18	Write a program to implement of queue operations using array.	
Experiment 19	Write a program to create a linked list, display its element and search an element in it.	

Experiment 20	Write a program to implement stack operations using linked list.	
Experiment 21	Write a program to implement queue operations using linked list.	
Experiment 22	Implementation of Single, Double and circular Linked List	
Experiment 23	Creation and traversal of Binary Search Tree.	
Experiment 24	Write a program to perform the following operations: Insert an element into a binary search tree. Delete an element from a binary search tree. Search for a key element in a binary search tree.	
Experiment 25	Write a program that use recursive functions to traverse the given binary tree in Preorder b) Inorder and c) Postorder.	
Reference	1. **Tanenbaum, A. S., & Langsam, Y. (2017).** *Data Structures Using C (2nd ed.)*. Pearson Education. **2**. **Seymour, L. (2020).** *Data Structures and Algorithms in C (3rd ed.)*. Cengage Learning. 3. **Kruse, R. L., & Tondo, C. L. (2017).** *Data Structures and Program Design in C (4th ed.)*. Pearson Education. 4. **Reema Thareja. (2018).** *Data Structures Using C (2nd ed.)*. Oxford University Press. *Latest Editions of all the suggested books are recommended	

<table>
<tr><td>Course Code
DBCASE208P24</td><td>Skill Enhancement Course – 1
BCA Semester II
HTML Programming Lab with projects</td><td>C-2</td></tr>
<tr><td>Course Outcomes</td><td colspan="2">On completion of the course, the students will be able to</td></tr>
<tr><td>CO1</td><td colspan="2">Students learn about the concept of web application creation using HTML.</td></tr>
<tr><td>CO2</td><td colspan="2">Different formatting options used while creating the web pages.</td></tr>
<tr><td>CO3</td><td colspan="2">Build a responsive web site using HTML5 and CSS3.</td></tr>
<tr><td>CO4</td><td colspan="2">Understand the role of HTML and CSS in effective web development along with its uses.</td></tr>
<tr><td>CO5</td><td colspan="2">Develop an effective web application using HTML and CSS as per the projects.</td></tr>
<tr><td colspan="3"><u>Exercises</u></td></tr>
<tr><td>Experiment 1</td><td colspan="2">Create an HTML document with the following formatting options:
1. Bold
2. Italics
3. Underline
4. Font (Type, Size and Color)
5. Pre tag</td></tr>
<tr><td>Experiment 2</td><td colspan="2">Create an HTML document which consists of:
1. Ordered List
2. Unordered List
3. Nested List
4. Image</td></tr>
<tr><td>Experiment 3</td><td colspan="2">Create an HTML document which implements Internal linking as well as External linking.</td></tr>
<tr><td>Experiment 4</td><td colspan="2">Create a table using HTML which consists of columns for Roll No., Student's name and grade.
<table><tr><td colspan="3">Result</td></tr><tr><td>Roll No.</td><td>Name</td><td>Grade</td></tr><tr><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>Experiment 5</td><td colspan="2">Create a Table with the following view:
<table><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td colspan="3"></td><td colspan="2" rowspan="3">Place an image here</td></tr><tr><td colspan="3"></td></tr><tr><td colspan="3"></td></tr></table></td></tr>
<tr><td>Experiment 6</td><td colspan="2">Create a form using HTML which has the following types of controls:
I. Text Box
II. Option/radio buttons
III. Check boxes
IV Reset and Submit buttons</td></tr>
</table>

<table>
<tr>
<td></td>
<td> 
</td>
<td></td>
</tr>
<tr>
<td>Experiment 7</td>
<td>Create HTML documents (having multiple frames) in the following three formats:
<table>
<tr><td>Frame 1</td></tr>
<tr><td>Frame2</td></tr>
</table>
<table>
<tr><td colspan="2">Frame 1</td></tr>
<tr><td>Frame2</td><td>Frame3</td></tr>
</table>
`</td>
<td></td>
</tr>
<tr>
<td></td>
<td>List of projects using HTML and CSS(Only for web page and UI design):

Interactive response system like any CRM of MNC
Railway project administration system
Worker loan management system
A catalog management system
School management system
Hospital management system
Cyber Café ID system daily Report
Internet and Data report login system
Mobile dealership management system
Garment shop barcode with billing system
Coffee shop management system
</td>
<td></td>
</tr>
</table>

	12) School library system 13) College organization system 14) Travel Reservation system 15|)Radio record system	
Reference	1. Ruvalcaba, Z., & Boehm, A. (2021). *Murach's HTML and CSS* (5th ed.). Murach. ISBN: 978-1-943872-90-9. 2. Boehm, A. (2021). *Lab Manual for Murach's HTML and CSS* (5th ed.). Murach. ISBN: 978-1-943872-92-3. *Latest Editions of all the suggested books are recommended	

Semester – III

Course Code DBCACO301T24	Core Course – 1 BCA Semester III **Operating System**	C-3
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Recall the main components of an OS & describe the important computer system resources functions and the types of Operating Systems.	
CO2	Explain the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS and understand the factors in OS design.	
CO3	Evaluate the requirement for process synchronization and coordination handled by operating system	
CO4	Categorize memory organization and explain the function of each element of a memory hierarchy and analyze its allocation policies.	
CO5	Conceptualize the components involved in designing a contemporary OS.	
Course Content		
Block 1	**Introduction:** System Software, Resource Abstraction, OS strategies. **Types of operating systems -** Multiprogramming, Batch, Time Sharing, Single user and Multiuser, Process Control & Real Time Systems	
Block 2	**Operating System Organization:** Factors in operating system design, basic OS functions, implementation consideration; process modes, methods of requesting system services - system Calls and system programs.	
Block 3	**Process Management:** System view of the process and resources, initiating the OS, process address space, process abstraction, resource abstraction, process hierarchy, Thread model, Deadlocks **Scheduling:** Scheduling Mechanisms, Strategy selection, non-pre-emptive and pre-emptive strategies.	
Block 4	**Memory Management:** Mapping address space to memory space, memory allocation strategies, fixed partition, variable partition, paging, virtual memory, Introduction to File Management, IO Management	
Block 5	**Shell introduction and Shell Scripting:** What is shell and various type of shell, Various editors present in Linux, Different modes of operation in	

	vi editor, shell script, Writing and executing the shell script, Shell variable (user defined and system variables), System calls, Using system calls, Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell, Function, Utility programs (cut, paste, join, tr, uniq utilities), Pattern matching utility (grep)	
Text Books	1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008. 2. A.S. Tanenbaurn, Modern Operating Systems, 3rd Edition, Pearson Education 2007. *Latest Editions of all the suggested books are recommended	
Reference Books	1. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997. 2. W, Stallings, Operating Systems, Internals & Design Principles, 5th Edition, Prentice Hall of India. 2008. 3. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.	

Course Code DBCACO302T24	Core Course – 2 BCA Semester III **OOPS Using C++**	C-3
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Have profound knowledge of object oriented programming.	
CO2	Demonstrate the difference between the solutions offered by traditional imperative	
CO3	Illustrate problem solving methods and object-oriented methods.	
CO4	Explain the class inheritance, data encapsulation, polymorphism as fundamental building blocks to generate reusable code.	
CO5	Understand and implement error handling and file handling routines.	
Course Content		
Block 1	Different paradigms for problem solving, differences between OOP and Procedure oriented programming, Abstraction, Overview of OOP principles, Encapsulation, Inheritance and Polymorphism. **C++ Basics:** Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings.	
Block 2	Flow control statement- if, switch, while, for, do, break, continue, got statements. Functions-Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions, Dynamic memory allocation and de-allocation operators-new and delete, Preprocessor directives C++ Classes And Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors	
Block 3	**Polymorphism:** Function overloading, Operator overloading, Generic programming, necessity of templates, Function templates and class templates. **Inheritance:** Defining a class hierarchy, Different forms of inheritance. Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction.	

	Destructors, Virtual base class.	
Block 4	**Virtual Functions and Polymorphism:** Static and Dynamic bindings, Base and Derived class virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions.	
Block 5	**C++ I/O:** I/O using C functions, Stream classes' hierarchy, Stream I/O, File streams and String streams, Overloading « and » operators, Error handling during file operations, Formatted I/O. **Exception Handling:** Benefits of exception handling, throwing an exception, the try block, catching an exception	
Text Books	1. Problem solving with C++, The OOP, 4th Edition, Walter Savitch, Pearson Education. 2. C++, The Complete Reference, 4th Edition, Herbert Schildt, TMH. *Latest Editions of all the suggested books are recommended	
Reference Books	1. C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education. 2. The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Education. 3. OOP in C++, 3rd Edition, T.Gaddis, J.Walters and G.Muganda, Wiley DreamTech Press. 4. Mastering C++, K.R. Venugopal, Rajkumar Buyya, McGraw Hill Education, 2017.	

Course Code DBCACO303T24	Core Course – 3 BCA Semester III **Software Engineering**	C-3
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	
CO2	Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
CO3	Communicate effectively with a range of audiences	
CO4	Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
CO5	Acquire and apply new knowledge as needed, using appropriate learning strategies	
CO6	Develop efficient software using latest tools and techniques. Use of computer aided designing and automated testing tools.	
Course Content		
Block 1	**Software Process:** Introduction, Software Engineering Paradigm, life cycle models (water fall, incremental, spiral, evolutionary, prototyping, object oriented), System engineering, computer based system, verification, validation, life cycle process, development process, system engineering hierarchy.	
Block 2	**Software requirements:** Functional and non-functional requirements, requirement engineering process, feasibility studies, validation and management, software prototyping, prototyping in the software process, rapid prototyping techniques, user interface prototyping, Software document analysis and modeling, data, functional and behavioral models, structured analysis and data dictionary	
Block 3	Design Concepts and Principles: Design process and concepts, modular design, design heuristic, design model and document, Architectural design, software architecture, data design, architectural design, transform and transaction mapping, user interface design, user interface design principles, Real time systems, Real time software design, system design, real time execution, data acquisition system, monitoring and control system.	
Block 4	**Software Configuration Management:** The SCM process, Version control, Change control, Configuration audit, SCM standards. **Software Project Management:** Measures and measurements, S/W complexity and science measure, size measure, data and logic structure measure, information flow measure. Estimations for Software Projects, Empirical Estimation Models, Project	

	Scheduling,	
Block 5	Testing: Taxonomy of software testing, levels, test activities, types of software test, black box testing boundary conditions, structural testing, test coverage criteria based on data flow, mechanisms, and regression testing in the large. Software testing strategies, strategic approach and issues, Unit testing, integration testing, validation testing, system testing and debugging **Trends in Software Engineering:** Reverse Engineering and Re-engineering: wrappers, Case Study of CASE tools.	
Text Books	1. Roger S. Pressman, Software engineering- A practitioner's Approach, McGraw-Hill 2. Ian Sommerville, Software engineering, Pearson education Asia, 6th edition. 2000. 3. Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997 *Latest Editions of all the suggested books are recommended	
Reference Books	1. James F Peters and Witold Pedryez, "Software Engineering-An Engineering Approach", John Wiley and Sons, New Delhi, 2000. 2. Ali Behforooz and Frederick J Hudson, "Software Engineering Fundamentals", Oxford University Press, New Delhi, 1996	

Course Code DBCACO304T24	Core Course – 4 BCA Semester III **Computer Networks**	C-3
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Independently understand basic computer network technology.	
CO2	Identify the different types of network topologies and protocols.	
CO3	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.	
CO4	Identify the different types of network devices and their functions within a network	
CO5	Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.	
Course Content		
Block 1	**Basic Concepts:** Components of data communication, standards and organizations, Network Classification, Network Topologies; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.	
Block 2	**Physical Layer:** Cabling, Network Interface Card, Transmission Media Devices- Repeater, Hub, Bridge, Switch, Router, Gateway. Data Link Layer: Framing techniques; Error Control; Flow Control Protocols; shared media protocols - CSMA/CD and CSMA/CA.	
Block 3	**Network Layer:** Virtual Circuits and Datagram approach, IP addressing methods - Subnetting; Routing Algorithms (adaptive and non-adaptive) **Transport Layer:** Transport services, Transport Layer protocol of TCP and UDP	
Block 4	**Application Layer:** Application layer protocols and services - Domain name system, HTTP, WWW, telnet, FTP, SMTP	
Block 5	**Network Security:** Common Terms, Firewalls, Virtual Private Networks.	
Text Books	1. B.A. Forouzan: Data Communication and Networking, 4th Edition, Tata McGraw Hill, 2007. 2. D.E. Comer, Internetworking with TCP/IP, Vol. I, Prentice Hall of India, 1998 *Latest Editions of all the suggested books are recommended	
Reference Books	1. W. Stalling, Data & Computer Communication, 8th edition, Prentice Hall of India, 2006. 2. D. Bertsekas, R. Gallager, Data Networks, 2nd edition, Prentice Hall of India, 1992.	

Course Code DBCASE305T24	Skill Enhancement Course – 1 BCA Semester III **MySQL (SQL/PL-SQL)**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Remember key concepts related to SQL including DDL, DML, DCL, DTL commands.	
CO2	Understanding of PL/SQL elements like Cursors, Procedures, functions, triggers.	
CO3	Applying cursors, procedures, functions and triggers on student database to perform different updating and manipulations in existing tables in database. Use of stored procedures, functions, cursors to ensure max reusability.	
CO4	Analyze the limitations of SQL and supports provided by procedural language to develop a effective application.	
CO5	Built a strong adherence in procedural language while creating application.	
Course Content		
Block 1	**SQL Vs. SQL * Plus:** SQL Commands and Data types, Operators and Expressions, Introduction to SQL* Plus.	
Block 2	**Managing Tables and Data:** Creating and Altering Tables (Including constraints),Data Manipulation Command like Insert, update, delete, SELECT statement with WHERE, GROUP BY and HAVING, ORDER BY, DISTINCT, Special operator like IN, ANY, ALL BETWEEN, EXISTS, LIKE.	
Block 3	**Join, Built in functions, Other Database Objects:** View, Synonyms, Index. Transaction Control Statements: Commit, Rollback, Savepoint	
Block 4	**PL/SQL:** SQL v/s PL/SQL, PL/SQL Block Structure, Language construct of PL/SQL (Variables, Basic and Composite Data type, Conditions looping etc.), % TYPE and % ROWTYPE. Using Cursor (Implicit, Explicit)	
Block 5	**PL/SQL Procedure**, Triggers, Exporting and importing data between MYSQL and Microsoft excel.	
Text Books	1. Baron Schwartz, High Performance MySQL, O'Reilly, 2012. 2. Vikram Vaswani, The Complete Reference MySQL, McGraw Hill Educations, 2004. *Latest Editions of all the suggested books are recommended	
Reference Books	1. Dyer, R. MySQL in a Nutshell 2e, OReilly; Rev Ed edition, (2008) 2. Reese, G. MySQL Pocket Reference 2e, O'Reilly, (2007)	
Online Reading/Supporting Material	1. MySQL http://www.mysql.com/ MySQL 5.0 Reference Manual. 2. http://dev,mysql.com/doc/refman/5.0/en/index.html	

Course Code DBCACO306P24	Core Course – 1 BCA Semester III **Operating Systems Lab**	C-2
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Remember the functions, structures and history of operating systems.	
CO2	Understand of design issues associated with operating systems	
CO3	Apply concepts including scheduling, synchronization and deadlocks.	
CO4	Distinguish multithreading , Multitasking & Multiprogramming and also able to explain the concept of memory management including virtual Evaluate the requirement for process synchronization and coordination handled by operating system	
CO5	Categorize memory organization and explain the function of each element of a memory hierarchy and analyze its allocation policies.	
CO6	Conceptualize the components involved in designing a contemporary OS.	
Exercises		
Experiment 1	1. Simulate the following CPU scheduling algorithms. a) FCFS b) SJF c) Round Robin d) Priority.	
Experiment 2	Write a C program to simulate producer-consumer problem using Semaphores	
Experiment 3	Write a C program to simulate the concept of Dining-philosophers problem.	
Experiment 4	Write a C program to simulate the following contiguous memory Techniques a) Worst fit b) Best fit c) First fit.	
Experiment 5	Simulate all page replacement algorithms a)FIFO b) LRU c) OPTIMAL	
Experiment 6	. Simulate all File Organization Techniques a) Single level directory b) Two level directory	
Experiment 7	Simulate all file allocation strategies a) Sequential b) Indexed c) Linked.	
Experiment 8	Simulate Bankers Algorithm for Dead Lock Avoidance.	
Experiment 9	Simulate Bankers Algorithm for Dead Lock Prevention.	
Experiment 10	Write a C program to simulate disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN	
Reference	1. Silberschatz, A., Galvin, P. B., & Gagne, G. (2023). *Operating System Concepts* (10th ed.). Wiley.	

	2. Tanenbaum, A. S., & Bos, H. (2023). *Modern Operating Systems* (5th ed.). Pearson Education. 3. Stallings, W. (2022). *Operating Systems: Internals and Design Principles* (9th ed.). Pearson Education. 4. Nemeth, E., Snyder, G., Hein, T. R., Whaley, B., & Mackin, D. (2023). *Unix and Linux System Administration Handbook* (5th ed.). Pearson Education. 5. Dhamdhere, D. M. (2018). *Introduction to Operating Systems* (3rd ed.). McGraw-Hill Education. 6. Stallings, W. (2021). *Operating Systems: A Systematic View* (8th ed.). Pearson Education. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO307P24	Core Course – 2 BCA Semester III **OOPs Using C++ Lab**	**C-2**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Acquire profound knowledge of object oriented programming.	
CO2	Demonstrate the difference between the solutions offered by traditional imperative problem solving method and object-oriented method	
CO3	Explain the class inheritance, data encapsulation, polymorphism as fundamental building blocks to generate reusable code.	
CO4	Explain the class inheritance, data encapsulation, polymorphism as fundamental building blocks to generate reusable code.	
Exercises		
Experiment 1	Write a C++ program for function with default arguments	
Experiment 2	Write a C++ program to illustrate the concept of call by value.	
Experiment 3	Write a C++ program to illustrate the concept of call by reference	
Experiment 4	Write a C++ program to illustrate the concept of call by address.	
Experiment 5	Write a C++ program to illustrate the concept of Classes and objects.	
Experiment 6	Write a C++ program to create a mark list using arrays in C++ programming language.	
Experiment 7	Write a C++ program to perform operation on string class.	
Experiment 8	Write a C++ program to implement static member function.	
Experiment 9	Write a C++ program to display the details of a person using constant member function.	
Experiment 10	Write a C++ program to illustrate the concept of unary operator overloading.	
Experiment 11	Write a C++ program to illustrate the concept of Binary operator overloading.	
Experiment 12	Write a C++ program to illustrate the concept of function overloading.	
Experiment 13	Write a C++ program to multiply the positive numbers using single inheritance.	
Experiment 14	Write a C++ program using multiple inheritances for collecting employee details.	
Experiment 15	Write a C++ program for calculation of area of shapes using virtual functions.	
Experiment 16	Write a C++ program for a student mark list processing using virtual base class.	
Experiment 17	Write a C++ program using function template to find the maximum of two data.	
Experiment 18	Write a C++ program using class template to find the greater of the given two data's.	
Experiment 19	Write a C++ program for creating student data using sequential file access.	

Experiment 20	Write a C++ program for creating student data using random file access.	
Reference	1. Balagurusamy, E. (2021). *Object-Oriented Programming with C++* (9th ed.). Tata McGraw-Hill Education. 2. Schildt, H. (2022). *C++: The Complete Reference* (5th ed.). McGraw-Hill Education. 3. Bhatt, R. S. (2020). *Programming in C++* (2nd ed.). Pearson Education. 4. Stroustrup, B. (2013). *The C++ Programming Language* (4th ed.). Addison-Wesley. 5. Lafore, R. (2002). *Object-Oriented Programming in C++* (4th ed.). Sams Publishing. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO308P24	Core Course – 3 BCA Semester III **Software Engineering Lab**	C-1
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Compare between traditional ad-hoc method and SDLC based approach of software development.	
CO2	Understand different theories, models, and techniques related to SDLC.	
CO3	Apply the software engineering lifecycle for different projects by demonstrating competence in communication, planning, analysis, design, construction, and deployment	
CO4	An ability to work in one or more significant application domains. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.	
CO5	Develop of efficient software using latest tools and techniques. Use of computer aided designing and automated testing tools.	
Exercises		
Experiment 1	**Practical Title** • Problem Statement, • Process Mode	
Experiment 2	**Requirement Analysis** • Creating a Data Flow • Data Dictionary, • Use Cases	
Experiment 3	**Project Management** • Computing FP • Effort • Schedule, Risk Table, Timeline chart	
Experiment 4	**Design Engineering** • Architectural Design • Data Design, Component Level Design	
Experiment 5	**Testing** • Basis Path Testing	
Experiment 6	**Sample Projects** • DTC Route Information: Online information about the bus routes and their frequency and fares • Car Pooling: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively. • Patient Appointment and Prescription Management System • Organized Retail Shopping Management Software • Parking Allocation System • Wholesale Management System	

Reference	1. **Pressman, R. S., & Maxim, B. R.** (2022). *Software Engineering: A Practitioner's Approach* (10th ed.). McGraw-Hill Education. **2. Sommerville, I.** (2021). *Software Engineering* (10th ed.). Pearson. 3. **Pankaj Jalote.** (2020). *Software Engineering* (3rd ed.). Wiley India. 4. **McConnell, S.** (2019). *Code Complete: A Practical Handbook of Software Construction* (2nd ed.). Microsoft Press. 5. **Beck, K., Beedle, M., van Bennekum, A., Cockburn, A., Cunningham, W., Fowler, M., ... & Thomas, D.** (2020). *Manifesto for Agile Software Development*. 6 **Freeman, A., & Pryce, N.** (2020). *Growing Object-Oriented Software, Guided by Tests*. Addison-Wesley. *Latest Editions of all the suggested books are recommended	

Course Code DBCASE309P24	Skill Enhancement Course – 1 BCA Semester III **MySQL (SQL/PL-SQL) Lab with Projects**	**C-1**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Learn to use key concepts related to SQL including DDL, DML, DCL and DTL commands.	
CO2	Developing of PL/SQL elements like Cursors, Procedures, functions, triggers.	
CO3	Applying cursors, procedures, functions and triggers on various databases to perform different updating and manipulations in existing tables in database.	
CO4	Building of databases for different project applications.	
Exercises		
Experiment 1	**SQL COMMANDS** 1. SQL* formatting commands 2. To create a table, alter and drop table. 3. To perform select, update, insert and delete operation in a table. 4. To make use of different clauses viz where, group by, having, order by, union and intersection, 5. To study different constraints.	
Experiment 2	**SQL FUNCTION** 1. To use oracle function viz aggregate, numeric, conversion, string function. 2. To understand use and working with joins. 3. To make use of transaction control statement viz rollback, commit and save point. 4. To make views of a table. 5. To make indexes of a table.	
Experiment 3	**PL/SQL** 1. To understand working with PL/SQL 2. To implement Cursor on a table. 3. To implement trigger on a table	
Experiment 4	**List of projects using DBMS (PL/SQL for database design and connectivity)** 1) Interactive response system like any CRM of MNC 2) Railway project administration system 3) Worker loan management system 4) A catalog management system 5) School management system 6) Hospital management system	

	7) Cyber Café ID system daily Report 8) Internet and Data report login system 9) Mobile dealership management system 10) Garment shop barcode with billing system 11) Coffee shop management system 12) School library system 13) College organization system 14) Travel Reservation system 15) Radio record system	
Reference	1. **Ben-Gan, Itzik, et al.** *Microsoft SQL Server 2019: A Beginner's Guide to SQL Server Database Management and Design*. 6th ed., McGraw-Hill Education, 2021. **2**. **Kumar, Rajesh, et al.** *Learning SQL and PL/SQL: A Step-by-Step Guide to Mastering Oracle Database Programming*. 3rd ed., O'Reilly Media, 2023. 3. **Celko, Joe.** *SQL for Smarties: Advanced SQL Programming*. 4th ed., Morgan Kaufmann, 2020. 4. **Ramakrishnan, Raghu, and Johannes Gehrke.** *Database Management Systems*. 3rd ed., McGraw-Hill, 2020. *Latest Editions of all the suggested books are recommended	

Semester – IV

Course Code DBCACO401T24	Core Course – 1 BCA Semester IV **Computer Architecture**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Understand the theory and architecture of central processing unit.	
CO2	Analyze some of the design issues in terms of speed, technology, cost, performance.	
CO3	Design a simple CPU with applying the theory concepts.	
CO4	Use appropriate tools to design verify and test the CPU architecture.	
CO5	Learn the concepts of parallel processing, pipelining and interprocessor communication.	
CO6	Understand the architecture and functionality of central processing unit.	
CO7	Exemplify in a better way the I/O and memory organization.	
CO8	Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.	
Course Content		
Block 1	Basic Computer Organization and Design: Instruction Codes, Computer Registers, Common bus system, Computer Instructions, Instruction formats, Instruction Cycle, Fetch and Decode, Flowchart for Instruction cycle, Register reference instructions.	
Block 2	Register Transfer and Micro-operation: Register Transfer Language, Register Transfer, Bus and Memory Transfer, Three state bus buffers, Memory Transfer; Arithmetic Micro operations, Logic Micro operations..	
Block 3	Micro programmed Control Unit: Design of Control Unit, and Central Processing Unit: Introduction, General Register Organization, and Stack Organization: Register stack. Memory stack; Instruction Formats, Addressing Modes	
Block 4	Input Output Organization: Peripheral devices, Input Output interface, Modes of Data Transfer, Priority Interrupt and Direct Memory Access.	
Block 5	Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.	
Text Books	1. M. Mano, Computer System Architecture, Pearson Education 1992. 2. Digital Design, M.M. Mano, Pearson Education Asia, 1979. *Latest Editions of all the suggested books are recommended	
Reference Books	1. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004. 2. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India, 2009	

Course Code DBCACO402T24	Core Course – 2 BCA Semester IV **Programming in Java**	C-3
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Recall the basic knowledge on Object Oriented concepts specially in java.	
CO2	Create & design applications using Object Oriented Programming Concepts using java	
CO3	Describe for compile, test and run Java programs comprising more than one class	
CO4	Create simple data structures like arrays in a Java program	
CO5	Explain members of classes found in the Java API	
Course Content		
Block 1	**Introduction to Java:** Features of Java, JDK Environment, Object Oriented Programming Concept Overview of Programming, Paradigm, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C++ and JAVA	
Block 2	**Java Programming Fundamental:** Structure of Java program, Data types, Variables, Operators, Keywords, Naming Convention, Decision Making (if, switch),Looping(for, while) ,Type Casting Classes and Objects: Creating Classes and objects, Memory allocation for objects, Constructor	
Block 3	**Arrays and Strings:** Arrays, Creating an array, Types of Arrays, String class Methods, String Buffer methods. Implementation of Inheritance, Implementation of Polymorphism, Method Overloading, Method Overriding, Nested and Inner classes	
Block 4	**Abstract Class, Interface and Packages:** Modifiers and Access Control, Abstract classes and methods, Interfaces, Packages Concept, Creating user defined packages **Exception Handling:** Exception types, using try catch and multiple catch, Nested try, throw, throws and finally, Creating User defined Exceptions.	
Block 5	File Handling: Byte Stream, Character Stream, File 10 Basics, File Operations, Creating file, Reading file, Writing File **Applet Programming:** Introduction. Types Applet, Applet Life cycle, Creating Applet, Applet tag	
Text Books	1. Herbert Schildt, Java 7, The Complete Reference, 8th Edition, 2009. 2. E Balagurusamy, Programming with JAVA, TMH, 2007. *Latest Editions of all the suggested books are recommended	
Reference Books	1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtmljavascript, Perl Cgi, BPB Publications, 2009. 2. Cay Horstmann, BIG Java, Wiley Publication, 3rd Edition, 2009. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO403T24	Core Course – 3 BCA Semester IV **Internet and Web Design**	C-3
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Apply the basic concepts for network implementation. Review the current topics in Web & Internet technologies.	
CO2	Interpret and Learn the basic working scheme of the Internet and World Wide Web.	
CO3	Describe fundamental tools and technologies for web design.	
CO4	Identify and comprehend the technologies for Hypertext Mark-up Language (HTML).	
CO5	Create and specify design rules in constructing web pages and sites.	
Course Content		
Block 1	**Introduction to Web Design:** Introduction to hypertext markup language (html) document Type definition, creating web pages, graphical elements, lists, hyperlinks, tables, web forms, inserting images, frames.	
Block 2	**Customized Features:** Cascading style sheets, (ess) for text formatting and other manipulations, **JavaScript:** Data types, operators, functions, control structures, events and event handling.	
Block 3	**Java:** Use of Objects, Array and Array List class, Designing classes, Inheritance, Input/output, Exception Handling. **JDBC:** JDBC Fundamentals, Establishing Connectivity and working with connection interface, working with statements, Creating and Executing SQL Statements, Working with Result Set Objects	
Block 4	**JSP:** Introduction to JavaServer Pages, HTTP and Servlet Basics, The Problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values	
Block 5	Using an expression to set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data between JSP Pages, Requests, and Users, Database Access.	
Text Books	1. Web Enabled Commercial Application Development Using Html, Dhtml, javascript. Perl Cgi by Ivan Bayross, BPB Publications, 2009. 2. The Complete Reference J2EE, TMH, Jim Keogh, 2002, Java Server Pages, Hans Bergsten, Third Edition, O'Reilly Media December 2003. *Latest Editions of all the suggested books are recommended	
Reference Books	1. BIG Java Cay Horstmann, Wiley Publication , 3rd Edition., 2009 2. Java 7, the Complete Reference, Herbert Schildt, 8th Edition, 2009. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO405T24	Core Course – 4 BCA Semester IV **Shell Programming and System Administration**	C-3
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Understand the installation and configuration of mainstream operating systems, important network services.	
CO2	Explain about disaster recovery procedures, and techniques for ensuring the security of the system.	
CO3	Manage system resources, including methods for tracking system metrics.	
CO4	Apply these skills in the administration of an actual computer system with actual users.	
CO5	Configure desktop environment that users would normally require for day to day operations.	
CO6	Synthesize an algorithm or program code or segment that contains iterative constructs and analyze the code segment.	
Course Content		
Block 1	Overview of Linux:what is Linux, root in Unix,Common Linux Features,advantage of Linux Overview of Unix and Linux architectures,Linux files system, hardware requirements for Linux Linux standard directories,Commands for files and directories cd, ls, cp, rm, mkdir, rmdir, pwd, file, more, less, Creating and viewing files using cat file comparisons	
Block 2	Essential Linux commands, Processes in Linux, Process fundamentals,Connecting processes with pipes, Redirecting input, Redirecting output, Backgroundprocessing, Managing multiple processes, Process scheduling – (at, batch), nohupcommand, kill, ps, who,find, sort, touch, filefile processing commands – wc, cut, paste etc, Mathematical commands – expr, factor etc, Creating files with vi editor, Editing files with vi editor.	
Block 3	Shell programming: Basics of shell programming, various types of shell available in Linux, Comparisons between various shells, Shell programming in bash, Conditional statements Looping statements, Case statements, Parameter passing and arguments, Shell variables, System shell variables, shell keywords, Creating Shell programs for automating system tasks.	
Block 4	System administration: Common administrative tasks, identifying administrative files, Configuration and log files, Role of system administrator , managing user accounts -adding users, Managing user accounts -deleting users , Changing permissions and ownerships, Creating and managing groups, Modifying group attributes, Temporary disabling of users accounts, Creating and mounting file	

	system, Checking and monitoring system performance, file security & Permissions, becoming super user using su, Getting system information with uname, host name, Disk partitions & sizes, users, kernel, installing and removing packages, rpm command.	
Block 5	Simple filter commands & Understanding various Servers: Filter Commands-pr, head, tail, Filter Commands -cut, sort, Filter Commands- uniq, tr, Filter using regular expression grep, Filter using regular expression egrep, sed, DHCP, DNS, Squid, Apache, Telnet, FTP, Graham Glass, King Ables, Pearson Education	
Text Books	1. W. Richard. Stevens (2005), Advanced Programming in the UNIX Environment, 3rd edition,Pearson Education, New Delhi, India. 2. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson *Latest Editions of all the suggested books are recommended	
Reference Books	1. Linux System Programming, Robert Love, O'Reilly, SPD. 2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education. 3. UNIX Network Programming, W.R. Stevens, PHI. UNIX for Programmers and Users, 3rd Edition, Graham Glass, King Ables, Pearson Education*Latest Editions of all the suggested books are recommended	

Course Code DBCASE404T24	Skill Enhancement Course – 1 BCA Semester IV **E-Commerce Technologies**	C-3
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identify and explain fundamental web site tools including design tools, programming tools, and data processing tools.	
CO2	Apply the solutions on finding major electronic payment issues and options.	
CO3	Acquire the knowledge of security issues and explain procedures used to protect against security threats.	
CO4	Communicate effectively in ways appropriate to the discipline, audience and purpose.	
CO5	Implement the corrective measures to management issues underlying e-Commerce issues including organizational structure, strategic planning, goal setting, and corporate social responsibility, international arena, changing market intermediaries, resource allocation and customer service.	
Course Content		
Block 1	**An introduction to Electronic commerce:** What is E-Commerce (Introduction and Definition), Main activities E-Commerce. Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce, Electronic Commerce Applications, 9 Electronic Commerce and Electronic Business(C2C)(C2G,G2G, B2G, B2P, B2A, P2P, B2A, C2A, B2B, B2C)	
Block 2	**The Internet and WWW:** Evolution of Internet, Domain Names and Internet Organization (.edu, .com, .mil, .gov, .net etc.) , Types of Network, Internet Service Provider, World Wide Web, Internet & Extranet, Role of Internet in B2B Application, building own website, Cost, Time, Reach, Registering a Domain Name, Web promotion, Target email, Barter, Exchange, Shopping Bots	
Block 3	**Internet Security:** Secure Transaction, Computer Monitoring, Privacy on Internet, Corporate Email privacy, Computer Crime(Laws , Types of Crimes), Threats, Attack on Computer System, Software Packages for privacy, Hacking, Computer Virus(How it spreads, Virus problem, virus protection, Encryption and Decryption, Secret key Cryptography, DES, Public Key Encryption, RSA, Authorization and Authentication, Firewall, Digital Signature(How it Works)	
Block 4	**Electronic Data Exchange:** Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDI model, Electronic Payment System: Introduction, Types of Electronic Payment System, Payment Types, Value Exchange System, Credit	

	Card System, Electronic Fund Transfer, Paperless bill, Modern Payment Cash, Electronic Cash	
Block 5	**Planning for Electronic Commerce:** Planning Electronic Commerce initiates, Linking objectives to business strategies, Measuring cost objectives, Comparing benefits to Costs, Strategies for developing electronic commerce web sites. **Internet Marketing;** The PROS and CONS of online shopping, The cons of online shopping. Justify an Internet business, Internet marketing techniques, The E-cycle of Internet marketing, Personalization e-commerce.	
Text Books	1. G.S.V.Murthy, E-Commerce Concepts, Models, Strategies- - Himalaya Publishing House, 2011. 2. Kamlesh K Bajaj and Debjani Nag, E- Commerce, 2005. *Latest Editions of all the suggested books are recommended	
Reference Books	1. Gray P. Schneider, Electronic commerce, International Student Edition, 2011. 2. E-Commerce, Fundamentals and Applications, Wiely Student Edition, *Latest Editions of all the suggested books are recommended	

Course Code DBCAAE406T24	Value Added Course – 1 BCA Semester IV **English-II**	C-0
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Learn the grammatical concepts and communication process for effective communication skills.	
CO2	Develop the habit of reading and understanding the text for better comprehensive skills.	
CO3	Identify the importance of Time Management, Goals and Business etiquette.	
CO4	Apply their effective communication and writing skills at their work place.	
Course Content		
Block 1	Grammar: Articles, Parts of Speech, Subject – Verb Agreement, Moral Verbs, Direct & Indirect & Speech	
Block 2	Communication: Definition, Process and Importance, Communication Barriers, Types of Communication- Formal, Informal: Verbal, Non Verbal	
Block 3	Smart Goals, Time Management, Business Etiquette, Long Term & Short Term Goals	
Block 4	Comprehension: 'Of Studies' by Francis Bacon, 'where the mind is without fear' by Rabindra Nath Tagore, 'Last Leaf' by O' Henry, 'Mending Wall' by Robert Frost	
Block 5	Composition: Dialogue Writing, Group Discussion, Report Writing, Letter- Formal & Informal, C V / Resume Writing	
Text Books	1. A Practical English Grammar (4th Edition) by A. J. Thomson (Author), A. V. Martinet. 2. Wrien, P.C & Martin. H. "English Grammar & Composition". S. Chand. *Latest Editions of all the suggested books are recommended	
Reference Books	1. Close, R. A. Reference Grammar for Students of English. Orient Longman *Latest Editions of all the suggested books are recommended	

Course Code DBCACO407P24	Core Course – 1 BCA Semester IV **Java Programming Lab**	**C-2**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Recall traditional imperative design and object-oriented Design using java	
CO2	Understand class structures as fundamental, modular building blocks	
CO3	Describe for compile, test and run Java programs comprising more than one class	
CO4	Create simple data structures like arrays in a Java program	
CO5	Create and Specify classes found in the Java API	
Exercises		
Experiment 1	Write a program to find the largest of n natural numbers.	
Experiment 2	Write a program to find whether a given number is prime or not.	
Experiment 3	Write a menu driven program for following: a. Display a Fibonacci series b. Compute Factorial of a number c. Write a program to check whether a given number is odd or even. d. Write a program to check whether a given string is palindrome or not.	
Experiment 4	Write a program to print the sum and product of digits of an Integer and reverse the Integer.	
Experiment 5	Write a program to create an array of 10 integers. Accept values from the user in that array. Input another number from the user and find out how many numbers are equal to the number passed, how many are greater and how many are less than the number passed.	
Experiment 6	Write a program that will prompt the user for a list of 5 prices. Compute the average of the prices and find out all the prices that are higher than the calculated average.	
Experiment 7	Write a program in Java to input N numbers in an array and print out the Armstrong numbers from the set.	
Experiment 8	Write Java program for the following matrix operations: a. Addition of two matrices	

	b. Summation of two matrices c. Transpose of a matrix d. Input the elements of matrices from user	
Experiment 9	Write a Java program that computes the area of a circle, rectangle and a Cylinder using function overloading.	
Experiment 10	Write a Java for the implementation of multiple inheritance using interfaces to calculate the area of a rectangle and triangle.	
Experiment 11	Write a Java program to create a frame window in an Applet. Display your name, address and qualification in the frame window.	
Experiment 12	Write a Java program to draw a line between two coordinates in a window.	
Experiment 13	Write a java program to display the following graphics in an applet window. a. Rectangles b. Circles c. Ellipses d. Arcs e. Polygons	
Experiment 14	Write a program that reads two integer numbers for the variables a and b. If any other Character except number (0-9) is entered then the error is caught by Number Format Exeeption object. After that ex.getMessage() prints the information about the error occurring causes.	
Experiment 15	Write a program for the following string operations: a. Compare two strings b. Concatenate two strings c. Compute length of a string	
Experiment 16	Create a class called Fraction that can be used to represent the ratio of two integers. Include appropriate constructors and methods. If the denominator becomes zero, throw and handle an exception	

Reference	1. Sierra, K., & Bates, B. (2005). *Head First Java* (2nd ed.). O'Reilly Media. 2. Schildt, H. (2018). *Java: The Complete Reference* (11th ed.). McGraw-Hill. 3. Bloch, J. (2018). *Effective Java* (3rd ed.). Addison-Wesley. 4. Flanagan, D. (2014). *Java in a Nutshell* (5th ed.). O'Reilly Media. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO408P24	Core Course – 2 BCA Semester IV **Internet and Web Design Lab**	C-1
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Recall traditional imperative design and object-oriented Design using java	
CO2	Understand class structures as fundamental, modular building blocks	
CO3	Describe for compile, test and run Java programs comprising more than one class	
CO4	Create simple data structures like arrays in a Java program	
CO5	Create and Specify classes found in the Java API	
Exercises		
Experiment 1	**JAVA Script** 1. Create a student registration form. Create functions to perform the following checks: a. Roll number is a 7-digit numeric value b. Name should be an alphabetical value(String) c. Non-empty fields like DOB 2. Implement a static password protection. 3. Write a Java script a. To change the colour of text using SetTimeOut() b. To move an image across screen using Setlnterval()	
Experiment 2	**JAVA Programs** 1. Write a program to find the largest of n natural numbers. 2. Write a program to find whether a given number is prime or not 3. Write a program to print the sum and product of digits of an Integer and reverse the Integer. 4. Write a program to create an array of 10 integers. Accept values from the user in that array. Input another number from the user and find out how many numbers are equal to the number passed, how many are greater and how many are less than the number passed. 5. Write Java program for the following matrix operations; a. Addition of two matrices b. Summation of two matrices c. Transpose of a matrix	

	Input the elements of matrices from user 3. Write a Java program that computes the area of a circle, rectangle and a Cylinder using function overloading.	
Experiment 3	**JDBC** 1. Create a table 'Student' and 'Teacher' in 'College' database and insert two rows in this newly created table using JDBC API and do the following: a. Update an already created table Teacher' in 'College' database by updating a teacher's name, with "Dr." appended before the name, whose name is "Rita". b. Repeat the same thing for all the teachers using Prepared Statement. c. Delete the student with ID=3 from 'Student' database. d. Insert two students to the ResultSet returned by the query which selects all students with FirstName="Ayush". The database must also get updated along with ResultSet. 2. Create a procedure in MySQL to count the number of Rows in table 'Student'. Use Callable Statement to call this method from Java code.	
Experiment 4	**JSP Practical list** 1. Display the pattern: 1 1 2 1 2 3 Take 'n' in a textbox from user. Display this pattern using • Scriptlets • <c:forEach> loop	
Experiment 5	Make two files as follows: a. main.html: shows 2 text boxes and 3 radio buttons with values "addition", "subtraction" and	

	"multiplication" b. operate.jsp: depending on what the user selects perform the corresponding function (Give two implementations: using request, get Pararneter() and using expression language)	
Experiment 6	Validate User input entered in a form. The input must include Name, DOB, Email ID, Lucky Number, Favorite food etc. (Refer Chapter 8)	
Experiment 7	Display Good Morning <uname>, Good Afternoon <uname> or Good Evening <uname> based on the current time of the day.	
Experiment 8	Create your custom library which contains two tags: <hello>, <choco>. Usage of the tags: • <hello name="Ajay">: Output should be Hello Ajay. It contains a mandatory attribute 'name' which can accept Dynamic value. • <choco texture="Chewy">: Output should be FiveStar, BarOne. <choco texture="Crunchy">: Output should be Munch. KitKat. That means the mandatory attribute must accept a value, and based on the attributes value, it should give output. You must use a bean ChocoBean for this purpose.	
Experiment 9	Simulate Bankers Algorithm for Dead Lock Prevention.	
Experiment 10	**List of projects using JSP, JDBC and JAVA Script (UI Design Validation and Verification):** 1) Interactive response system like any CRM of MNC 2) Railway project administration system 3) Worker loan management system 4) A catalog management system 5) School management system 6) Hospital management system 7) Cyber Café ID system daily Report 8) Internet and Data report login system	

	9) Mobile dealership management system 10) Garment shop barcode with billing system 11) Coffee shop management system 12) School library system 13) College organization system 14) Travel Reservation system 15) Radio record system	
Reference	1.Duckett, J. (2011). *HTML and CSS: Design and Build Websites*. Wiley. 2.Duckett, J. (2014). *Web Design with HTML, CSS, JavaScript and jQuery*. Wiley. 3.Frain, B. (2015). *Responsive Web Design with HTML5 and CSS3* (2nd ed.). Packt Publishing. 4.Krug, S. (2013). *Don't Make Me Think: A Common Sense Approach to Web Usability* (3rd ed.). New Riders. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO409P24	Core Course – 3 BCA Semester IV **Shell Programming and System Administration Lab**	C-1
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Students learn the installation and configuration of mainstream operating systems, important network services.	
CO2	Students learn to manage system resources, including methods for tracking system metrics.	
CO3	Can apply these skills in the administration of an actual computer system with actual users.	
CO4	Configuration of desktop environment that users would normally require for day to day operations.	
Exercises		
Experiment 1	Study of Linux Terminal	
Experiment 2	Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir,rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip,	
Experiment 3	file handling utilities, security by file permissions,process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask,ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text Processing utilities and backup utilities , tail, head ,sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg,comm, cmp, diff, tr, awk, cpio.	
Experiment 4	Write a shell script which ask your name, age, department, and course and lastly give the syntax to display all your information.	
Experiment 5	Write a shell script which asks your Enrolment no., name, name of 3 subjects and marks obtained.	
Experiment 6	Display these fields by using echo and equal operator.	
Experiment 7	Write a shell script, declare 5 variables and assign values to them. Display the values in the given order: - 1, 5,2,3,4.	
Experiment 8	Write a shell script that creates a file containing the message that this file is created today i.e. on the current date followed are the users of UNIX at this moment and show the list of users.	
Experiment 9	Write a shell script that accepts two file names from the command line, copies the first to second file and display the second file.	
Experiment 10	Write a shell script that accepts two parameters i.e. two files, append file1 to file2 and display file2.	
Experiment 11	Write a shell script that assigns execute permission to a file.	

Experiment 12	Write a shell script that accepts one file and directory name and move that file tothe directory and show recursive listing and long listing.	
Experiment 13	Write a shell script where we create a directory, move to the directory, create a file. Show the present path and display the file.	
Experiment 14	Write a shell script that asks your name and invite you on current date for a party and append this message to a file name party.	
Experiment 15	Write a shell script that reads a file name from command line and changes name to filename.logname.	
Experiment 16	Display the number of links and size of the file given as the command line argument.	
Experiment 17	Write a shell script which displays the date in desired format i.e. Monday 25 September 2006. Write a shell script by which you create a branch \usr directory till depth of d5 and using concept of assigning the path to the variables do the movements within this directory path and create two files in each directory from d1.	
Experiment 18	Write a shell script and declare two variables A and B. Take static valueof A=5 and B=3. Perform all operations on it.	
Experiment 19	Write a shell script which accepts a number and checks whether the number is an odd or even number.	
Experiment 20	Write a shell script to give the result of student. Take marks of the five subjects, student name, roll no and percentage and show a message whether a student gets division as per the following rules: 70% <-> distinction 60 %-> 1st divisions 50 %-> 2nd divisions <40 %-> Fail	
Experiment 21	Write a shell script which checks the age of the student for swimming. The condition are as follows: <10- not allowed 10- 18- junior pool only >18- swimming is allowed in depth also.	
Experiment 22	Write a shell script to find out the gross salary of an employee when the given information is as under:- a) If basic salary is less than Rs.1500/- HRA = 10% of basicDA = 90% of basic b) If basic is greater than or equal to Rs.1500/-HRA = 500/- , DA = 98% of basic	
Experiment 23	Write a shell script to enter a year and show a message whether the year is a leap year or not.	

Experiment 24	Write a shell script using concept of position parameters which copies one file and display destination file and it should also contain an error message if the source file	
Experiment 25	Write a shell script to calculate the gross salary of an employee whose basic salary is entered through keyboard. His DA=40% of basic and HRA=20% of basic.	
Experiment 26	Write a shell script where distance between two cities is input through the keyboard in km.	
Experiment 27	Convert and print this distance in meters, feet, inches and cm.	
Experiment 28	Write a shell script to find area and perimeter of rectangle.	
Experiment 29	Write shell scrip to find area and circumference of the circle.	
Experiment 30	Write a shell script to find sum of digits of a number and check whether the number is palindrome or not.	
Experiment 31	Pass a filename as command line argument to script which finds (i) Whether file exists or not. (ii) Display the message what type of file it is. (iii)(a) If the file is ordinary files check its read permission. If available display the file else display message read permission denied. (b) Check its write permission and if available append that file by your name and course, else display error message. (c) Check executes permission & if available shows the output of that file. (iv)(a) if it's a directory checks its read permission, if available list the directory.	
Experiment 32	Check its write permission; if available make a sub-directory in tha Create two file in that sub-directory that you created just now.	
Experiment 33	Write a menu driven program:- a) Place the pwd of user. b) List the directory of user. c) Long listing the directory of the user and at the same time this long listing is to be stored in a file. d) Create a file in your directory and copy this file in your directory. e) Move the specified file to your parent directory. f) Rename the specified file in the current directory. g) Make a sub directory in the current directory and change its permission by taking away all the permission of group and others.	

Experiment 34	Write a Menu driven program a) Check the contents of /etc/passwd file. b) List of users who have currently logged in. c) Pwd d) Exit	
Reference	1. Shotts, W. E. (2019). *The Linux Command Line: A Complete Introduction* (2nd ed.). No Starch Press. 2. Kanetkar, Y. (2003). *Unix Shell Programming*. BPB Publications. 3. Love, R. (2013). *Linux System Programming* (2nd ed.). O'Reilly Media. 4. Kerrisk, M. (2010). *The Linux Programming Interface*. No Starch Press. *Latest Editions of all the suggested books are recommended	

Semester- V

Course Code DBCACO501T24	Core Course – 1 BCA Semester V **Computer Graphics and Multimedia**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Remember the technical aspect of Multimedia Systems.	
CO2	Understand various file formats for audio, video and text media.	
CO3	Develop various Multimedia Systems applicable in real time.	
CO4	Design interactive multimedia software.	
CO5	Apply various networking protocols for multimedia applications.	
CO6	Evaluate multimedia application for its optimum performance.	
Course Content		
Block 1	Introduction: The Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Classification of Application Development of Hardware and software for Computer Graphics, Conceptual Framework for Interactive Graphics, Overview, Scan: Converting Lines, Scan Converting Circles, Scan Converting Ellipses.	
Block 2	Hardcopy Technologies, Display Technologies, Raster-Scan Display System, Video Controller, Random-Scan Display processor, Input Devices for Operator Interaction, Image Scanners. Clipping Southland- Cohen Algorithm, Cyrus-Beck Algorithm, Midpoint Subdivision Algorithm.	
Block 3	Geometrical Transformation: 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composition of 2D Transformations, The Window-to-Viewport Transformation, Efficiency, Matrix Representation of 3D Transformations, Transformations as a Change in Coordinate System.	
Block 4	Multimedia Elements, Multimedia Applications, Multimedia System Architecture, Evolving Technologies for Multimedia Systems, Multimedia Data Interface Standards, the Need for Data Compressions, Multimedia Database.	
Block 5	Media and Data Streams: Medium, Main Properties of a Multimedia Stream, Multimedia System Definition, Combination of Media. Data & File Format Standards: Rich –Text Format, TIFF File Format, RIFF,	

	MIDI File Format, JPEG DIB File Format, MPEG Standards.	
Text Books	1. Foley, Van Dam, Feiner, Hughes, Computer Graphics Principles& practice,2000. 2. Ralf Skinmeiz and KlanaNaharstedt, Multimedia: computing, Communication and Applications, pearson, 2001 3. D.Harn& Baker. Computer Graphics Prentice Hall of India,1986. 4. J. F. Koegel Buferd -Multimedia Systems, Pearson Education, New Delhi, 2006 5. Villamil and Molina, "An Introduction to Multimedia", MacMillan, 1997 6. Lozano, "Multimedia: Sound & Video", Prentice Hall of India (Que), 1997. 7. Ranjan Parekh, "Principle of Multimedia", Tata McGraw Hilf. 8. Villamil and Molina, "Multimedia: Production, Planning and Delivery", Que, 1997 *Latest Editions of all the suggested books are recommended	
Reference Books	1. Sinclair, "Multimedia on the PC". BPB Publications 2. Tay Vaughan. "Multimedia: Making It Work", Fifth edition, Tata McGraw Hill, 1994. 3. James E Shuman, "Multimedia in Action", Wadsworth Publications, 1997. 4. Jeff Coate Judith, "Multimedia in Practice", Prentice Hall of India, 1995 John F. Koegel, "Multimedia Systems", Addison Wesley Ltd.	

Course Code DBCACO502T24	Core Course – 2 BCA Semester V **Programming in .NET**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Remember the programming skills and be familiar with programming environment.	
CO2	Apply the concept so the students will be able to use ASP.NET controls in web applications.	
CO3	Interpret the to debug and deploy ASP.NET web applications	
CO4	Describe to create database driven ASP.NET web applications and web services	
CO5	To develop, implement, and demonstrate Component Services, Threading, remoting, Windows services.	
CO6	Create and develop Assemblies and Deployment in .NET, Application Development.	
Course Content		
Block 1	The Framework of .Net: Building blocks of .Net Platform (the CLR, CTS and CLS), Features of .Net, deploying the .Net Runtime, Architecture of .Net platform, Introduction to namespaces & type distinction. Types & Object in .Net, the evolution of Web development.	
Block 2	Class Libraries in .Net, Introduction to Assemblies & Manifest in .Net, Metadata & attributes. Introduction to C#: Characteristics of C#, Data types: Value types, reference types, default value, constants, variables, scope of variables, boxing and unboxing.	
Block 3	Operators and expressions: Arithmetic, relational, logical, bitwise, special operators, evolution of expressions, operator precedence & associativity. Control constructs in C#: Decision making, loops. Classes & methods: Class, methods, constructors, destructors, overloading of operators & functions.	
Block 4	Inheritance & polymorphism: visibility control, overriding, abstract class & methods, sealed classes & methods, interfaces.	
Block 5	Advanced features of C#: Exception handling & error handling, automatic memory management, Input and output (Directories, Files, and streams).	
Text Books	1. Introduction to C# using .NET By Robert J. Oberg, PHI, 2002, 2. Programming in C# by E. Balaguruswamy, Tata McGraw Hill, *Latest Editions of all the suggested books are recommended	
Reference Books	1. The Complete Guide to C# Programming by V. P. Jain.	

Course Code DBCACO503T24	Core Course – 3 BCA Semester V **Data Warehousing and Data Mining**	C-3
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identify the basic concepts and need of the data warehousing and data mining with its various application.	
CO2	Summarize the Data Warehousing Architecture and Data Mining Architecture along with the physical design and deployment process.	
CO3	Experiment with single dimensional and multi dimensional association rules for data mining.	
CO4	Assess the various classification techniques such as Bayesian classification, Classifier accuracy, Clustering Methods and Outlier analysis etc.	
CO5	Determine the various applications and algorithms for data mining, text mining and web mining.	
Course Content		
Block 1	**Data Warehousing:** Introduction- Definition and description, need for data ware housing, need for strategic information, failures of past decision support systems, OLTP vs DWH, Requirements-trends in DWH Application of DWH.	
Block 2	**Data Warehousing Architecture:** Reference architecture, Components of reference architecture, Data warehouse building blocks, implementation, physical design process and DWH deployment process, Multidimensional Data Model and Data Warehouse Architecture.	
Block 3	**Data Mining:** Data mining tasks, Data mining vs. KDD , Issues in data mining, Data Mining metrics, Data mining architecture, Data cleaning, Data transformation , Data reduction and Data Mining primitives.	
Block 4	**Association Rule Mining:** Introduction to Mining, single dimensional Boolean association rules from transactional databases, multi-dimensional association rules. **Classification and Prediction:** Classification Techniques, Issues regarding classification and prediction. Decision tree, Bayesian	

	classification, Classifier accuracy, Clustering Methods and Outlier analysis	
Block 5	**Applications and Other Data Mining Methods:** Distributed and parallel Data Mining Algorithms, Text mining and Web mining	
Text Books	1. Jiawei Han and Micheline Kamber," Data Mining Concepts and Techniques", Morgan Kaufmann Publishers, USA, 2006. 2. BersoiV'DataWarehousing, Data Mining and OLAP", Tata McGraw Hill Ltd, New Delhi, 2004. 3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining,, Pearson Education. *Latest Editions of all the suggested books are recommended	
Reference Books	1. Arun K Pujari,"Data mining techniques", Oxford University Press, London, 2003. 2. Dunham M H,"Data mining: Introductory and Advanced Topics". Pearson Education, New Delhi, 2003. 3. Mehmed Kantardzic," Data Mining Concepts, Methods and Algorithms", John Wiley and Sons, USA, 2003. 4. Soman K. P., DiwakarShyam, Ajay V., Insight into Data mining: Theory and Practice, PHI 2006.	

Course Code DBCACO505T24	Core Course – 4 BCA Semester V **Android Programming**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Remember Android platform, Architecture and features.	
CO2	Understand the User Interface and develop activity for Android App.	
CO3	Design and implement Database Application and Content providers.	
CO4	Use multimedia, camera and Location based services in Android App.	
CO5	Discuss various security issues in Android platform	
Course Content		
Block 1	**Introduction:** History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.	
Block 2	**Overview of object oriented programming using Java:** OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine	
Block 3	**Development Tools:** Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project, Hello World, run on emulator, Deploy it on USB-connected Android device	
Block 4	**User Interface Architecture:** Application context, intents. Activity life cycle, multiple screen sizes. **User Interface Design:** Form widgets, Text Fields, Layouts. Button control, toggle buttons, Spinners (Combo boxes), Images, Menu, and Dialog.	
Block 5	**Database:** Understanding of SQLite database, connecting with, the database.	
Text Books	1. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013. 2. Android Wireless Application Development By Lauren Darcey and Shane Conder, Pearson Education, 2nd ed. (2011) 3. Using SQLite By Jay A. Kreibich, Publisher: O'Reilly Media.	
Reference Books	1. Mobile Computing using Android and iPhone [ISBN: 978-93-81786-93-2] by Bharat & Company. 2. Professional Android 2 Application Development Reto Meier, Wiley India Pvt Ltd (2011). 3. Beginning Android Mark L Murphy, Wiley India Pvt Ltd. *Latest Editions of all the suggested books are recommended	
Online Reading / Supporting Material	1. http://www.developer.android.com 2. http://developer.android.com/aboLJt/versions/indexJitml 3. http://developer.android.com/training/basics/flrstapp/indexJ^tml 4. http://docs.oracle.com/javase/tutorial/index.htm (Available in the form of free downloadable ebooks also).	

Course Code DBCAVA506T24	Value Added Course – 1 BCA Semester V **Management Process & Organization Behaviour**	C-2
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Learn the grammatical concepts and communication process for effective communication skills.	
CO2	Develop the habit of reading and understanding the text for better comprehensive skills.	
CO3	Identify the importance of Time Management, Goals and Business etiquette.	
CO4	Apply their effective communication and writing skills at their work place.	
Course Content		
Block 1	Grammar: Articles, Parts of Speech, Subject – Verb Agreement, Moral Verbs, Direct & Indirect & Speech	
Block 2	Communication: Definition, Process and Importance, Communication Barriers, Types of Communication- Formal, Informal: Verbal, Non Verbal	
Block 3	Smart Goals, Time Management, Business Etiquette, Long Term & Short Term Goals	
Block 4	Comprehension: 'Of Studies' by Francis Bacon, 'where the mind is without fear' by Rabindra Nath Tagore, 'Last Leaf' by O' Henry, 'Mending Wall' by Robert Frost	
Block 5	Composition: Dialogue Writing, Group Discussion, Report Writing, Letter- Formal & Informal, C V / Resume Writing	
Text Books	4. A Practical English Grammar (4th Edition) by A. J. Thomson (Author), A. V. Martinet. 5. Wrien, P.C & Martin. H. "English Grammar & Composition". S. Chand. *Latest Editions of all the suggested books are recommended	
Reference Books	5. Close, R. A. Reference Grammar for Students of English. Orient Longman *Latest Editions of all the suggested books are recommended	

Course Code DBCASE504T24	Skill Enhancement Course – 1 BCA Semester V **Management Information System**	C-3
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Relate the basic concepts and technologies used in the field of management information systems.	
CO2	Compare the processes of developing and implementing information systems.	
CO3	Outline the role of the ethical, social, and security issues of information systems.	
CO4	Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.	
CO5	Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization	
Course Content		
Block 1	Meaning and role of MIS: Introduction to MIS, definition & characteristics of MIS, Components of MIS, Nature & Scope of MIS, MIS organization within the company.Management, organizational theory & systems Approach: Development of organization theory, management & organizational behavior, management, information, and the systems approach. Introduction to system and Basic System Concepts, Types of Systems Information System: Definition & Characteristics, Types of information, Role of Information in Decision-Making, Sub-Systems of an Information system: EDP and MIS Levels of Management TPS/MIS/DSS.	
Block 2	Information Systems for Decision making: Evolution of an Information System, Basic information systems, Decision making & MIS, Types of decisions--Structured Vs Unstructured decisions, Strategic , tactical & operational information for taking decisions, Simon's model of decision-making. MIS as a technique for making programmed decisions, decision assisting information systems.	
Block 3	Strategic and project planning for MIS: General business planning, appropriate MIS response, MIS planning – general, MIS planning – details. Conceptual Design – Definition of the problem, system objective and system constraints, analysis of information source, alternative system design and selection of optimal system, conceptual system designs document.	
Block 4	Detailed System Design: Inform & Involvement of end user, aim of detailed design, project management, identification & trade-off criteria, defining subsystems, degree of automation of each operation, inputs, outputs & processing, early system testing, software, hardware & tools, documentation, Role of Top management during design.	

Block 5	Implementation, evaluation and maintenance of the MIS: Plan the implementation, acquire floor space and plan space layouts, organize for implementation, develop procedures for implementation, train and operating personnel, computer-related acquisitions, develop forms for data collection and information, dissemination, develop the files, test the system, cut over, document the system, evaluate the MIS, control and maintain the system. System maintenance: Corrective, Adaptive & perfective maintenance. Pitfalls in MIS: Fundamental weaknesses. Functional MIS: A Study of Marketing, Personnel, Accounting MIS.	
Text Books	1. R. G. Murdick, J. E. Ross and J. R. Clagget, "Information Systems for Modern Management", 3rd Edition by, PHI – 1994 2. D. P. Goyal, "Management Information Systems", Macmillan Business Books 3. Laudon & Laudon, "Information Systems", PHI *Latest Editions of all the suggested books are recommended	
Reference Books	1. Laudon, K. C., & Laudon, J. P. (2020). *Management Information Systems: Managing the Digital Firm* (16th ed.). Pearson. 2. Rainer, R. K., & Prince, B. (2017). *Introduction to Information Systems: Supporting and Transforming Business* (9th ed.). Wiley. 3. Laudon, K. C., & Laudon, J. P. (2018). *Essentials of Management Information Systems* (13th ed.). Pearson. 4. Piccoli, G., & Bichler, F. P. C. (2008). *Information Systems for Managers: Texts and Cases*. Wiley.	

Course Code DBCACO507P24	Core Course – 1 BCA Semester V **Computer Graphics and Multimedia Lab**	C-2
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identify the basic tools and components of a multimedia project.	
CO2	Apply basic elements and principles of photo editing software to achieve a great photo	
CO3	Apply effects like color, shadows, alteration of backgrounds, cropping and Collage making.	
CO4	Create simple shapes using animation editing software and design.	
CO5	Prepare and present a multimedia portfolio containing electronic media that demonstrates multimedia and problem-solving skills	
Exercises		
Experiment 1	Write a program to draw a chain of diamonds.	
Experiment 2	Write a program to draw village of houses.	
Experiment 3	Write a program to create checker board effect.	
Experiment 4	Write a C program to implement line drawing algorithm.	
Experiment 5	Write a C program to implement circle drawing algorithm.	
Experiment 6	Write a C program to implement the Line, Circle and ellipse attributes by drawing "House".	
Experiment 7	Write a C program to implement ellipse drawing algorithm.	
Experiment 8	Write a C program to implement two Dimensional transformations - Translation, Reflection, and Shear.	
Experiment 9	Write a C program to implement two Dimensional transformations – Rotation (With and without pivot point), Scaling (With and without pivot point).	
Experiment 10	Write a C program to implement composite 2D Transformations – Translation, Scaling, Rotation.	
Experiment 11	Write a C program to implement composite 2D Transformations – fixed point scaling, fixed point rotation.	
Experiment 12	Write a C program to implement Cohen Sutherland 2D line clipping algorithm.	
Experiment 13	Write a C program to implement Sutherland – Hodgeman Polygon clipping Algorithm.	
Experiment 14	Write a C program to implement three dimensional transformations - Translation, Rotation, Scaling.	
Experiment 15	Write a C program to implement composite 3D transformations -	

	Translation, Rotation, and Scaling.	
Experiment 16	Draw an animation to show a bouncing ball.Design a moving ball in V-shape	
Experiment 17	Draw an animation to show a moving stick man.	
Experiment 18	Draw an animation to show a fainting banana.	
Experiment 19	Draw an animation to show sunrise and sunset	
Experiment 20	Draw an animation to show a disappearing house.	
Experiment 21	Draw an animation to show two boats sailing in river	
Experiment 22	Draw an animation to show a scene of cricket match	
Experiment 23	Draw an animation to help teach a poem or a song	
Experiment 24	Draw an animation to show cartoon with a message	
Experiment 25	Create Spot Light using Macromedia Flash	
Experiment 26	Make a movie showing Shape Tweening.	
Experiment 27	Make a movie showing Motion Tweening	
Experiment 28	Add sound and button to the movie	
Experiment 29	Create Animated Pool Table	
Experiment 30	Create Bow & Arrow hitting a Ball	
Reference	1. Hughes, J. F., van Dam, A., McGuire, M., & Sklar, D. F. (2014). *Computer Graphics: Principles and Practice* (3rd ed.). Addison-Wesley. 2. Angel, E., & Shreiner, D. (2018). *Interactive Computer Graphics: A Top-Down Approach with WebGL* (7th ed.). Pearson. 3. Shirley, P., Marschner, S., & Luebke, D. J. P. (2016). *Fundamentals of Computer Graphics* (4th ed.). A. K. Peters/CRC Press. 4. Gokhale, S. S., & Srivastava, H. M. (2012). *Computer Graphics and Multimedia: Applications, Problems, and Solutions*. Wiley. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO508P24	Core Course – 2 BCA Semester V **.NET Programming Lab**	**C-2**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Apply the concept so the students will be able to use ASP.NET controls in web applications.	
CO2	Interpret the debug and deploy ASP.NET web applications.	
CO3	Develop, implement, and demonstrate Component Services, Threading, remoting, Windows services.	
CO4	Identify Security in the .NET framework and Deployment in the .NET.	
CO5	Develop Assemblies and Deployment in .NET, Application Development	
Exercises		
Experiment 1	Write a simple program in C# to write a string on the screen	
Experiment 2	Write a program in C# to prompt the user for some input and then take some action.	
Experiment 3	Write a program in C# to demonstrate different kinds of arrays including jagged arrays.	
Experiment 4	Write a program to demonstrate boxing.	
Experiment 5	Write a program to demonstrate how unary operators are used.	
Experiment 6	Write a program in C# to demonstrate how binary operators work.	
Experiment 7	Write a program in C# to find out trie range of number from 1-10 or 11-20 or 21-30 or less than 1.	
Experiment 8	Write a program in C# to find out the number entered between 1 -3.	
Experiment 9	Write a program in C# to override a method which calculates pay of employees to take bonus into account.	
Experiment 10	Write a program in C# to ask a user to enter a choice to add, delete, modify or view address using methods for each functionality.	
Experiment 11	Write a program in C# to demonstrate and verify that the static constructor runs only one time, even though two instances of Class are created, and that it runs before the instance constructor runs.	
Reference	1. Albahari, J., & Albahari, B. (2020). *C# 9.0 in a Nutshell: The Definitive Reference*. O'Reilly Media. 2. Griffiths, I. (2022). *Programming .NET 6*. O'Reilly Media. 3. Lock, A. (2021). *ASP.NET Core in Action* (2nd ed.). Manning Publications. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO509P24	Core Course – 3 BCA Semester V **Android Programming Lab & Minor Project**	C-1
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Students learn to develop android based applications.	
CO2	Understand the User Interface and develop UI for Android App.	
CO3	Design and program Database Application and Content providers using android.	
CO4	Students learn to develop small projects using the various technologies.	
Exercises		
Experiment 1	Create "Hello World" application that will display "Hello World" in the middle or the screen in the emulator. Also display "Hello World" in the middle of the screen in the Android Phone.	
Experiment 2	Create an application with login module. (Check username and password).	
Experiment 3	Create spinner with strings taken from resource folder (res » value folder) and on changing the spinner value, Image will change.	
Experiment 4	Create a menu with 5 options and selected option should appear in text box.	
Experiment 5	Create a list of all courses in your college and on selecting a particular course teacher-in charge of that course should appear at the bottom of the screen.	
Experiment 6	Create an application with three option buttons, on selecting a button colour of the screen will change.	
Experiment 7	Create and Login application as above. On successful login, pop up the message,	
Experiment 8	Create an application to Create, Insert, Update, Delete and retrieve operation on the database.	
Experiment 9	**List of some minor projects during the V Semester:** • Assignment Management System • Project ATM Banking System • Project Cab Management System • Project Cargo Management System • Project City Bus Management System • Project Civil Registration System • Project Content Management System • Project Customer Relationship Management System • Project Drug Management System • Project Employee Leave Management System • Project Factory Information Management System • Project Hospital Management System • Project Infrastructure Management System	

	• Project Life Insurance Management System • Project Mobile Shop • Project Newspaper Ad Management System • Project Online IT Service Help Desk • Project Online Job Portal System • Project Online Student Management System • Project Online Tax Information System • Project Online Voting System • Project Patient Management System • Project Payroll Management System • Project School Management System • Project Task Management System • Project Vehicle Insurance Management System	
Reference	1. Phillips, B., Stewart, C., & Marsicano, K. (2020). *Android Programming: The Big Nerd Ranch Guide* (5th ed.). Big Nerd Ranch Guides. 2. Horton, J. (2020). *Android Programming for Beginners* (4th ed.). Packt Publishing. 3. Griffiths, D., & Griffiths, D. (2015). *Head First Android Development: A Brain-Friendly Guide* (2nd ed.). O'Reilly Media. 4. Sheusi, J. C. (2011). *Android Application Development for Java Programmers*. Addison-Wesley. 5. Skeen, J., & Greenhalgh, D. (2019). *Kotlin Programming: The Big Nerd Ranch Guide*. Big Nerd Ranch Guides. *Latest Editions of all the suggested books are recommended	

Semester – VI

Course Code DBCACO601T24	Core Course – 1 BCA Semester VI **PHP Programming**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Remember basic concept of PHP code to produce outcomes and solve problems.	
CO2	Design and insert data using PHP and MySQL.	
CO3	Apply basic knowledge for test, debug, and deploy web pages containing PHP and MySQL.	
CO4	Creating Infrastructure and maintain complex Data flow with security.	
CO5	Develop an application using PHP and MySQL	
Course Content		
Block 1	**Introduction to PHP:** PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, and Editors etc.). PHP with other technologies, scope of PHP, Basic Syntax, PHP variables and constants, Types of data in PHP, Expressions, scopes of a variable (local, global), PHP Operators: Arithmetic, Assignment, Relational , Logical operators, Bitwise , ternary and MOD operator.PHP operator Precedence and associatively.	
Block 2	**Handling HTML form with PHP:** Capturing Form Data, GET and POST form methods Dealing with multi value fields, Redirecting a form after submission. **PHP conditional events and Loops:** PHP IF Else conditional statements (Nested IF and Else) Switch case, while, For and Do While Loop, Goto , Break ,Continue and exit.	
Block 3	**PHP Functions:** Function, Need of Function, declaration and calling of a function. PHP Function with arguments, Default Arguments in Function. Function argument with call by value, call by reference. Scope of Function Global and Local	
Block 4	**String Manipulation and Regular Expression:** Creating and accessing String , Searching & Replacing String, Formatting, joining and splitting String, String Related Library functions Use and advantage of regular expression over inbuilt function. Use of preg_match (), preg_replace (), preg_split() functions in regular expression.	
Block 5	**Array:** Anatomy of an Array, Creating index based and Associative array, Accessing array Looping with Index based array, with associative array using eachQ and foreachQ.Some useful Library function	

Text Books	1. Core PHP Programming. Leon Atkinson {Prentice Hall, ISBN 0130463469). 2. Beginning PHP5 and MySQL: From Novice to Professional, W. Jason Gilmore, 2004, Apress, ISBN: 1-893115-51-8 *Latest Editions of all the suggested books are recommended	
Reference Books	1. Vikram Vaswani (2008), PHP: A BEGINNER'S GUIDE, McGraw-Hill	

Course Code DBCACO602T24	Core Course – 2 BCA Semester VI **Cloud Computing**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Remember concept of Cloud Computing, benefit and challenges associated with it.	
CO2	Understand various cloud services, cloud service providers and frameworks being used.	
CO3	Describe importance of virtualization along with their technologies.	
CO4	Identify the need for the virtualization and advantage and limitations of using virtualization concept.	
CO5	Analyze the open stack & Google Cloud platform components and understand Mobile Cloud Computing	
CO6	Investigate the security aspect in cloud, standards for security framework, challenges.	
Course Content		
Block 1	**Cloud Introduction;** Cloud Computing Fundamentals: Cloud Computing definition, Types of Cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing usage scenarios and Applications, Business models around Cloud Major Players in Cloud Computing.	
Block 2	**Cloud Services and File** System: Types of Cloud services, Service providers, Google App Engine, Amazon EC2, Microsoft Azure, Sales force. Introduction to Map Reduce, GFS, HDFS, Hadoop Framework,	
Block 3	**Collaborating With Cloud:** Collaborating on Calendars, Schedules and Task Management **Collaborating** on Event Management, Contact Management, Collaborating via Web-Based Communication Tools, Evaluating Web Mail Services and Collaborating via Social Networks	
Block 4	**Virtualization for Cloud:** Need for Virtualization - Pros and cons of Virtualization, Types of Virtualization, System VM, Process VM, Virtual Machine monitor.	
Block 5	**Security, Standards, and Applications** Security in Clouds: Cloud security challenges, Common Standards: The Open Cloud Consortium - The Distributed management Task Force - Standards for application Developers Standards for Messaging - Standards for Security. End user access to cloud computing, Mobile Internet devices and the cloud.	

Text Books	1. Bloor R., Kanfman M., Halper F. **Judith** Hurwitz "Cloud Computing Wiley India Edition, 2010 2. John Rittinghouse & James Ransome, "Cloud Computing Implementation Management and Strategy", CRC Press, 2010 3. Antony T Velte, Cloud Computing : "A Practical Approach", McGraw HiIl,2009	
Reference Books	1. Michael Miller, Cloud Computing: "Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, August 2008. 2. James E Smith, Ravi Nair, "Virtual Machines", Morgan Kauftnann Publishers, 2006. *Latest Editions of all the suggested books are recommended	
Online Reading/Supporting Material	1. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing", Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008. 2. webpages.iust.ac.ir/hsalimi/.../89.../Cloud%20Common%20standards.pptop ennebula.org, 3. www.cloudbus.org/cloudsim/, http://wvvw.eucalyptus.com/ 4. hadoop.apache.org 5. http://hadoop.apaehe.org/docs/stable/hdfs_design,html	

Course Code DBCACO604T24	Core Course – 3 BCA Semester VI **'R' Programming and Python Programming**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identify programming logics and develop efficient programs using R (and similar high-level languages).	
CO2	Explain & describe routine a specialized data manipulation/management and analysis tasks.	
CO3	Apply and build document, share, and collaborate on code development using a suite of Open Source.	
CO4	Develop methods and procedures	
Course Content		
Block 1	**Introduction:** Overview and History of R, Basic Features of R, Design of the R System, Limitations of R, R Resources	
Block 2	Install and configuration of R programming environment, Getting started with the R interface, Getting Help, Entering Input, Evaluation, R Objects, Numbers, Attributes, Creating Vectors, Mixing Objects, Matrices, Lists, Factors, Missing Values, Data Frames	
Block 3	Getting Data In and Out of R, Using the reader Package, Using Textual and Binary Formats for Storing Data, Interfaces to the Outside World, Sub-setting R Objects.	
Block 4	Dates and Times, Managing Data Frames , Control Structures , Functions , Scoping Rules of R , Loop Functions, Debugging, Debugging Tools in R, Simulating Random Numbers, Profiling R Code, Data Analysis Case Study	
Block 5	Python programming Basic: Python interpreter, IPython Basics, Tab completion, Introspection, $run command, magic commands, matplotlib integration, python programming, language semantics, scalar types. Control flow Data Structure, functions, files: tuple, list, built-in sequence function, dict, set, functions, namescape, scope, local function, returning multiple values, functions are objects, lambda functions, error and exception handling, file and operation systems	
Text Books	1. Roger D. Peng, R Programming for Data Science, 2015-07-20. 2. R programming Using R for introductory Statistics, by John Verzani, Chapman & Hall/CRC, 2004 *Latest Editions of all the suggested books are recommended	
Reference Books	1. W. N.Venables, D. M. Smith, An Introduction to R, R-core team, 2015	

Course Code DBCASE603T24	Skill Enhancement Course – 1 BCA Semester VI **Software Testing Concepts**	**C-3**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Learn systematic approach to the development, operation, maintenance, and retirement of software.	
CO2	Learn how to use available resources to develop software, reduce cost of software and how to maintain quality of software.	
CO3	Illustrate Methods and tools of testing and maintainace of software's.	
CO4	Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.	
CO5	Develop methods and procedures for software development that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle time	
Course Content		
Block 1	**Introduction** Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System Testing, Basic Terminologies, V Shaped Software Lifecycle Model.	
Block 2	**Functional Testing\ Black-box Testing** Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing	
Block 3	**Structural Testing: White-box Testing** Basis Path Testing: Program Graph, DD Path graph, Cyclomatic Complexity, Graph Matrices, Control Flow Testing: Statement Coverage, Branch Coverage, Condition Coverage, Path Coverage.	
Block 4	Software Quality Assurance, test optimization, Eleven Step Testing Process and Testing Security.	
Block 5	Software Reusability, Software Metrics, Software Testing Tools, Defect Tracking Tools, Defect Management Tools and Challenges.	
Text Books	1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, Seventh Edition, Mc Graw Hill Education.2009. 2. Yogesh Singh, Software Testing, Cambridge University Press, 2011. *Latest Editions of all the suggested books are recommended	
Reference Books	**1. "Foundations of Software Testing: ISTQB Certification" (4th Edition)** by Dorothy Graham, Rex Black, and Erik van Veenendaal	

	(2015) **2. "Software Testing: A Craftsman's Approach" (4th Edition)** by Paul C. Jorgensen (2018) **3. "Exploratory Software Testing: Tips, Tricks, Tours, And Techniques to Guide Test Design"** by James Whittaker (2015) **4."The Art of Software Testing" (3rd Edition)** by Glenford J. Myers, Corey Sandler, and Tom Badgett (2011) *Latest Editions of all the suggested books are recommended	

Course Code DBCACO605P24	Core Course – 1 BCA Semester VI **PHP Lab**	C-2
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Understand the major areas and challenges of web programming.	
CO2	Distinguish web-related technologies.	
CO3	Use advanced topics in HTML5, CSS3, JavaScript	
CO4	Use a server-side scripting language, PHP	
CO5	Design and implement typical static web pages and interactive web applications, dynamic web applications.	
Exercises		
Experiment 1	Create a PHP page using functions for comparing three integers and print the largest number.	
Experiment 2	Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.	
Experiment 3	WAP to check whether the given number is prime or not.	
Experiment 4	Create a PHP page which accepts string from user, After submission that page displays the reverse of provided string.	
Experiment 5	Write a PHP function that checks if a string is all lower case.	
Experiment 6	Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)	
Experiment 7	WAP to sort an array.	
Experiment 8	Write a PHP script that removes the whitespaces from a string. Sample string : The quick " " brown fox' Expected Output: Thequick""brownfox	
Experiment 9	Write a PHP script that finds out the sum of first n odd numbers.	
Experiment 10	Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.	
Experiment 11	Write a PHP script that checks if a string contains another string.	
Experiment 12	Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.	
Experiment 13	Create a script to construct the following pattern, using nested for loop. * **	

	*** **** *****	
Experiment 14	Write a simple PHP program to check that emails are valid-	
Experiment 15	WAP to print first n even numbers.	
Experiment 16	$color = array('white[1], 'green', 'red'') Write a PHP script which will display the colors in the following way: Output: white, green, red, • green • red • white	
Experiment 17	Using switch case and dropdown list display a "Hello" message depending on the language selected in drop down list.	
Experiment 18	Write a PHP program to print Fibonacci series using recursion.	
Experiment 19	Write a PHP script to replace the first 'the' of the following string with 'That'. **Sample :** 'the quick brown fox jumps over the lazy dog.' **Expected Result:** That quick brown fox jumps over the lazy dog.	
Reference	1. Welling, L., & Thomson, L. (2021). *PHP and MySQL Web Development* (5th ed.). Addison-Wesley. 2. Lockhart, J. (2021). *Modern PHP: New Features and Good Practices* (2nd ed.). O'Reilly Media. 3. Schwartz, M. (2017). *PHP Objects, Patterns, and Practice* (2nd ed.). Apress. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO606P24	Core Course – 2 BCA Semester VI **Cloud Computing Lab**	C-2
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Define & implement Virtualization using different types of Hypervisors	
CO2	Experience storage, calendar and document editing services offered by Google cloud.	
CO3	Describe the functioning of Platform as a Service	
CO4	Explore the Microsoft cloud platform.	
CO5	Analyze and understand the functioning of different components involved in Amazon web services cloud platform.	
CO6	Design & Synthesize Storage as a service using own Cloud	
Exercises		
Experiment 1	Create virtual machines that access different programs on same platform,	
Experiment 2	Create virtual machines that access different programs on different platforms.	
Experiment 3	Exploring Google cloud for the following a) Storage b) Sharing of data c) manage your calendar, to-do lists, d) a document editing tool	
Experiment 4	Exploring Microsoft cloud	
Experiment 5	Exploring Amazon cloud	
Reference	1. Erl, T., Mahmood, Z., & Puttini, R. (2013). *Cloud Computing: Concepts, Technology & Architecture* (2nd ed.). Prentice Hall. 2. Bahga, A., & Madisetti, V. (2014). *Cloud Computing: A Hands-On Approach*. VPT. 3. Marinescu, D. C. (2017). *Cloud Computing: Theory and Practice* (2nd ed.). Morgan Kaufmann. 4. Sosinsky, B. (2011). *Cloud Computing Bible* (2nd ed.). Wiley. *Latest Editions of all the suggested books are recommended	

Course Code DBCACO607P24	Core Course – 3 BCA Semester VI **'R' Programming and Python Programming Lab**	**C-2**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identify and implement programming logics and develop efficient programs using R and Python	
CO2	Students learn to develop various programs using R and Python.	
CO3	Apply and build document, share, and collaborate on code development using a suite of Open Source.	
CO4	Develop methods and procedures for various tasks used for different analysis of data.	
Exercises		
Experiment 1	Write a program that prints 'Hello World' to the screen.	
Experiment 2	Write a program that asks the user for a number n and prints the sum of the numbers 1 to n	
Experiment 3	Write a program that prints a multiplication table for numbers up to 12.	
Experiment 4	Write a function that returns the largest element in a list.	
Experiment 5	Write a function that computes the running total of a list.	
Experiment 6	Write a function that tests whether a string is a palindrome.	
Experiment 7	Implement the following sorting algorithms: Selection sort, Insertion sort, Bubble Sort	
Experiment 8	Implement linear search.	
Experiment 9	Implement binary search.	
Experiment 10	Implement matrices addition, subtraction and Multiplication.	
Experiment 11	Create a vector of coefficients for a quadratic equation, using the sample function.	
Experiment 12	Read the file, assigning the result to the object hills,	
Experiment 13	Construct a scatter plot matrix.	
Experiment 14	Compute a linear regression of time against distance.	
Experiment 15	List objects in current working space.	
Experiment 16	Compute the real roots of the quadratic equation $x^2 + x + 1 = 0$ with the formula for the roots of a quadratic $x = -b \pm \sqrt{(b^2 - 4ac)}/2a$ and use sqrt function to compute a (positive) square root.	
Experiment 17	Write an R expression to determine if two sets, A and B, represented as integer vectors are disjoint. If they are disjoint, display elements of set A otherwise display elements of set B. (Examine the help for functions print and cat).	
Experiment 18	Compound interest can be computed using the formula $A = P \times (1 + R/100)^n$ where P is the original money lent, A is what it amounts to in n years at R percent	

	per year interest. Write R code to calculate the amount of money owed after n years, where n changes from 1 to 15 in yearly increments, if the money lent originally is 5000 pounds and the interest rate remains constant throughout the period at 11.5%.	
Experiment 19	Write a loop structure to scan through an integer vector to determine the index of the maximum value. The loop should terminate as soon as the index is obtained. Examine the help for the rank, sort and order functions.	
Experiment 20	Let vector y be the logarithm of a random sample from a standard normal distribution, N(0, 1). Use the if-else function to replace missing values with the value 9999.	
Experiment 21	Construct a 2×2 data frame, X say. Experiment with X^(1: K), where K takes values 1:4. How does the recycling rule behave? What happens if you remove the brackets from the command	
Experiment 22	Assume that we have registered the height and weight for four people: Heights in cm are 180, 165, 160, 193; weights in kg are 87, 58, 65, J00. Make two vectors, height and weight, with the data. The bodymass index (BMI) is defined as Weight in kg/ (height in $m)^2$	
Experiment 23	Make a vector with the BMI values for the four people, and a vector with the natural logarithm to the BMI values. Finally make a vector with the weights for those people who have a BMI larger than 25	
	Python Experiment List: **1.** Write a python program to print the multiplication table for the given number **2.** Write a python program to check whether the given number is prime or not **3.** Write a python program to find factorial of the given number **4.** Write a python program to implement simple Chatbot **5.** Write a python program to implement List operations (Nested List, Length,Concatenation, Membership, Iteration, Indexing and Slicing) **6.** Write a python program to implement List methods (Add, Append, Extend & Delete).	

	7. Write a python program to Illustrate Different Set Operations **8.** Write a python program to generate Calendar for the given month and year **9.** Write a python program to implement Simple Calculator program **10.** Write a python program to Add Two Matrices **11.** Write a python program to Transpose a Matrix **12.** Write a python program to implement Breadth First Search Traversal **13.** Write a python program to implement Water Jug Problem **14.** Write a python program to remove punctuations from the given string **15.** Write a python program to sort the sentence in alphabetical order.	
Reference	1. Wickham, H., & Grolemund, G. (2019). *R for Data Science* (2nd ed.). O'Reilly Media. 2. Matloff, N. (2011). *The Art of R Programming*. No Starch Press. 3. Peng, R. D. (2016). *R Programming for Data Science*. Leanpub. 4. McKinney, W. (2022). *Python for Data Analysis* (3rd ed.). O'Reilly Media. 5. *Data Science from Scratch: First Principles with Python* by Joel Grus (2nd ed., O'Reilly Media, 2020). *Latest Editions of all the suggested books are recommended	

Course Code DBCAPS608P24	Core Course – 4 BCA Semester VI **Project**	**C-4**
Course Outcomes	**On completion of the course, the students will be able to**	
CO1	Identify the real world problems and challenges that need IT based solutions and create very precise specifications of the IT solution to be designed.	
CO2	Understand project characteristics and various stages of a project.	
CO3	Identify project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultation with stakeholders.	
CO4	Implement project management knowledge, processes, lifecycle and the embodied concepts, tools and techniques in order to achieve project success.	
CO5	Demonstrate an ability to work in teams and manage the conduct of the research study.	
Exercises		
	As such, during the development of the project students shall involve themselves in all the stages of the System Development Life Cycle (SDLC) like requirements analysis, systems design, software development/coding;, testing and documentation, with an overall emphasis on the development of reliable software systems. Since, the project work spans over the entire final semester, the students shall be advised to take up projects for solving problems of software industry or any research organization or the real life problems suggested by the faculty in-charge of BCA project work in the institutions. This option is to be offered only in 6th Semester. The students will be allowed to work on any project based on the concepts studied in core/elective or skill based elective courses. The group size should be maximum of three (03) students. Each group will be assigned a teacher as a supervisor who will handle both their theory as well lab classes. Theory classes will cover project management techniques. During the project work, its progress will be monitored, on monthly basis, by the internal guide. 1 Copies of Project Report to be submitted to SC (I copy to be retained by SC and 1 copy to be forwarded to Department). End Examination shall be based on Project Report, Presentation, Viva, and Demonstration of the software.	
	Duration (for 1 group), * Presentation 20 minutes	

	* Viva 15 minutes * Demonstration 15 minutes * Report checking 10 minutes Students shall be given 30 minutes time to make preparations of their presentation and demonstration in the Lab (students are advised to carry out preparation on the previous day).	
	Project Work carries Total 300 Marks * Project Report 100 marks * Presentation (PowerPoint based) 80 marks * Viva 60 marks * Demonstration 60 marks 8.	
	Format of Project Report The manuscript of the report should be organised in the following sequence; * Preliminary pages * The body of the project(chapters) * The bibliography * Preliminary pages * Approval Page * The approval page is also known as signature page or completion certificate * Internal as well as External guides should sign this page in order to assure that they have seen and approved the final version of the report.	
	Synopsis * It should preferably be a single page (150 words max) * The synopsis should be a summary or condensation of the project.	
	Acknowledgement * The acknowledgment should not be more than one page. * The student may acknowledge financial support, permission to use copy righted materials, trademarks, service marks, personal assistance etc.	

	Table of Contents * It should be left justified, Times Roman 14 (student may use Table of content feature available in MS-WORD)	
	Introduction and Background * It should have about 10% of total length * Statement of Problem Area (brief, non-technical) * Existing system, Methods and Procedures * Background * Purpose/Objectives/justification of Project	
	Body of the Project Report The body of the project report may include relevant features listed below: * Company Profile * Requirements Analysis * Systems Design * Database design (normalization, tables) * File System and Data Structures * User Interface design * Prototyping * Software and Hardware Platform (Selection of Operating System, Software packages, Computer Languages, Computer Systems and Peripherals) * Verification and Software Testing * DFD, Structure Charts, E-R diagram, Flowcharts, UML diagrams, Pseudocode, Decision Table, Decision Tree, Workflow, data dictionary * Input and Output Forms/formats/reports * Screen Dumps * System Functional Specification * Off-line or On-line Help feature * Quality parameters/procedures * Encryption/Security features * Future Directions * Results / conclusion * References Any points made in the text must be supported by evidence, either your results or the published findings of others. The sources are identified by citation.	
	To insure durability, permanency, and opacity, project report should be	

	printed on A4 size white bond paper	
	Typeface and Printing Chapter/Section Titles * Should be printed in Times New Roman font in black colour * Font size should be 16/14 points bold. * Chapter should start on new page	
	Running text in the Report should be printed in Times New Roman font in black colour * Font size should be 12 points. * The print should be best quality * Single line spacing for running text * Double line spacing between paragraphs * Printing on both sides	
	Margins * Every page of the report, including all appendices, all notes, and the bibliography must have a LEFT and RIGHT margins of $1^{1/2}$ inches (to allow room for binding) and TOP and BOTTOM margins of 1 inch. * Nothing should appear in LEFT and RIGHT margins. This means that all page numbers, text, tables, parts of illustrations, etc., must not appear in the margin area.	
	Page Numbers * The page numbers must be bottom-cantered to the text (font Times New Roman; 10 points) * All preliminary pages should NOT be numbered. * The numbering should start from chapter-one (Introduction) * Chapter titles (Headings) start on a new page. * Leave an extra space after title * Since you will have several levels of subheadings, distinguish one level from another in a consistent way, such as (1, 1.1, 1.2,2, 2.1,2.1.1,2.1.2, 2.2), * Avoid having more than three levels of subheadings.	
	Length of Project Report * In any case, the length of the graduate project report should not be more than 100 pages (excluding program listing)	
	Binding * The project report must be clothbound (hardcover binding) and must be in light gray or black colour. Spiral binding is NOT allowed. * The outside cover of the project report must follow the format described earlier and the lettering must be printed in	

	gold letters.	
	Certificate for Evaluation This is to certify that the undersigned have assessed and evaluated the Project Work titled " ..... " submitted by the student. The project Report has been (accepted / rejected) for the partial fulfilment of BCA programme. Signature of the Examiner Name of the Examiner	

Annexure II- Mandatory Documents for Admission

To be uploaded on the Admission Portal by the Prospective students

Admission Documents	Format (Jpeg/PNG/PDF)	Documents Size
Duly filled application form with student signature	Digital signature/Student signature JPEG/PNG	20 KB
Colour scan copy of all year/semester mark sheet/grade cards (for PG programs only) or consolidated mark sheet/grade cards also accepted.	PDF/JPEG	500 KB
Colour scan copy of 10th std. Mark sheet/grade card	PDF/JPEG	
Colour scan copy of 12th std./ Three-Year Polytechnic Diploma Mark sheet/grade card	PDF/JPEG	
Colour scan copy of passport size photograph	JPEG or PNG Format	50 KB
Colour scan copy of Govt. Photo id proof, Aadhar card is mandatory. (Other options: Voter's id, Driving License, Passport etc.)	PDF/JPEG	100 KB
In case of name change, Gazette notification documents for name changes For married women – marriage certificate would be accepted – provided previous maiden name is clearly mentioned in the same. In case of deferred Father name or mother name in such cases without a Gazette notification document.	PDF	500 KB
Fees submission transaction details or receipt as per University policy for respective Distance programs	PDF/JPEG	500 KB
Digitally Signed undertaking as per the process; where applicable	PDF	500 KB

Students can also visit the University website for the said information.

Annexure III- Academic Bank of Credit Id Creation Process

All enrolled students, particularly those of Indian nationality, are required to register with ABC (Academic Bank of Credits), a central scheme established by the Ministry of Education, Government of India, for depositing credit. ABC ID creation is mandatory for all students, ensuring their participation in this scheme.

Process	• Students can register by logging in at www.abc.digilocker.gov.in • Click on My Account → Login as Student • Click on "Sign up with DigiLocker" → Enter valid mobile number → An OTP is sent at the phone number via SMS → Enter the OTP and click on "Continue" button → Enter Security PIN set created during Sign Up and click "Submit" Button • You will be prompted with ABC student account creation window
Documents and proofs required	• Aadhaar Card is mandatory for ABC Id creation • Learners Name • Date of Birth • Gender • Enrolment Number • Requirements by Academic Institution: • Mobile Number

The ABC Id can be created by students themselves using Digi-locker, UMANG application, ABC portal or Academic Institution Portal. The process for which is provided below.

The University will extend support to the students to create ABC ID. The documents required will remain the same as stated above.

Annexure IV – Continuous Internal Assessment Pattern

Particular	A1 (Objective Type)	A2 (Objective Type)
Marks	15	15

Question Pattern for the CIA Components
A-1 1.There will be 15 Objective type Multiple Choice Questions (MCQs), each carrying mark1 mark 2. The time for the A-1 assignment will be 30 mins 3. All questions are compulsory 4. There will be NO NEGATIVE MARKING for the wrong answers. **A-2** 1. There will be 15 Objective type Multiple Choice Questions (MCQs), each carrying mark1 mark 2. The time for the A-1 assignment will be 30 mins 3. All questions are compulsory 4. There will be NO NEGATIVE MARKING for the wrong answers.

Annexure V– End-term Examination Pattern

JNU

Centre for Distance and Online Education

End Term Examination

[PROGRAM NAME]

[COURSE NAME][COURSE CODE]

Time : 2 Hours	Max. Marks : 70
Note for students: The paper will comprises of 70 compulsory objective questions of 1 mark each.	
Answer all the questions. Each question carries one mark.	
Q. No. 1 to Q. No. 70 - Objective questions with four multiple choices.	