NAAC ACCREDITED A+ UNIVERSITY

ON. VGU

ONLINE VGU

Entitled by UGC

PROGRAM GUIDE
VERSION 1.0

ACADEMIC SESSION BEGINNING FROM JANUARY'2023

Bachelor of Computer Applications

(BCA)

PROGRAM CODE- 3

Contents

BCA

Program Guide 1.0

1. Program Overview

1.1 Program's Vision and Mission

At Vivekananda Global University (VGU), the Mission is to transform lives of the students and provide the industry with ethical global leaders for the 21st century, who are sensitive towards protecting the environment and are passionate about making significant societal contributions. The University firmly believes in the words of the great philosopher and educator Swami Vivekananda whose philosophy guides us to become better with the time. The Department of Computer Applications, aims to create opportunities for the students to learn about programming, data analysis, artificial intelligence etc. The department attempts to provide the industry with technology enabled professionals. The department continuously seeks to create an enriching educational environment, where innovative thinking is imbibed in ones way of life.

The BCA program at VGU is offered by Centre for Distance and Online Education (CDOE). The program equips students with the skills to remain relevant in this technologically advancing world by imparting rigorous education and personalized attention. The CDOE-VGU provides a unique experiential and online learning platform where a team of competent faculty members guide towards excellence incorporating ethics and values while shaping and sharpening the mindset through academic rigor. It strives to mould the young students into world class technology experts in compliance with the mission. It believes in creating an environment where people from different nationalities, races and religious beliefs learn cohesively and competitively with harmony and dignity. The members at CDOE-VGU constantly endeavour to enhance and upgrade their knowledge through research and learning to ultimately add value to the learner's education and the University. The students will be valued as highly skilled professionals in the service of national and international organizations and Government Institutions.

The program aims to achieve the following objectives:

1. To create practically experienced professionals in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to develop knowledge in various domain-based prospects
2. To encourage learners to communicate effectively and to improve their competency in creating real time IT solutions
3. To enable learners to employ modern computer languages and applications to develop a successful career
4. To enable learners to specialize in an area of their choice such as block chain, cloud technology and information security, data science, UX and artificial intelligence
5. To provide opportunities for the learners to become entrepreneurs and aspire for further up skilling
6. To provide a platform where the students experience all-round development in various disciplines through the courses designed in line with New Education Policy

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

VGU was established with a vision to become a University with commitment to excellence in education, research and innovation aimed towards human advancement.

The program provides learners with an in-depth understanding of the core concepts essential in computer application studies. The students are equipped with the knowledge and skills they need to acquire when they face the technologically advanced world. The program is designed to help learners develop the ability to think critically and strategically and design solutions for complex problems. CDOE-VGU strives to provide the students with the best education and prepares them to take on the challenges of the modern world and the same is relevant to VGU's mission i.e.

- **To promote quality education, training, research, consultancy, and enhance employability and entrepreneurial skills of our students.**
- **To integrate industry with academics in order to prepare our students in an immersive way for the world of work developing an effective interface with the industry and other institutes within and outside the country is the cornerstone of our approach.**
- **To meet these ends, we encourage and nurture the development of students' physical, mental, emotional, secular, and spiritual faculties.**

The BCA Program in online mode aims to provide quality education to the candidates aspiring for higher education but are unable to match the requirements of a fixed time-table and teaching tools in the conventional mode of education in the Universities.

Moreover, to maintain the quality of the curriculum, the syllabus has been designed at par with the conventional mode keeping in mind the specific needs and acceptability of the students of online mode in the industry. The curriculum is also in line with the aims and objectives of the University and the requirements of future skills in the industry.

1.3 Nature of Prospective Target Group of Students

The curriculum of BCA infused with flexibility is designed to enhance comprehension of management education and encourage graduates from varied disciplines and enables them to become learned managers or entrepreneurs. The students are prepared to explore opportunities being newly created in the management profession. The program will target all graduates who want to enhance their knowledge, skills and build careers in entrepreneurial and business world.

The target group of students will be both working professionals and students who are deprived of admission in the regular mode due to limited intake capacity, dropouts primarily due to social, financial and economic compulsions as well as demographic reasons, population of any age and those living in remote areas where higher education institutes are not easily accessible. Ones who wish to pursue education in flexible mode of timings/delivery. It is also aimed at the working professionals who wish to upgrade their knowledge. Students enrolled in the program for delivery through online mode shall contribute towards Gross Enrolment Ratio (GER) of 50% by 2035, as envisaged by the Government of India.

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

The education throughout the course duration will involve inculcating the skills in the field of business management and entrepreneurship. The degree will provide value to the students in the field of HR, Marketing, Finance, Information Technology, Agri-Business, Healthcare Management, International Business and Operations Management.

The degree shall not only provide values to students for employment as a professional in industry, business house, finance or the civil service, but it will also be value by employers for other occupations where a demonstrated ability for logical and quantitative reasoning is desired.

A Learning Management System (LMS) that keeps track of execution of e-Learning material, learner's engagement, assessment, results and reporting in one centralized location, is in place. All of the above teaching and learning processes will be delivered by online mode with much ease for the students. Hence the BCA program is suited for online mode of learning.

2. Procedure for Admission and Curriculum Transaction

Academic programs offered for candidates who enrolled for online mode of learning will be conducted by CDOE-VGU with the support of various faculties of the University. Eligibility criteria, course structure, detailed curriculum, duration of program and evaluation criteria shall be approved by Board of Studies and Academic Council of VGU, based on UGC guidelines for the programs which comes under the purview of Online mode for award of Degree.

Details of procedure for admission with eligibility criteria for admission, fee structure, Curriculum including program delivery, details about Learning Management System (LMS) and Assessments and Evaluation are provided below.

2.1 Procedure for Admission

Students who are seeking admission in programs offered by CDOE-VGU need to apply through www.onlinevgu.com in the courses offered there.

2.1.1 Minimum Eligibility Criteria for Admission

The minimum eligibility criteria for admission in Online BCA program is 12th or equivalent examination in any stream from a recognized Board / Council / University or a three year Polytechnic Diploma holder from a Recognized Board of Technical Education. The learner should also meet all the required documentation criteria as mentioned on the website for admission in the program. Admission will stand cancelled, if candidate does not submit proof of eligibility within stipulated time given by CDOE-VGU. Candidates are expected to read all instructions given in the Program prospectus before filling of application form.

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2.1.2 Online Admission Process and Instructions: Learner Communication

The online admission process for the students is provided below:

Step	Process	Particulars

Step 1	**Counselling**	Prospective students would be counselled for the chosen program by designated and authorised counsellors
Step 2	**Registration on admission portal to get access to My Account.**	Prospective student registers by paying Rs. 1000/- as registration fee. Fill all the details in the application form and upload all the mandatory documents.
Step 3	**Details of Document upload**	Student Uploads document as follows- Personal Documents Passport-size Photograph Student's Signature Aadhar Card (Back & Front) Passport (For International Student) Academic Documents 10th Marksheet 12th Marksheet Other Certificates (detailed list of documents is provided in **Annexure II**)
Step 4	**Scholarship Details**	Student will be eligible for below categories- Merit Base VGU Alumni & Current Student Extra Curriculum Excellence VGU Employee As per the Notice by Deputy Registrar CDOE-VGU.
Step 5	**Verification of documents by the Deputy Registrar**	Dy. Registrar verifies all the documents uploaded by the prospective student on the admission portal and approve/disapprove within 48 hours the eligibility for the chosen program.
Step 6	**Undertaking**	Student will sign Undertaking after Approval in Application.
Step 7	**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 8	**Enrolment**	After the payment of program fee, the student will get the Enrolment number and access to the LMS within 48 hours.
Step 9	**Access to Learning Management System (LMS)**	

1. All students should carefully read and understand the eligibility conditions given in student handbook document and mentioned on the university website before applying for the online programs.
2. The prospective learner has to ensure that their education/qualifying degree has been issued from a recognized university/board only. For learners from an Indian higher education institution, it should be recognized by the regulatory authority of Government of India. For recognized Board of Education to check www.cobse.org.in/ while for Polytechnic Diploma check the respective State Board of Technical Education. To verify degrees from www.ugc.ac.in for recognized universities. For foreign prospective learners they may verify their institutions from www.aiu.ac.in.
3. Prospective learner to check their eligibility on the date of admission and should have passed the qualifying exams before the start of admission batch.
4. A registration fee of Rs.1000 is non-refundable.

Students after enrolment must be registered with ABC (Academic Bank of Credits) a central scheme for depositing credit formulated by Ministry of Education, Govt. of India. Academic Bank of credits (ABC) ID creation is mandatory for all the students. (See **Annexure V** for details)

2.1.3 Program Fee for the Academic Session beginning January 2023

Program fees for students pursuing BCA in various specializations offered by CDOE-VGU is mentioned below:

Program	Branch & Specialization	Academic Fees per Year (INR)	Foreign Nationals Fees
BCA	General	**38,000**	**$850**
	Artificial Intelligence		
	Data Science		
	Cloud Technology And Information Security		
	Block Chain Technology		
	UX		
Other Fees			

	Particulars	**For Indian Students fees**	**For Foreign /NRI Students Fees**
1.	Bonafide Letter (On Demand)	300	$10
2.	Transcripts (On Demand)	500	$10
3.	Specialization Change Fees	1000	$25
4.	Course Change Fees	1000	$25
5.	Validation Extension Fees (1 Year)	10000	$200
6.	Degree Application Fees	3000	$75
7.	Duplicate Mark Sheet/Grade Card	500	$10
8.	Duplicate Degree Certificate	5000	$105
9.	Alumni Membership Fee	3000	$75

Scholarship

The eligible students can avail scholarship opportunities extended to the students as follows:

<table>
<tr><td rowspan="2">Types of Scholarship</td><td colspan="5">Marks scored in qualifying Examination</td><td rowspan="2">Scholarship offered</td><td rowspan="2">Documents Required</td></tr>
<tr><td colspan="5">Percentage /Equivalent CGPA</td></tr>
<tr><td rowspan="2">Merit base</td><td colspan="5">60-75%</td><td>10%</td><td rowspan="2">For UG (12th mark sheets)</td></tr>
<tr><td colspan="5">75% Onwards</td><td>20%</td></tr>
<tr><td colspan="6">VGU Alumni & Student</td><td>20%</td><td>Student Enrolment
(VGU Degree /Marksheet)</td></tr>
<tr><td colspan="6">VGU Employee</td><td>20%</td><td>Employee Code (Employee_id Card)</td></tr>
<tr><td colspan="8">Co-curricular Excellence (Sports/Theatre/Dance/Performing Arts/NCC/NSS)</td></tr>
<tr><td>Level</td><td>District Federation
Association</td><td>State Federation/ Association</td><td>Cluster/ Zonal CBSE</td><td>National Federation/Association</td><td colspan="2">Achievement Certificate</td></tr>
<tr><td>Medallist Scholarship</td><td>10%</td><td>15%</td><td>15%</td><td>20%</td><td colspan="2"></td></tr>
</table>

2.1.4 Financial Assistance Policy

The fees will be paid by the students through the online mode provided on the website. The University has partnered with a third party NBFC to provide financial assistance to those in need.

2.2 Curriculum Transactions

2.2.1 Program Delivery

The curriculum is delivered through the Self Learning Materials (SLMs) in the form of e-Contents supported by various learning resources including audio-video aids through Learning Management System (as per four quadrant approach) along with the online contact hours with discussion forums and synchronous live interactive sessions conducted through LMS as per the prevailing UGC norms for course delivery.

2.2.2 Learning Management System to support online mode of Course delivery

The Learning Management System (LMS) is designed to facilitate the students to have a Global learning experience. LMS has user friendly approach through which the learning is made simple, interesting and truly meeting the global standards of learning. The audio-visual mode of teaching, the self-learning materials, discussion forums and evaluation patterns are unique and meeting the requirements of the industry and in sync with the UGC Guidelines of four quadrant approach.

The students can experience uninterrupted learning 24x7 through web and mobile at the pace chosen by them. The user interface will be simple and easy to navigate through the e-learning modules; the LMS will provide seamless accessibility with all the learning tools designed as per standard norms for a perfect learning experience.

2.2.3 Course Design

The Course content is designed as per the 4-quadrant approach as detailed below to facilitate seamless delivery and learning experience

Quadrant-I i.e., e-Tutorial, that contains – Faculty led Video and Audio Contents, Simulations, video demonstrations, Virtual Labs

Quadrant-II i.e., e-Content that contains – Portable Document Format or e-Books or Illustration, video demonstrations, documents as required.

Quadrant-III i.e., Discussion forums to raise and clarify doubts on real time basis by the Course Coordinator and his team.

Quadrant-IV i.e. Self-Assessment, that contains MCQs, Problems, Quizzes, Assignments with solutions and Discussion forum topics.

2.2.4 Format for Academic Calendar

Sr. No.	Event	Session	Month (Tentative)
1.	Commencement of semester	January	January
		July	July
2.	Enrol learner to Learning Management system	January	Within 48 working hours of fee deposit and confirmation
		July	
3.	Webinars / Interactive Live Lectures and Discussion Forum for query resolution	January	February to May
		July	August to November
4.	Assignment Submission	January	By March-April (i.e. in the mid of the session and towards the end of the session)
		July	By September-October (i.e. in the mid of the session and towards the end of the session)
5.	Performa For Project Proposal	January	by last week of January
		July	by last week of July
6.	Submission of Synopsis (Applicable during Pre final semester)	January	By March
		July	By September
7.	Project Report Submission (Applicable during Final semester)	January	Last week of April
		July	Last week of November

8.	Slot booking for Online Examination	January	April
		July	November
9.	Practical Examinations (Wherever Applicable)	January	May
		July	November
10.	Admit Card Generation	January	By May
		July	By November
11.	Term End Examination	January	June onwards
		July	December onwards
12.	Result Declaration of End Term Examination	January	By August
		July	By February

3. Instructional Design

3.1 Curriculum Design

The curriculum is designed by Experts in the field of management and has taken into account topics that are contemporary and create environmental awareness. It is approved by the Board of Studies of Faculty of Management, the Centre for Internal Quality Assurance (CIQA), and the University Academic Council.

The curriculum comprises of four types of courses:

1. Core Course- It is a compulsory component for award of degree. It provides the foundational knowledge and skills needed to be successful in a specific subject or field.

2. Elective Course – It allows students to choose courses that are specifically tailored to their interests and goals.

3. Skill Enhancement Course – Courses focused to make students competent and improve their professional skills.

4. Major Project – A compulsory component for each learner undertaking the course is the Major Project to orient students with dynamic and contemporary topics of the practical world. The guidelines for Major Project is provided in **Annexure XI**.

5. **Practical Course** – Training will be provided for lab based practical classes

3.2 Program structure and detailed syllabus

3.2.1 Program Structure

Semester 1			
Course Code	**Course Category**	**Title**	**Credits**
MAT 195	Core Course	Basic Mathematics	4
BCA 101	Core Course	Fundamental of C	4
CA 102	Core Course	Basic Electronics	4
CA 103	Core Course	Principle of Programming Languages	4
BCA 104	Practical Course	Fundamentals of C Lab	4
BCA 105	Core Course	PC Software and Automation	2
BCA EL 1		Elective 1	2
		TOTAL	**24**
		Semester 2	
BCA 201	Core Course	Object Oriented Programming with C++	4
BCA 202	Core Course	Data Structures and Algorithms	4
BCA 203	Core Course	Management information system	4
BCA 204	Core Course	Object Oriented Programming with C++ Lab	4
BCA 205	Practical Course	Data Structures Lab	4
BCA 206	Core Course	Soft Skill and Professional Aptitude	2
BCA EL2		Elective 2	2
		TOTAL	**24**
		Semester 3	
BCA 301	Core Course	Database Management Systems	4
BCA 302	Core Course	Computer Networks	4

BCA 303	Core Course	Operating Systems	4
BCA EL 3		Elective 3	2
BCA EL 4		Elective 4	2
BCA 304	Practical Course	Database Management Systems Lab	4
BCA 305	Practical Course	Internet & Web Programming Lab	4
		TOTAL	**24**
		Semester 4	
BCA 401	Core Course	Programming in Java	4
BCA 402	Core Course	Artificial Intelligence	4
BCA 403	Core Course	Computer Graphics and Visualization	4
BCA EL 5		Elective 5	2
BCA EL 6		Elective 6	2
BCA 404	Practical Course	Computer Graphics Lab	4
BCA 405	Practical Course	Programming in Java Lab	4
		TOTAL	**24**
		SEMESTER 5	
BCA 501	Core Course	Software Engineering	4
BCA 502	Practical Course	Software Engineering Lab	4
BCA 503	Core Course	Python Programming	4
BCA 504	Practical Course	Python Programming Lab	4
BCA EL 7		Elective 7	2
BCA EL 8		Elective 8	2
BCA 505	Practical Course	Project Formulation and Appraisal	4

		TOTAL	**24**
		SEMESTER 6	
BCA 601		MAJOR PROJECT	14
BCA EL 9		Elective 9	2
BCA EL 10		Elective 10	2
		Total	**18**
		Grand Total	**138**

Semester	Course Code	Title	Credits
Semester 1	BCA EL 1	Elective 1- Multimedia System	2
Semester 2	BCA EL 2	Elective 2- Basic Program in Entrepreneurship	2
Semester 3	BCA EL 3	Elective 3- Discrete Mathematics	2
	BCA EL 4	Elective 4- Internet and Web Technologies	2
Semester 4	BCA EL 5	Elective 5- Machine Learning	2
	BCA EL 6	Elective 6- Information System Security	2
Semester 5	BCA EL 7	Elective 7- Distributed Systems	2
	BCA EL 8	Elective 8- Real Time Systems	2
Semester 6	BCA EL 9	Elective 9- Cybercrime and IT Law	2
	BCA EL 10	Elective 10- Software Project Management	2

*****Apart from the BCA electives mapped above, learners can also opt for electives from the following disciplines if they wish to specialise in a specific field:***

1. UX
2. Data Science
3. Cloud Technology and Information Security
4. Block-chain Technology
5. Artificial Intelligence

Attached below is each specialisation's list of 10 electives:

Specialization 1- UX			
Semester	Course Code	Title	Credits
Semester 1	BCA UX 1	Elective 1- Introduction to UX Design	2

Semester 2	BCA UX 2	Elective 2- Empathy and User Research	2
Semester 3	BCA UX 3	Elective 3- Technology in Experience Design	2
	BCA UX 4	Elective 4- Information Architecture	2
Semester 4	BCA UX 5	Elective 5- Interaction Design	2
	BCA UX 6	Elective 6- Wireframing and Prototyping	2
Semester 5	BCA UX 7	Elective 7- Usability Testing	2
	BCA UX 8	Elective 8- Visual Design Tools	2
Semester 6	BCA UX 9	Elective 9- Business, UX and Design Management	2
	BCA UX 10	Elective 10- Design Thinking Application	2

Specialization 2 – Data Science			
Semester	**Course Code**	**Title**	**Credit**
Semester 1	BCA EL_1	Elective 1- Multimedia Systems	2
Semester 2	BCA DS 1	Elective 2- Mathematical Computation of Data	2
Semester 3	BCA DS 2	Elective 3- Introduction to Data Science	2
	BCA DS 3	Elective 4- Big Data Analytics	2
Semester 4	BCA EL 5	Elective 5- Machine Learning	2
	BCA DS 4	Elective 6- R for Data Science	2
Semester 5	BCA DS 5	Elective 7- Information Extraction and Retrieval	2
	BCA DS 6	Elective 8- Data Mining and Prediction	2
Semester 6	BCA DS 7	Elective 9- Data Handling and Visualization	2
	BCA EL_10	Elective 10- Software Project Management	2

Specialization 3 – Cloud Technology and Information Security			
Semester	**Course Code**	**Title**	**Credit**
Semester 1	BCA EL_1	Elective 1- Multimedia Systems	2
Semester 2	BCA CTIS 1	Elective 2: Introduction to cryptography	2
Semester 3	BCA CTIS 2	Elective 3: Principles of Virtualisation	2
	BCA CTIS 3	Elective4: Fundamentals of Cloud Technology	2
Semester 4	BCA CTIS 4	Elective 5- Network Security	2
	BCA CTIS 5	Elective 6- Cloud Web Services	2

Specialization 3 – Cloud Technology and Information Security			
Semester	**Course Code**	**Title**	**Credit**
Semester 5	BCA CTIS 6	Elective 7- Database Security Fundamentals	2
	BCA CTIS 7	Elective 8- Ethical Hacking	2
Semester 6	BCA CTIS 8	Elective 9- Infrastructure Solutions on Cloud	2
	BCA EL_10	Elective 10- Software Project Management	2

Specialization 4 – Block Chain Technology			
Semester	**Course Code**	**Title**	**Credit**
Semester 1	BCA EL_1	Elective 1- Multimedia Systems	2
Semester 2	BCA CTIS 1	Elective 2: Introduction to cryptography	2
Semester 3	BCA BL_1	Elective 3- Fundamentals of blockchain technology	2
	BCA BL_2	Elective 4- Distributed Ledger Technology	2
Semester 4	BCA BL_3	Elective 5- Solidity Programming	2
	BCA BL_4	Elective 6- Smart Contract Development	2
Semester 5	BCA BL_5	Elective 7- Blockchain Architecture	2
	BCA BL_6	Elective 8- Blockchain Platforms and Ethereum	2
Semester 6	BCA BL_7	Elective 9- Blockchain Economics	2
	BCA EL_10	Elective 10- Software Project Management	2

Specialization 5– BCA Artificial Intelligence			
Semester	**Course Code**	**Title**	**Credit**
Semester 1	BCA EL_1	Elective 1- Multimedia Systems	2
Semester 2	BCA DS1	Elective 2- Mathematical Computation of Data	2
Semester 3	BCA EL 3	Elective 3- Discrete Mathematics	2
	BCA EL4	Elective 4- Artificial Intelligence	2
Semester 4	BCA EL 5	Elective 5- Machine Learning	2
	BCA AI 1	Elective 6- Deep Learning	2
Semester 5	BCA AI 2	Elective 7: Reinforcement Learning	2
	BCA AI 3	Elective 8: Natural Language Processing	2

Specialization 5– BCA Artificial Intelligence			
Semester	**Course Code**	**Title**	**Credit**
Semester 6	BCA AI 4	Elective 9: Chat Bot Development	2
	BCA EL_10	Elective 10- Software Project Management	2

3.2.2 Detailed Syllabus of BCA

Detailed syllabus of BCA program along with specific specialisations are 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 years	138 credits

3.4 Instructional delivery mechanisms

VGU has a fully dedicated team of faculty members and staff who are well versed in delivering online lectures under the CDOE – VGU.

Academic calendar will be provided to students at the beginning of each session through LMS. Self-learning material, audio and video content will be shared with the students through LMS through following delivery channels:

3.4.1 Four Quadrants and Academic Delivery

No. of Credits	**Duration**	**Live Sessions**	**Quadrant – I e-Tutorial**		**Quadrant – II e-Content**	**Quadrant – III Discussion Forum**	**Quadrant – IV Assessment**
			(Recorded Lecture)	**Open Source Videos**	**e-Content(E-book/ PDF & PPT)**	**Live Session (2 hrs/week)**	**CIA**

2	6 weeks	6 (1/week)	6 hrs	4 hrs	• 2 files – 1 PPT and 1 E-book/PDF • Total 12 files • Reading time should be mentioned for each file	Forum Topics – For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions
Total Hours= 60		**6 hrs**	**10 Hrs**		**10 Hrs**	**12 hrs**	**22 Hrs**
4	12 weeks	12 (1 session/week)	12	8	• 2 files – 1 PPT and 1 E-book/PDF • Total 28 files Reading time should be mentioned for each file	-same-	-same-
Total Hours = 120		**12 Hrs**	**20 Hrs**		**20 Hours**	**24 hrs**	**44 Hrs**

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

LMS is a comprehensive digital platform that provides all recorded faculty video lectures, provision for real-time discussion forums and live session, e-content in the form of study material, open source materials and graded assessments.

For each module of a course, there shall be one live session conducted by the concerned faculty on a particular topic. CDOE-VGU has designed study material that is lucid and easy to understand with proper summary, self-assessment questions and case studies.

These course materials can be accessed through**:**

- Login credentials as mentioned on the welcome mail sent by the university
- Students can also login through My Account Tab as mentioned on the University website https://onlinevgu.com/.
- Student can also download Online VGU app from Google Play Store and Apple Store.

Online Courseware

The students would get access to the following course material through LMS:

- e-Books (SLM) for each module of a course
- Study Guide (PPT) for each module of a course
- Tutorials Videos for each module of a course
- Live Interactive Online Sessions for each module of a course
- Frequently Asked Questions (FAQ) and Misconceptions for each module of a course

- Web Resources for Research Purpose for each module of a course
- Practice Assignments for each module of a course
- Online Discussion Forums for each course
- Enriching Content: Gamified Test for each module of a course; Case Studies for each module of a course
- The LMS have semester / year wise buckets for subjects and specializations of the respective programs as enrolled.

The Dashboard will ascertain the progress of their learning, comparison with their peers in terms of learning, regular notifications regarding upcoming Webinars/virtual classes, Assignments, Discussion Forum participations and Examinations. It also provides an opportunity for raising queries which may be answered and conveyed by the course coordinators mentors and faculty.

3.6 Student Support Services

Student would have the access to connect with the SRM for support services offered by CDOE-VGU in case of any queries related to administration and general technical queries. A ticketing system integrated on the LMS would help the learner to connect with the CDOE-VGU technical team for support services which shall be duly resolved by the appropriate authority. A notification will also be sent to the Deputy Registrar, to ensure queries are resolved within 24 hours or sooner.

For academic course based queries, the student will raise query which will be directly notified to the Course Coordinator, Program Coordinator and Deputy Director through an open discussion form. The query should be resolved within 48 hours of the query raised; otherwise the matter should be managed and resolved by the Program Coordinator. The same should be ensured by the Deputy Director.

Apart from being a well-recognized university that delivers academic excellence by integrating industrial expertise, CDOE-VGU also ensures holistic development of the students. To cater to multifarious needs of the students that shape them to become future leaders, the department aids in widening the scope of opportunities. The clubs and activities and activities are as follows:

ACIC-VGU Foundation

To foster innovation and entrepreneurship multiple facilities supported by various Government and private agencies, including infrastructure for pre-incubation, incubation centers, and R&D facilities on campus have been initiated. These centers provide the resources they need to turn their ideas into successful startups.

VGU TBI Foundation and VGU RTBI are also incubation centers at VGU. They provide support for the faculty and students of the University to develop their innovative ideas into products and services. These centers offer infrastructure, mentorship, and guidance for developing their innovative ideas.

Currently, VGU is home to more than 80+ startups, which are working on a wide range of projects across various industries. These startups are founded and run by VGU students, alumni and faculty members, who are taking advantage of the university's resources and support to turn their ideas into successful businesses.

SIDBI Swavalamban chair: - The SIDBI Swavalamban chair at VGU provides a wide range of support for students and start-ups, with the goal of fostering entrepreneurship and innovation on campus. The chair is funded by the Small Industries Development Bank of India (SIDBI) and is dedicated to promoting the development of small and medium-sized enterprises (SMEs) in India.

Aspire: A Scheme for Promotion of Innovation, Rural Industries, and Entrepreneurship (ASPIRE) is a scheme of MSME that aids to set up a network of technology centres and to set up incubation centres across India. VGU hosts this facility to accelerate entrepreneurship and also to promote startups for innovation in agro-industry.

Placement

VGU has a reputation to provide educational excellence and future-ready programs. The university has achieved a placement rate of 94% at renowned national and international companies. VGU attracts over 500 recruiters from different domains that help every VGUite to find a suitable organization.

Internship

The curriculum of the university mandates a six months internship for all the students to understand real-world issues. Students get valuable industry insights by working hands-on in these organizations. There are more than 100 collaborations at various industries, companies, NGOs, etc. for placement

Entertainment and Add-on Services

A plethora of additional services are extended by CDOE-VGU. Free access to channels like e-sports, e-news, e-clubs, e-movie theatre and digital purchase opportunities are provided to the students.

VGU-ICON

VGU-ICON Alumni Society is an opportunity to connect and network with all VGUite ever since the University was established.

Pathway Twinning and Foreign Degree Options

A twinning program is an arrangement between domestic and international universities to provide degrees accredited by both universities. VGU has tied up with various international universities to offer degrees through integrated learning management system.

4. Assessment and Evaluation

1.1 Overview

Learning of the students would be evaluated through internal assignments, quizzes, learner response sheets, and end-term examinations. CDOE-VGU adopts rigorous process in development of question papers, question / quiz banks, assignments and their moderation, conduct of examinations, analysis of answer scripts by qualified academics, and declaration of result. The Centre shall frame the question papers so as to ensure that complete syllabus is covered. The evaluation shall include two types of assessments-

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 shall be conducted to assess the knowledge acquired during the study.

For theory courses, the internal evaluation shall be conducted as Continuous Internal Assessment (CIA) by assignments preparation and quizzes. The internal assessment shall comprise of maximum of 30 marks for each course. Plagiarism for CIA will be accepted upto a maximum of 15% only for subjective content. The end semester examination shall be of two hours duration for each course at the end of each semester.

To ensure flexibility and convenience for the students, they may opt to book an Online Examination Slot for each course on each day of exam dates as declared by the COE of the University. The slot timings will be as follows:

1. **10 am to 12 Noon**
2. **12.30 pm to 2.30 pm**
3. **3 pm to 5 pm**

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.

4.1 Question Paper Pattern

Online Exam Time: 2 Hours

Max. Marks: 70

1. Part A comprising of 49 Multiple-Choice Questions (1 Mark Each) – 49 Marks

2. Part B comprising of 3 Essay Type Question Answers (7 Marks Each) – 21 Marks

4.2 Distribution of Marks in Continuous Internal Assessments

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

Particular	A1 (Objective Type)	A2 (Subjective Type)	A3 (Discussion Forum)
Weightage %	10%	15%	5%

Note: Refer to **Annexure VII** and **VIII** for reference to the question paper pattern and further guidelines

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

As per UGC's recommendations for the 'Evaluation Reforms in the Higher Education System', CDOE-VGU will be adhering to Relative Grading System. In this system, grades are awarded to students according to their performance relative to their peers in the same class (class is defined as a unique combination of course-slot-faculty).The statistical method shall invariably be used with marginal adjustment for natural cut off. The mean and the standard deviation (σ) shall be calculated as follows:

$$\text{Mean} = \frac{\sum \text{Total Marks obtained by students in a class}}{n}$$

Where n = total number of students in a class

$$\text{Standard Deviation} = \sqrt{\frac{\sum (X - Mean)^2}{n}}$$

Where X = individual marks

The mean and the standard deviation (σ) marks obtained of all the students in a course shall be calculated and the grades shall be awarded to a student depending upon the marks and the mean and the standard deviation as per table given below:

Lower Range of Marks	Grade Awarded, if marks falls in range		Upper Range of Marks
	UG	PG	
≥Mean + 1.5 σ	AA	AA	---
≥Mean + 1.0 σ	A	A	< Mean + 1.5 σ
≥Mean + 0.5 σ	BB	BB	< Mean + 1.0σ
≥Mean	B	B	< Mean + 0.5 σ
≥Mean -0.5 σ	CC	CC	<Mean
≥Mean – 1.0 σ	C	NC	< Mean -0.5 σ
-	NC	-	< Mean – 1.0 σ
-	Ab (Absent)	Ab (Absent)	-
-	W(Withdrawal)	W(Withdrawal)	-
-	GA(Grade Awaited)	GA(Grade Awaited)	-
-	S(Satisfactory)	S(Satisfactory)	-
-	X(Not Satisfactory)	X(Not Satisfactory)	-

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

The letter Grades awarded to a student in all the courses (except audit courses) shall be converted into a semester and cumulative performance index called the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). The SGPA is an indicator of the overall academic performance of a student in all the courses he/she has registered during a given semester. Similarly, the CGPA indicates the overall academic performance of a student in all the courses registered up to and including the latest completed semester/summer term.

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 upto and including the latest semester as per the procedure provided in VGU Academic Regulations (v 2.2). It is the weighted average of the grade points of all the letter grades received by the student from his entry into the 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 member is 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

Percentage (%) Marks = (CGPA -0.75) 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. The grade card also contains the Cumulative Grade Point Average (CGPA).

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 of Rs. 3000/- to the University.
- Students who wish to be member of alumni society need to pay Rs 3000/- as membership fee.

4.5.2 Online Results, grade card and Degree Logistics–Internal Process

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

CDOE-VGU 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.

5. Requirement of the Laboratory Support and Library Resources

5.1 Laboratory Support

For practical component (programming and coding), students will have access to lab manuals designed by faculty and provided with online virtual lab as required and lab simulation tools and software, to allow learners to practice accordingly. Faculty will engage students by demonstrating various programs. For this purpose lab manuals and lab exercises will be prepared by faculty. The details of various labs and their requirements have been provided in **Annexure IX**. Students will be assessed based on their learning during their lab hours which are part of their practical classes.

5.*2 Library Resources*

The Central Library has reference, circulation, audio-visual, periodical, book-bank, digital library, and reprographic sections. The library has more than 35000 books, e-journals, online-database such as Scopus and Web of Science and institutional repositories having rare book collection. All e-resources can be accessed through LAN on the campus and remotely through login Id and password . Besides, University library has membership of various consortia such as E-Shod Sindhu, Shodhganga, INFLIBNET, DELNET, ManuPatra etc. The details of accessing these platforms is provided in **Annexure X**.

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)	45,00,000 INR
2	Program Delivery (Per Year)	9,00,000 INR
3	Program Maintenance (Per Year)	30,00,000 INR

7. Quality Assurance Mechanism

Quality of a program depends on the course curriculum, syllabus and academic delivery which is designed to meet the gap between industry and academia. To achieve this Centre for Internal Quality Assurance (CIQA) and the Academic Council shall duly fulfil their duties.

The **Academic Council** is responsible to ratify the curriculum and changes as recommended by CIQA in order to maintain the quality and standard of online education at CDOE-VGU .

The **Centre for Internal Quality Assurance (CIQA)** shall be responsible to

(i) to conduct periodic assessment of the online learning course material and audio-video tutorials and will assure that the quality of learning is maintained

(ii) to ensure stakeholder's feedback is taken from time to time and recommended changes are executed as per the requirement of the course delivery and industry requirement

(iii) to assess the quality of assignments, quizzes and end- term assessment and advice improvements to maintain the standard of the learning program

(iv) to assure that the learning is truly a global experience for the student along with the possibility to inculcate skills as expected from the program outcomes and map with vision and mission of VGU

The **CoE** of the University shall oversee the examinations and the evaluation system.

The CDOE-VGU will work continuously for the betterment of processes, assessments, teaching methodology, e-learning material improvisation as per four quadrant approach and implementation of the same as per New Education Policy. The University is committed to deliver the best education in all the learning modes with adherence to NEP, UGC and other regulatory guidelines in true global sense.

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Annexure I_Detailed syllabus of BCA Program

The program outcomes for the BCA program are as follows:

PO1: Computational Knowledge-Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

PO2: Problem Analysis-Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences and relevant domain disciplines.

PO3: Design /Development of Solutions-Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex Computing problems:Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage-Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

PO6: Professional Ethics-Understand and commit to professional ethics and cyber regulations, responsibilities and norms of professional computing practices.

PO7: Life-long Learning-Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

PO8: Project management and finance-Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO9: Communication Efficacy-Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PO10: Societal and Environmental Concern-Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.

PO11: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

PO12: Innovation and Entrepreneurship-Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Semester I

Course Code: MAT 195 - Basic Mathematics

Credit 4, 120 hours

Learning Objectives:

- Solve business arithmetic operations with fractions to do business problems, and be able to select which math method needs to be used to do problems
- Use Matrix Algebra and its applications to perform different calculations which are otherwise complex and time consuming
- Use differential and integral calculus to do business calculations, trend analysis, study market fluctuations and be able to differentiate which math method should be used for different problems

Unit 1: Determinants**:** Definition, Minors, Cofactors, And Properties of Determinants

Unit 2: Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices

Unit 3: Adjoint, Inverse, Cramers Rule, Rank of Matrix Dependence of Vectors, Eigen Vectors of a Matrix, Caley-Hamilton Theorem (without proof).

Unit 4: Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions

Unit 5: Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities

Unit 6: Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions.

Unit 7: Definition of polynomial in one variable with example, Standard form of a quadratic equation $ax^2+bx+c=0$, $a\neq0$,

Unit 8: Solution of quadratic equation(only real roots) by factorization, By completing the square and by using quadratic formula, Relationship between discriminant and nature of roots..

Unit 9: Basics: Frequency distribution, Graphical representation of frequency distribution. Mean, Median, Mode and other measures of Central Tendency

Unit 10: Measures of Dispersion: Dispersion, Standard Deviations, Variance, Correlation and regression

Unit 11: Correlation: Measure of Karl's Pearson's coefficient of correlation

Unit 12: Regression: Regression analysis, Properties of regression lines.

Unit 13: Definition of a vector in 2 and 3 Dimensions; Double and Triple Scalar and Vector Product and physical interpretation of area and volume.

Unit 14: Practical exercises

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Module 1								2 overall Assignments
Electric Current	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Ohm's Law		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Faraday's Law		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 2								
Kirchoffs laws	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Resistive, Inductive and Capacitive Networks		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Series and Parallel Circuits		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Module 3							
Semiconductors	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Conduction in Semiconductors Diodes		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
P N Junction		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 4							
Zener Diodes	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Photovoltaic Cells		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Rectifiers		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 5							
Transistors	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Current components and gains		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Configurations		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 6							

Transistor as an Amplifier	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Field Effect Transistor		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
JFET and MOSFET		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 7								
Representation of Data	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Digital vs Analog		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Digital Number system		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 8								
Conversion	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Fractional Numbers and Signed Numbers		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Complements		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 9								
Arithmetics Operations on Binary numbers	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Fixed point representation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Floating point representation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Module 10							
Boolean Algebra	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Logic Gates		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Truth Tables		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 11							
Communications	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)
IEEE Spectrum		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 12							
Types of communications	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)
Amplitude Modulation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Frequency Modulation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 13							
Transducers	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)
Thermocouple		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 14							

RTD	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Strain gauge		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Load Cell		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**		**24 hours**	**44 Hours**	

Text/Reference Books:

1. B.S. Grewal, "Elementary Engineering Mathematics", 34th Ed., 1998.
2. Shanti Narayan, "Integral Calculus", S. Chand & Company, 1999
3. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Company, 9th Revised Edition, 2001.
4. Shanti Narayan, "Differential Calculus", S.Chand & Company, 1998.
5. Mathematics XI &XII, R.D. Sharma, Dhanpat Rai Publications.
6. Probability, Statistics and Queueing theory: Allen.

Course Code: BCA 101 - FUNDAMENTALS OF C

Credit 4, 120 hours

Learning objectives:

- Be able to implement, test, debug, and document programs in C
- Understand low-level input and output routines
- Program with pointers and arrays, perform pointer arithmetic, and use the preprocessor
- Be able to write programs that perform explicit memory management
- Understand how to write and use functions, how the stack is used to implement function calls, and parameter passing options
- Understand and use the common data structures typically found in C programs -namely arrays, strings, lists, trees, and hash tables

Unit 1: Programming: What is a program? What is a programming language? Steps in Programming, Skills needed to do programming, A little introduction to C, Writing a Program

Unit 2: Types of Programming: Fundamentals of a Programming Language, Different Programming Techniques, Procedural Programming, Modular Programming, Object Oriented Programming, Getting started with compiler**.**

Unit 3: Forming Words and Sentences: Words and Sentences in C Language: Alphabets in C, Keywords in C, Rules of forming Words in C language

Unit 4: Data Types: Data Variables, Data Types and Rules for naming and declaring data, variables, Basic Data Types in C, Constants, Comments in C

Unit 5: Input/Output Instructions: Types of instructions, Data Manipulation Instructions, Input/Output Instructions, Flow Control Instructions

Unit 6: Decision Control: Decision Control Instructions, If, if-else, If-else-if, Nested if-else

Unit 7: Loop Control: Loop Control Instructions, For Loop, While Loop, Do While, Selection Instructions

Unit 8: Arrays: What is an array? Array Declaration, Array Initialization, Accessing individual elements of an array,

Unit 9: Two-dimensional Array: Two Dimensional Arrays, Passing an array element to a function, Rules of using an array

Unit 10: Functions: Why use Functions, Components of Function, Name of a function, Body of a function, Local variables of a function

Unit 11: Passing Parameters: Parameters or Arguments to a function, Return Values, Prototype of a function

Unit 12: Pointers and Strings: What is a pointer? Declaring a Pointer variable, initializing a pointer variable, Using a Pointer Variable, Pointer Arithmetic, Pointers and array, passing an entire array to a function, What are strings? String I/O, String Manipulation Functions

Unit 13: Structures: Declaring and Accessing Structure, variables Uses of Structures, Unions Storage Classes and Scoping: Automatic, Register, External, Static, Scope of a Variable

Unit 14: Command Line and File Input/Output: Command-line arguments, File Input and Output, Combining Command-line Arguments and File I/O.

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial	Quadrant - II e-Content	Quadrant - III Discussion Forum	Quadrant - IV Assessment

BCA 101- Fundamentals of C (4 Credits) Duration - 12 Weeks	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 12 Hours**	**Open Source Videos = 8 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**
Total = 120 Hours	**12 Hours**	**20 Hours**		**20 Hours**		**24 hours (2 hours/week)**	**44 Hours**
Module 1							2 overall Assignments
Introduction to Programming	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Introduction to C Language		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Programming		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 2							
Programming Techniques	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
OOPS		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Compilers		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 3							

Words and Sentences	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Alphabets and Keywords		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Rules for forming words		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 4								
Data types and Variables	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Constants		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Rules for naming Data types		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 5								
Data Input and Output	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Data Manipulation Instructions		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Flow Control Instructions		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 6								
Decision Control	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice	

If else		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		Questions)	
Nested If else		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 7								
Loop Control Instructions	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
For Loop, While Loop		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Selection Instructions		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 8								
Array Definition	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Declaration of Arrays and Initialisation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Accessing Individual Elements		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 9								
Two Dimensional Arrays	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Passing an Element to a function		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Rules of using an array		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 10								

Components of Function	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Name of a function, Body of a function		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Local variables of a function		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 11								
Parameters or Arguments to a function	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Return Values		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Prototype of a function		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 12								
Pointers and Strings - Definitions	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Pointers and Array		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
String Manipulation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 13								
Structures	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Variables		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Scoping		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 14								
Command Line Arguments	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
File Input and Output		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Combining Command line and File I/o		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**		**24 hours**	**44 Hours**	

Text/Reference Books:

1. Brian W. Kernighan, Dennis M. Ritchie, “The C Programming Language”

2. K. N. King, “C Programming: A Modern Approach” Prentice-Hall

3. Stephen Prata, “C Primer Plus” published by Sams

4. Steve Oualline, “Practical C Programming” O'Reilly Media

5. Yashwant Kanetkar, “ Let us C” BPB Publications, Yashwant Kanetkar, “Pointers in C” BPB Publications

Course Code: BCA 102 - BASIC ELECTRONICS

Credit 4, 120 hours

Learning objectives:

- Analyse and understand the concepts of different types of electronic devices
- Describe the working principles of electronic devices
- Understanding the construction of FET and working principle of FET circuits
- Understand the problem solving techniques Op Amp based circuits and design Op Amp based application circuits
- Understand the different building blocks in digital electronics using logic gates and implement simple logic function using basic universal gates

Unit 1: Electric Current, Electromotive force, Electric Power, Ohm's Law, Basic Circuit Components, Faraday's Law of Electromagnetic Induction

Unit 2: Lenz's Law, Kirchhoff's laws, Network Sources, Resistive, Inductive and capacitive Networks, Series Parallel Circuits.

Unit 3: Conduction in Semiconductors, Conduction Properties of Semiconductor Diodes, Behaviour of the PN Junction, PN Junction Diode

Unit 4: Zener Diode, Photovoltaic Cell, Rectifiers, L, C, & L-C filters.

Unit 5: Transistor, Modes of operation, Characteristics, Current components, Current gains: alpha, beta and gamma. CE, CB and CC configuration

Unit 6: Transistor as an Amplifier. Field Effect Transistor; JFET and MOSFET.

Unit 7: Representation of Data: Digital versus Analog, Digital number system (binary, octal, decimal and hexadecimal numbers)

Unit 8: Conversion from one form to another, fractional numbers and signed numbers, Complements

Unit 9: Arithmetic operations on binary numbers, Fixed point and floating point representations

Unit 10: Boolean algebra, Logic Gates and Their Truth Tables.

Unit 11: Introduction, IEEE Spectrum for Communication Systems

Unit 12: Types of Communication, Amplitude and frequency Modulation

Unit 13: Introduction to Transducers: Thermocouple

Unit 14: RTD, Strain Gauges, Load Cell.

Content Matrix

Semester	**Live Sessions**	**Quadrant - I e-Tutorial**		**Quadrant - II e-Content**		**Quadrant - III Discussion Forum**	**Quadrant - IV Assessment**
BCA 102- Basic Electronics (4 Credits) Duration - 12 Weeks	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 12 Hours**	**Open Source Videos = 8 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**

						Coordinator or his team		
Total = 120 Hours	**12 Hours**	**20 Hours**		**20 Hours**		**24 hours (2 hours/week)**	**44 Hours**	
Module 1								2 overall Assignments
Eelctric Current	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Ohm's Law		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Faraday's Law		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 2								
Kirchoffs laws	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Resistive, Inductive and Capacitive Networks		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Series and Parallel Circuits		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 3								

Semiconductors	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Conduction in Semiconductors Diodes		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
P N Junction		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 4								
Zener Diodes	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Photovoltaic Cells		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Rectifiers		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 5								
Transistors	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Current components and gains		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Configurations		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 6								
Transistor as an Amplifier	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (	

Field Effect Transistor		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		Practice Questions)	
JFET and MOSFET		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 7								
Representation of Data	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Digital vs Analog		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Digital Number system		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 8								
Conversion	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Fractional Numbers and Signed Numbers		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Complements		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 9								
Arithmetics Operations on Binary numbers	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Fixed point representation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Floating point representation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 10								

Boolean Algebra	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Logic Gates		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Truth Tables		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 11								
Communications	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
IEEE Specctrum		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 12								
Types of communications	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Amplitude Modulation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Frequency Modulation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 13								
Transducers	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Thermocouple		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 14								

RTD	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Strain gauge		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Load Cell		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**		**24 hours**	**44 Hours**	

Text / Reference Books:

1. Basic Electrical and Electronics Engineering by Sukhija and Nagsarkar, Oxford Publication
2. Basic Electrical & Electronics Engineering by Kothari, Nagrath, TMH
3. Electronic devices & circuits theory, R.L. Boylestad, Louis Nashelsky , Pearson education
4. Millman, Electronics Devices and Circuits, TMH
5. Basic Electronics Engineering by Vijay Baru et al, Dream Tech, New Delhi
6. Fundamentals of Electrical and Electronics Engineering by Ghosh, Smarajit, PHI India

Course Code BCA 103: PRINCIPLE OF PROGRAMMING LANGUAGES

Credit 4, 120 hours

Learning objectives:

- To introduce several different paradigms of programming.
- To gain experience with these paradigms by using example programming languages.
- To understand concepts of syntax, translation, abstraction, and implementation.

Unit 1: Definition, History, Features. Issue in Language Design: Structure and Operation of computer

Unit 2: Language Paradigms, Efficiency, and Regularity

Unit 3: Issues in Language Translation: Syntax, Semantics, Stages analysis and synthesis.

Unit 4: Specification and Implementation of Elementary and Structured Data Types

Unit 5: Type equivalence, checking and conversion. Array, Structure, Union.

Unit 6: Sequence control with Expressions, Conditional Statements

Unit 7: Loops, Exception handling

Unit 8: Subprogram definition and activation, simple and recursive subprogram

Unit 9: subprogram environment, Parameter passing mechanism**.**

Unit 10: Abstract Data type, information hiding, encapsulation, type definition

Unit 11: Static and Stack-Based Storage management

Unit 12: Fixed and Variable size heap storage management.

Unit 13: Introduction, parallel processing and programming language

Unit 14: Threads, semaphore, monitor, message passing.

Semester	**Live Sessions**	**Quadrant - I e-Tutorial**		**Quadrant - II e-Content**		**Quadrant - III Discussion Forum**	**Quadrant - IV Assessment**	
BCA 103- Principles of Programming Languages (4 Credits) Duration - 12 Weeks	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 12 Hours**	**Open Source Videos = 8 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 120 Hours	**12 Hours**	**20 Hours**		**20 Hours**		**24 hours (2 hours/week)**	**44 Hours**	
Module 1								
History of Programming	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	2 overall Assignments
Language Design		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Structure and Operation of Computers		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 2								
Language Paradigms	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Efficiency		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Regularity		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 3								
Language Translation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Syntax and Semantics		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Analysis and Synthesis		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 4								
Structured Data types	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Specification		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Implementation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 5								
Type equivalence	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Checking and Conversion		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Array, Structure, Union.		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 6								
Sequence control	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Expressions		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Conditional Statements		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 7								
Loops	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Exception handling		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 8								
Subprogram	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice	

Simple Subprogram		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		Questions)	
Recursive Subprogram		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 9								
Subprogram Environment	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Passing parameters		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 10								
Abstract Data Type	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Information Hiding		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Encapsulation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 11								
Storage Management	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Static and Stack based storage Management		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 12								
Fixed Size Heap	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	

Variable Size Heap		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 13								
Parallel Processing Definition	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Paralle processing in programming		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 14								
Threads	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Semaphore and message passing		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**		**24 hours**	**44 Hours**	

Text/Reference Books:

1. Concepts of Programming Language, Robert W. Sebesta, Addison Wesley, pearson Education Asia, 1999.
2. Introduction to Computer Science, Ramon A. Mata-Toledo and Pauline K. Cushman, Mc Graw Hill International Edition.
3. Programming Languages, D. Appleby and JJ Vande Kopple: Tata Mc Graw Hill, India.
4. How to Program C, Deitel and Deitel, Addison Wesley, Pearson Education Asia, 1999.

Course Code BCA 104 - FUNDAMENTALS OF C LAB

Credit 4, 120 hours

Learning objectives:

1. Understand the logic for a given problem.

2. Write the algorithm of a given problem.

3. Draw a flow chart of a given problem.

4. Recognize and understand the syntax and construction of C programming code.

5. Gain experience of procedural language programming.

6. Know the steps involved in compiling, linking and debugging C code.

Basic Calculation:

1. Write a c program to display your Name, address and city in different lines.
2. Write a c program to perform all airthmatic operations.
3. Write a c program to convert the Fahrenheit into centigrade. Formula c= (F-32)/1.8
4. Write a c program to calculate the simple interest.
5. Write a c program to calculate the compound interest.
6. Write a program in C to display sum of first N natural numbers.
7. Write a c program to find the roots of the quadratic equation.

Conditional Statements-1

1. Write a C – program which used to determine type of triangle based on sides. Measure of sides input by the user. To check whether the triangle is isosceles, scalene or equilateral triangle. Hint: If all the sides are equal than equilateral, If any two sides are equal than isosceles otherwise scalene.
2. Write a program in C to which allow user to enter any arithmetic operator (+ - * /) and two integer values and display result according to selection of operator.

Conditional Statements-2

3. Write a program in C to calculate gross salary of employee using : 1. Gross Salary = Basic Pay + DA + HRA – PF. 2. DA = 30% If Basic Pay < 5000 otherwise DA = 45% of the Basic Pay. 3. HRA = 15% of Basic Pay. 4. PF = 12% of Basic Pay. Only basic pay will input by the user. Display Gross salary – DA – HRA – PF and basic salary
4. Student should fulfill the following criteria for admission: Mathematics >= 50 Physics >= 45 Chemistry >= 60 Total of all subject >= 170 OR Total of Mathematics + Physics >= 120 Accept the marks of all the three subjects from the user and check if the student is eligible for admission.
5. Write a program in C for grade calculation using if…else if ladder and switch Statement. Accept marks of 3 subjects calculate total and based on it calculate Grade.

Loop Programs 1

1. Program to display first N prime numbers. N is input by the user.
2. Program to display A to Z in upper case or lower case according to user selection.
3. Program which used to print A to Z and Z to A.

Loop Programs 2

4. Program which ask for party to user until the user say yes (Using While)
5. Program which ask for party to user until the user say yes (Using Do While)

Loop Programs 3

6. Program which check that whether the given number is palindrome or not.
7. Program to check that the given number is Armstrong or not.

8. Program which will display next nearest prime number of given integer number. For example next nearest prime of 5 is 7, for 8 is 11, for 7 is 11 (Using Do while)

Semester 1	**Live Sessions**	**Quadrant - I e-Tutorial**		**Quadrant - II e-Content**		**Quadrant - III Discussion Forum**	**Quadrant - IV Assessment**
BCA 104 - Fundamentals of C Lab (4 Credits) Duration - 12 Weeks	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 0 Hours**	**Open Source Videos = 0 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**
Total = 12 Hours	**6 Hours**	**0 Hours**		**6 Hours**		**0 hours (0 hours/week)**	**0 Hours**
Module I							
Lab Manual	12 Live sessions for giving Instructions on the Lab Assignments (Total 12 Lab exercises)				1 E-book/PDF		

Course Code BCA 105 - PC SOFTWARE & AUTOMATION LAB

Credit 2, 60 hours

Learning outcomes

- Work effectively with a range of current, standard, Office Productivity software applications.
- Evaluate, select and use office productivity software appropriate to a given situation.
- Apply basic adult learning and assessment principles in the design, development, and presentation of material produced by office productivity applications.
- Demonstrate employability skills and a commitment to professionalism.
- Operate a variety of advanced spreadsheet, operating system and word processing functions.

List of Practicals

Understanding a Personal Computer and how it operates

a. Given a PC Diagram into its components, name its various components and list their functions

b. Identification of various parts of a computer and peripherals

MS-WORD

a. File Management: Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, giving password protection for a fil
b. Page set up: Setting margins, tab setting, ruler, indenting
c. Editing a document: - Entering text, Cut, copy, paste using tool- bars

Work books:

a. Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula, creation and links, controlling calculations, working with arrays
b. Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet.
c. Creating a chart:-Working with chart types, changing data in chart, formatting a chart, use chart to analyze data

MS-Excel

a. How to change view of worksheet, outlining a worksheet, customize workspace, using templates to create default workbooks, protecting work book
b. Exchange data with other application: linking and embedding, embedding objects, linking to other applications, import, and export document.

Internet and its Applications

(a) Log-in to internet (b) Navigation for information seeking on internet (c) Browsing and down loading of information from internet (d) Sending and receiving e-mail

Semester 1	**Live Sessions**	**Quadrant - I e-Tutorial**		**Quadrant - II e-Content**		**Quadrant - III Discussion Forum**	**Quadrant - IV Assessment**
BCA 105 - PC Software and Automation Lab (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	**Lecture Video Recordings = 0 Hours**	**Open Source Videos = 0 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**
Total = 9 Hours	**3 Hours**	**0 Hours**		**6 Hours**		**0 hours (0 hours/week)**	**0 Hours**
Module I							
Lab Manual	12 Live sessions for giving Instructions on the Lab Assignments (Total 12 Lab exercises)				1 E-book/PDF		
Total = 9 Hours	**3 Hours**	**0 Hours (or more)**	**0 Hours (or more)**	**6 Hours**		**0 hours (0 hours/week)**	**0 Hours**

Semester 2

Course Code BCA 201 - OBJECT ORIENTED PROGRAMMING WITH C++

Credit 4, 120 hours

Learning objectives:

- Identify importance of object oriented programming and difference between structured oriented and object oriented programming features.
- Able to make use of objects and classes for developing programs.
- Able to use various object oriented concepts to solve different problems.

Unit 1: Different paradigms for problem solving, need for OOP, differences between OOP and Procedure oriented programming, Abstraction, Overview of OOP principles, Encapsulation, Inheritance and Polymorphism.
Unit 2: C++ BASICS: Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence
Unit 3: Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References
Unit 4: Flow control statement- if, switch, while, for, do, break, continue, goto statements.
Unit 5: Functions-Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions.
Unit 6: Dynamic memory allocation and de-allocation operators-new and delete, Pre-processor directives.
Unit 7: C++ Classes And Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class
Unit 8: Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects
Unit 9: Data abstraction, ADT and information hiding.

Unit 10: Function overloading, Operator overloading, Generic programming necessity of templates, Function templates and class templates.
Unit 11: Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes
Unit 12: Access to the base class members, Base and Derived class construction, Destructors, Virtual base class.
Unit 13: Static and Dynamic bindings, Base and Derived class virtual functions
Unit 14: Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

Semester	Live	Quadrant - I e-	Quadrant - II	Quadrant -	Quadrant - IV

	Sessions	**Tutorial**		**e-Content**		**III Discussion Forum**	**Assessment**	
BCA 201- Object Oriented Programming (4 Credits) Duration - 12 Weeks	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 12 Hours**	**Open Source Videos = 8 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 120 Hours	**12 Hours**	**20 Hours**		**20 Hours**		**24 hours (2 hours/week)**	**44 Hours**	
Module 1								
Different paradigms for problem solving, need for OOP, differences between OOP and Procedure oriented programming, Abstraction, Overview of OOP principles, Encapsulation, Inheritance and Polymorphism.	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	2 overall Assignments
Introduction to C Language		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Programming		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 2								
C++ BASICS	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Data types		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Operators		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 3								
Evaluation of expressions	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Pointers and Arrays		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Strings and Structures		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 4								
Flow control statements	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
if, switch, while statements		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Go To statements		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 5								
Scope of variables	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Default arguments		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Recursive Functions		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 6								
Dynamic memory allocation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
new and delete operators		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Pre-processor directives		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 7								
C++ Classes And Data Abstraction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Class structure and Objects		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Friends to a class		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 8								

Static class members	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Constructors and Destructors		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Dynamic Creation and Destruction of Objects		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 9								
Data abstraction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
ADT		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Information Hiding		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 10								
Function overloading, Operator overloading	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Necessity of templates		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Function templates		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 11								
Inheritance: Defining a class hierarchy	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Forms of inheritance		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Base and derived classes		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 12								
Access to the base class members	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Base and derived class construction		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Virtual base class		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 13								
Static and Dynamic bindings	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Base and Derived class virtual functions		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 14								
Dynamic binding through virtual functions	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Virtual function calls		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Polymorphic use of classes		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**		**24 hours**	**44 Hours**	

Text/Reference Books:

1. Problem solving with C++, The OOP, 4th Edition, Walter Savitch, Pearson Education.
2. C++, The Complete Reference, 4th Edition, Herbert Schildt, TMH.
3. C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education.
4. The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Education.
5. Object Oriented Programming in C++, 3rd Edition, R.Lafore, Galgotia Publications pvt ltd.

Course Code BCA 202 - DATA STRUCTURE AND ALGORITHMS
Credit 4, 120 hours

Learning objectives:

- To understand the basic concept of data structures for storage and retrieval of
- ordered or unordered data.
- To learn about arrays, linked lists, binary trees, heaps, and hash tables.

Unit 1: Definition of data structures and abstract data types. Static and Dynamic implementations.

Unit 2: Examples and real life applications, Data Structures: Arrays, Address calculation in a single and multi dimensional array. Sparse matrices

Unit 3: Definition, Array based implementation of stacks, Linked List based implementation of stacks, Examples: Infix, postfix, prefix representation

Unit 4: Applications: Mathematical expression Evaluation Definition: Queues & Lists: Array based implementation of Queues / Lists,

Unit 5: Linked List implementation of Queues / Lists, Circular implementation of Queues and singly linked Lists, Straight / circular implementation of doubly linked Queues / Lists, Priority queues, Applications

Unit 6: Definition of trees and Binary trees, Properties of Binary trees and Implementation, Binary Traversal - preorder, post order, in order traversal, Binary Search Trees, Implementations,

Unit 7: Threaded trees, Balanced multi way search trees, AVL Trees, Implementations, Applications Definition of Undirected and Directed Graphs and Networks

Unit 8: The Array based implementation of graphs, Adjacency matrix, path matrix implementation, The Linked List representation of graphs, Shortest path Algorithm, Graph Traversal – Breadth first Traversal

Unit 9: Depth first Traversal, Connectivity of graphs; Connected components of graphs, Weighted Graphs, Applications.

Unit 10: Introduction, Sorting by exchange, selection, insertions, Bubble sort, Selection sort, Insertion sort, Pseudo code algorithm and their C++ implementation

Unit 11: Efficiency of above algorithms, Shell sort, Performance of shell sort, Merge sort, Merging of sorted arrays, The merge sort Algorithms, Quick sort Algorithm.

Unit 12: A partitioning strategy, Heap sort, Heap Construction

Unit 13: Heap sort, bottom – up, Top – down Heap sort approach, Radix sort, Straight Sequential Search, Array implementations

Unit 14: Linked List representations, Binary Search, non – recursive Algorithms, recursive Algorithms, Indexed Sequential Search

Semester	**Live Sessions**	**Quadrant - I e-Tutorial**		**Quadrant - II e-Content**		**Quadrant - III Discussion Forum**	**Quadrant - IV Assessment**	
BCA 202- Data Structures and Algorithms (4 Credits) Duration - 12 Weeks	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 12 Hours**	**Open Source Videos = 8 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 120 Hours	**12 Hours**	**20 Hours**		**20 Hours**		**24 hours (2 hours/week)**	**44 Hours**	
Module 1								2 overall Assignments
Definition of data structures	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
data structures and abstract data types		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Static and Dynamic implementations.		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 2								
Examples and real life applications	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	

Arrays		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Sparse Matrices		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 3								
Array based implementation of stacks	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Linked List based implementation of stacks		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Infix, postfix, prefix representation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 4								
Applications: Mathematical expression Evaluation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Queues & Lists		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Array based implementation of Queues / Lists,		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 5								
Linked List implementation of Queues / Lists	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice	

Circular implementation of Queues and singly linked Lists		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		Questions)	
Straight / circular implementation of doubly linked Queues / Lists, Priority queues, Applications		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 6								
Definition of trees and Binary trees	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Properties		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Binary Traversal		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 7								
Threaded trees, Balanced multi way search trees	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
AVL Trees, Implementations		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Undirected and Directed Graphs and Networks		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 8								
The Array based implementation of graphs	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Shortest path Algorithm		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Graph Traversal – Breadth first Traversal		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 9								
Depth first Traversal	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Connectivity of graphs		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Weighted Graphs, Applications.		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 10								
Introduction - Sorting	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Bubble sort, Selection sort, Insertion sort		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Pseudo code algorithm and their C++ implementation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 11								
Shell sort and Merge Sort	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Performance of shell sort, Merge sort		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
The merge sort Algorithms, Quick sort Algorithm.		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 12								

A partitioning strategy	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Heap sort		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Heap Construction		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 13								
Heap sort	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Array implementations		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 14								
Linked List representations	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Indexed Sequential Search		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
, recursive Algorithms		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**		**24 hours**	**44 Hours**	

Text/Reference Books:

1. Theory & Problems of Data Structures by Jr. Symour Lipschetz, Schaum's outline by TMH
2. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.
3. Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
4. Fundamentals of Data structures by Ellis Horowitz &SartajSahni, Pub, 1983,AW

Course Code BCA 203 - MANAGEMENT INFORMATION SYSTEM
Credit 4, 120 hours

Learning objectives

- Evaluate the role of information systems in today's competitive business environment.
- Define an information system from both a technical and business perspective and distinguish between computer literacy and information systems literacy.
- Assess the relationship between the digital firm, electronic commerce, electronic business and internet technology.
- Identify the major management challenges to building and using information systems in organizations.
- Identify managerial risks related to information system organization processing and utilizing.

Unit 1: Introduction, Definition, Need of MIS, Managing in the Internet Era, Managing Information Systems in Organization-the IT interaction model
Unit 2: Challenges for the manager-what information to build?-how much to spend on information systems?-what level of capabilities should be created with information systems?
Unit 3: how centralized should the services be?-what security levels are required?-what is technology road map for the organization?
Unit 4: Introduction, data and information- measuring data, information as a resource, information in organizational functions
Unit 5: types of information technology, types of information systems- transaction processing systems-management information systems
Unit 6: Introduction, Decision making with MIS-Tactical decisions-operational decisions-strategic decisions
Unit 7: communication in organizations- types of communication- examples of communications in organizations
Unit 8: decision making with communication technology, Decision Support Systems: Introduction, Understanding DSS- MIS and DSS-Decision making-types of decisions
Unit 9: Analytics and Business Intelligence- BI techniques
Unit 10: SCM, CRAM AND INTERNATIONAL SYSTEMS: Introduction, Supply Chain Management Systems, Customer Relationships Management Systems
Unit 11: Challenges of Enterprise Systems Implementations- Managing the implementation, International Information Systems-Outsourcing and off-shoring

Unit 12: Introduction, Social Dynamics of the Internet, Services of the Internet- Blogs-Social Networks, Technology of the Internet- Twitter-Rating-Tagging/folksonomies
Unit 13: Social issues-Media impact-Collaboration-Emergence of order, Social Networks in the Enterprise
Unit 14: Challenges of Managing the IT function- Modern IT environment-Centralization versus Decentralization-IT security-Technology selection, Vendor Management- vendor selection-vendor contracts and service levels-Ongoing relationship management- vendor retention or termination

Semester	**Live Sessions**	**Quadrant - I e-Tutorial**		**Quadrant - II e-Content**		**Quadrant - III Discussion Forum**	**Quadrant - IV Assessment**	
BCA 203- Management information systems (4 Credits) Duration - 12 Weeks	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 12 Hours**	**Open Source Videos = 8 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 120 Hours	**12 Hours**	**20 Hours**		**20 Hours**		**24 hours (2 hours/week)**	**44 Hours**	
Module 1								
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	2 overall Assignments
Managing in the Internet Era		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
IT interaction Model		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Module 2								
Challenges for the manager	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
spend on information system		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
level of capabilities		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 3								
Centralisation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Security		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Technology roadmap		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 4								
data and information	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
measuring data		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

information as a resource		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 5								
types of information technology	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Transaction processing systems		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
management information systems		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 6								
Decision making with MIS	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Tactical decisions-operational decisions		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
strategic decisions		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 7								
communication in organizations	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
types of communication		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Module 8							
Decision Support Systems	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
DSS- MIS		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 9							
Business Intelligence - Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Busines Intelligence Techniques		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Analytics		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 10							
Introduction to Supply Chain Management Systems	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Customer Relationships Management Systems		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module 11							
Challenges of Enterprise Systems Implementations	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)
Managing the implementation		1 recorded video	1 open source	1 PPT	1 E-book/PDF		

			video					
Outsourcing and off-shoring		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 12								
Social Dynamics of the Internet	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Social Networks		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Tagging/folksonomies		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 13								
Social issues	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Social Networks in the Enterprise		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module 14								
Managing the IT function	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Modern IT environment		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Vendor relationship management		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**		**24 hours**	**44 Hours**	

Text/Reference Books:
1. Management Information Systems, Jawadekar, Tata McGraw Hill
2. Management Information Systems, Davis and Olson, Tata McGraw Hill
3. Analysis and Design of Information Systems, Rajaraman, Prentice Hall

Course Code BCA 204: OBJECT ORIENTED PROGRAMMING LAB WITH C++
Credit 4, 120 hours

Learning Outcomes
- The working of OOPS programming approach.
- The knowledge of object oriented programming style.
- The basic concepts involved in computer programming.
- Important programming aspects i.e object, class, inheritance and polymorphism.
- Knowledge with respect to the software development phase of OOPS.

1. Create a user defined function (any) and use it inside the program.
2. Implement "call by value" & "call by reference " function call techniques by using any user defined functions.
3. Implement the working of classes and objects by using any real world object.
4. Create a Stack object model in C++ & also make use of default and parameterized constructor to make the class more flexible in use.
5. Make all the member functions, including constructors, non-inline in the above class.
6. Create any user defined class using the concept of static data and member functions.
7. Create a Class or program implementing the concept of passing and returning object to/from member functions.
8. WAP to implement polymorphism through function overloading (Area of different shapes).
9. Create a user defined type Complex and do all the Complex number arithmetic. And also make use of operator overloading.
10. Implement single level inheritance by using Student and Marks class.
11. Implement multilevel inheritance by using the Stack class.
12. Demonstrate the calling mechanism of constructors and destructors in Multilevel Inheritance.

13. Create generic Stack model for storing different types of data.
14. Create a user defined type Matrix and perform all matrix operations. Also make use of operator overloading.
15. Implement the concept of Abstract classes and virtual functions by using Shape, Rectangle and Triangle class.

Semester 1	**Live Sessions**	**Quadrant - I e-Tutorial**		**Quadrant - II e-Content**		**Quadrant - III Discussion Forum**	**Quadrant - IV Assessment**
BCA 204 - OOPS (4 Credits) Duration - 12 Weeks	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 0 Hours**	**Open Source Videos = 0 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**
Total = 12 Hours	**6 Hours**	**0 Hours**		**6 Hours**		**0 hours (0 hours/week)**	**0 Hours**
Module I							
Lab Manual	12 Live sessions for giving Instructions on the Lab Assignments (Total 12 Lab exercises)				1 E-book/PDF		

Course Code BCA 205 - DATA STRUCTURE LAB
Credit 4, 120 hours

Learning Outcomes

- Implementing Stack, Queue , Linked List , Binary tree
- Sorting and Searching Techniques
- Divide and Conquer, Dynamic Programming methods
- Greedy method , Traversals and Backtracking

1. Program on array searching, sorting (Bubble sort, Quick sort, Marge sort etc.)
2. Program to insert element at desire position, replacing element, deletion in array.
3. Various matrices operations.
4. Various strings programs.

5. Implementation of stack and queue using array
6. Implementation of stack and queue using link lists
7. Implementation of circular queue using link lists.
8. Polynomial addition, multiplication.
9. Two-way link lists programs.
10. Infix to postfix/prefix conversion.
11. BST implementation (addition, deletion, searching).
12. Stack ADT (array implementation) Implementing basic operation of stack (push, pop) using array implementation

Course Credit BCA 206- Soft Skill and Professional Aptitude

Credit 2, 60 hours

Learning Objectives:

- strong practical orientation to building and improving their skills in communication
- effective use of English, business correspondence, presentations, team building, leadership, time management, group discussions, interviews, and inter-personal communication

Unit 1: Importance & Benefits of IPR, Developing Interpersonal Abilities, Team Building- Definition and Types, Team work skills, Qualities of a Team Player

Unit 2: Leadership- Understanding the qualities of a Good Leader, 4 Factors of Leadership, Bring out the Leader in You

Unit 3: Concepts of Resume, Curriculum Vitae and Bio-data, Resume – Information and Details, Sample Resume and Template, Cover Letter- Cover letter Writing, Sample Cover letter and Template

Unit 4: Basic Personal Hygiene, Professional Attire – Men& Women, Interview Etiquette Guide, Telephonic Interview- Importance and Preparation, Advantages and Disadvantages, Things to Remember, Video Interview- Preparation and Practice, Guide to a Successful Video Interview, Importance and Types of Personal Interviews, FAQs with Answers

Unit 5: Group Discussion Guide, Topics for Group Discussion, Mock GD

Unit 6: Guide to Successful Extempore, Extempore Topics, Practice Session

Content Matrix

Semester 1	Live Sessions	Quadrant - I e-Tutorial	Quadrant - II e-Content	Quadrant - III Discussion Forum	Quadrant - IV Assessment

BCA 206 - Softskill and Professional Aptitude (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	**Lecture Video Recordings = 6 Hours**	**Open Source Videos = 4 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 60 Hours	**6 Hours**	**10 Hours**		**10 Hours**		**12 hours (2 hours/week)**	**22 Hours**	
Module I								1 Overall Assignment
Interpersonal Relation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Developing Interpersonal Abilities		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Team work skills		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module II								
Leadership	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Qualities of a Good Leader		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module III								
Concepts of Resume	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Resume – Information and Details		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Resume and Cover Letter		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module IV								
Basic Personal grooming	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Professional Attire		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Interview etiquecy		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module V								
Group Discussion Guide	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Guide to Successful Extempore	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Practice Session		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Total = 60 Hours	**6 Hours**	**6 Hours (or more)**	**4 Hours (or more)**	**10 Hours**		**12 hours**	**22 Hours**	

Text/Reference Books:

1. Business communication Design, Angell, Pamela, Mcgraw-Hill, New York.
2. Grammar Finder, Eastwood, John, Oxford university press.
3. Effective technical communication, Mitra, K. Barun, Oxford university press.
4. Communicate to conquer: A handbook of group discussion and interviews, PHI learning, New Delhi.

Semester 3

Course Code BCA 301 : DATABASE MANAGEMENT SYSTEM

Credit 4, 120 hours

Learning objectives:

- Introduce the management of database systems and understand the fundamentals of relational systems including data models, database architectures, and database manipulations.
- Provide knowledge about relational database model.
- Learn the basic concepts of databases in general with an emphasis on relational databases, modelling techniques and writing queries.
- Understand Normalization techniques, Transaction processing, Concurrency Control techniques and Recovery of databases against crashes are also covered.

Unit 1: Database Systems versus File Systems, View of Data, Data Models, database languages, Database Users and Administrators. Transaction Management

Unit 2: Decision Support Systems, Components of a Database management System. Distributed Processing and Client- Server Architecture.

Unit 3: Entity-Relationship Model – Basic Concepts, Constraints, Keys, Design Issues, E-R Diagrams.

Unit 4: Structures of relational databases, Integrity Constraints, Logical database Design, Tables, Views, Data Dictionary. Relational Algebra, Relational Calculus.

Unit 5: SQL – Basic Structures, Query Handling, Embedded SQL, Open Database Connectivity (ODBC), Java Database Connectivity (JDBC), Triggers, Security and Authorization.

Unit 6: Query By Example (QBE), User Interfaces and Tools, Forms and Graphical User Interfaces. Report Generators. Overview of Relational Query Optimization.

Unit 7: Functional Dependencies, Multi-valued Dependencies, Normal Forms, Decomposition into Normalized Relations

Unit 8: Physical Database Design – File Structures. Object-Relational Databases – Nested Relations, Complex Data types, Object-Relational Features in SQL:1999.

Unit 9: World Wide Web, Client Side Scripting and Applets, Web Servers and Sessions, Services, Server Side Scripting.

Unit 10: XML – Structure of XML Data, XML Document Schema, XQuery, Storage of XML Data, XML Applications.

Unit 11: Fundamental Concepts of Transaction Management, Concurrency Control

Unit 12: Recovery Systems, Data Analysis and OLAP.

Unit 13: Introduction to Data Mining, Data Farming, Data Warehousing, Spatial and Geographic Databases, Temporal databases and Multimedia Databases.

Unit 14: Minor Project

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester - 3 BCA 301- Database Management systems (4 Credits) Duration - 12 Weeks	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 12 Hours**	**Open Source Videos = 8 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 120 Hours	**12 Hours**	**20 Hours**		**20 Hours**		**24 hours (2 hours/week)**	**44 Hours**	
Module 1								
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 2								
Components of a DBMS	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	2 overall Assignments
Module 3								
Entity Relationship Model	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 4								
Relational Database management systems	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 5								

SQL	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 6								
Query and Reports	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 7								
Normality	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 8								
Physical Database Design	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 9		**Module 9**						
Client side and Serverside scripting		1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 10								
XML	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 11								
Transactions and Concurrency	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Module 12								
OLAP	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Module 13		**Module 13**						
Data warehousing and mining		1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Module 14								
Minor Project	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	

Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**	**24 hours**	**44 Hours**

Text / Reference Books:

1. Date C J, " An Introduction to Database Systems", Addison Wesley

2. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill

3. Elmasri, Navathe, "Fundamentals of Database Systems", Addision Wesley

4. O'Neil, Databases, Elsevier Pub.

5. Leon & Leon,": Database Management Systems", Vikas Publishing House

6. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications

7. Majumdar & Bhattacharya, "Database Management System", TMH (14)

8. Ramkrishnan, Gehrke, " Database Management System", McGraw Hill

9. Kroenke, "Database Processing Fundamentals , Design and Implementation" Pearson Education.

10. D.Ulman, "Principles of Database and Knowledge base System", Computer Science Press.

11. Maheshwari Jain.'DBMS: Complete Practical Approach", Firewall Media, New Delhi

Course Code BCA 302 COMPUTER-NETWORKS

Credit 4, Hours 120

Learning objectives

- Basics of networking and networking technology
- Networking and its underlying principles.
- Fundamentals of layered models, devices used in networks and their wireless connectivity.
- The ways to troubleshoot network related issues.
- Protocols, standards, and the models associated with networking technology and their troubleshooting mechanisms.

Unit 1: OSI, TCP/IP and other networks models, Network Topologies WAN, LAN, MAN.Token Bus, Token Ring, FDDI

Unit 2: IEEE standards 802.2, 802.3

Unit 3: Hubs, Bridges, Routers Gateways

Unit 4: Transmission Media: Transmission of signals through twisted pair, Coaxial cable, optical fibre.

Unit 5: Design issues, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window.

Unit 6: Pure and slotted Aloha, Throughput analysis of pure and slotted Aloha.

Unit 7: Virtual circuit and Datagram subnets-Routing algorithm shortest path routing

Unit 8: Network layer in the Internet: IPv4 & IPv6 Protocols**.**

Unit 9: Congestion Control Algorithms.

Unit 10: Terminology, Frequency, spectrum, bandwidth

Unit 11: Unit analog and digital transmission, Transmission impairments.

Unit 12: Wireless Transmission: Antenna and antenna gain, introduction to terrestrial and satellite microwave, Propagation of wireless signals, free space loss for LOS communication.

Unit 13: Introduction to FDM, TDM and CDM

Unit 14: Multiple Accesses: Performance of FDMA-FM-FDMA, Single channel per carrier. TDMA frame structure TDMA Frame efficiency, TDMA super frame structure.

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester - 3 **BCA 302- Computer Networks (4 Credits)** **Duration - 12 Weeks**	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 12 Hours**	**Open Source Videos = 8 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 120 Hours	**12 Hours**	**20 Hours**		**20 Hours**		**24 hours (2 hours/week)**	**44 Hours**	
		Module 1						
Network Model and Topologies	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
		Module 2						
IEEE Standards	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
		Module 3						
Hubs, Bridges, Routers and Gateways	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
		Module 4						
Transmission Media	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
		Module 5						
Network Design	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
		Module 6						
Aloha	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
		Module 7						
Routing Algorithms	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	2 overall Assignments
		Module 8						
IPv4 and IPv6	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
		Module 9						
Congestion Control	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 10		**Module 10**						
Frequency and Bandwidth		1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
		Module 11						
Analog and Digital Transmission	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
		Module 12						
Wireless Transmission	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
		Module 13						
FDM, CDM and TDM	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Module 14		**Module 14**						
Multiple Access		1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**		**24 hours**	**44 Hours**	

Text/Reference Books:

1. Computer Network, Leon And Garcia, TMH
2. Data Communication And Networking(Sie), Forouzan, TMH

3. Computer Network, Tanenbaum, Pearson
4. Computer Networking, Kurose, Pearson
5. Computer Networking And Internet, Halsell, Pearson
6. Digital Telephony, 3rd Ed, James Irvine & David Harle, Wiley

Course Code BCA 303 - INTERNET & WEB TECHNOLOGIES

Credit 4, 120 hours

Learning objectives

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas

Unit 1: Introduction, Evolution of Internet, Internet Applications, Internet Protocol -TCP/IP, UDP, HTTP, Secure Http(https)

Unit 2: Internet Addressing – Addressing Scheme – Ipv4 & IPv6, Network Byte Order

Unit 3: Domain, Name Server, and IP Addresses, Mapping, Internet Service Providers, Types Of Connectivity Such As Dial-Up, Broad band, WiFi

Unit 4: Introduction, HTML tags, Dtd(Document Type Definition, Basic Html Elements, Tags and usages

Unit 5: HTML Standards, Cascading Style Sheets: Syntax, Class Selector

Unit 6: Approaches To Dynamic Pages: Cgi, Java Applets, Plug Ins, Active X

Unit 7: Java Script Object Model, Variables-Constant – Expressions, Conditions- Relational Operators, Data Types

Unit 8: Flow Control, Unit Functions & Objects-events and event handlers

Unit 9: What is XML – Basic Standards Schema Standards, Linking & Presentation Standards

Unit 10: Standards that build on XML, Generating XML data, writing a simple XML File

Unit 11: Types of Viruses, Client Server Security Threats, Data & Message Security

Unit 12: Various electronic payment systems, Introduction to EDI,

Unit 13: Encrypted Documents and Emails, Firewalls: Hardened Firewall Hosts

Unit 14: assignment/mini project

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Conter		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 3 BCA EL - Internet and Web Technologies (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	Lecture Video Recordings = 6 Hours	Open Source Videos = 4 hours	PPT	E-book/ PDF	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + Self Study	
Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hours	
Module I								
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Internet Addressing	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
HTML	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Java Script	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
XML	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Mini Project	1 Live Session					2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	6 Hours	6 Hours (or more)	4 Hours (or more)	10 Hours		12 hours	22 Hours	

Text/Reference Books:

1. Web Technology - N.P. Gopalan, J.Akilandeswari
2. Internet Technology and Web Design - ISRD Group
3. HTML and Web designing - Kris Jamsa and Konrad King
4. HTML for Beginners - Firuza Aibava- Second Edition

Course Code BCA 304- DATABASE MANAGEMENT SYSTEM LAB

Credit 4, Hours 120

Learning objectives:

- Introduce the management of database systems and understand the fundamentals of relational systems including data models, database architectures, and database manipulations.
- Provide knowledge about relational database model.
- Learn the basic concepts of databases in general with an emphasis on relational databases, modelling techniques and writing queries.
- Understand Normalization techniques, Transaction processing, Concurrency Control techniques and Recovery of databases against crashes are also covered.

Student can use My Sql (preferred open source DBMS) or any other Commercial DBMS tool (MS-Access / ORACLE) at backend and C++ (preferred) VB/JAVA at front end.

1. (a) Write a C++ program to store students records (roll no, name, father name) of a class using file handling.(Using C++ and File handling).

(b) Re-write program 1, using any DBMS and any compatible language.(C++/MySQL) (VB and MS-Access)

2. Database creation/ deletion, table creation/ deletion.

(a) Write a program to take a string as input from user. Create a database of same name. Now ask user to input two more string, create two tables of these names in above database.

(b) Write a program, which ask user to enter database name and table name to delete. If database exist and table exist then delete that table.

3. Write a program, which ask user to enter a valid SQL query and display the result of that query.

4. Write a program in C++ to parse the user entered query and check the validity of query.

(Only SELECT query with WHERE clause)

5 - 6. Create a database db1, having two tables t1 (id, name, age) and t2 (id, subject, marks).

(a) Write a query to display name and age of given id (id should be asked as input).

(b) Write a query to display average age of all students.

(c) Write a query to display mark-sheet of any student (whose id is given as input).

(d) Display list of all students sorted by the total marks in all subjects.

7 - 8. Design a Loan Approval and Repayment System to handle Customer's Application for Loan and handle loan repayments by depositing installments and reducing balances.

9 -10. Design a Video Library Management System for managing issue and return of Video tapes/CD and manage customer's queries.

Course Code BCA 305: INTERNET & WEB PROGRAMMING LAB

Credit 4, 120 hours

Learning objectives

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas

Unit 1- INTRODUCTION TO HTML: What is HTML, HTML Documents, Basic structure of an HTML document, creating an HTML document, Mark up Tags, Heading-Paragraphs,Line Breaks,HTML Tags.

Unit 2- INTRODUCTION TO CASCADING STYLE SHEETS: Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts),Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box

Model(Introduction, Border properties, Padding, Properties, Margin properties) , CSS Advanced (Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Color, Creating page Layout and Site Designs.

Unit 3- INTRODUCTION TO PHP: Basics of PHP, PHP tags, connectivity with MySQL database, embedding of PHP tags in HTML

Unit 4- INTRODUCTION TO WORDPRESS: development in wordpress press environment, wizard, Installation, Configure wordpress: Using the WordPress dashboard, Managing content in the WordPress dashboard, Types of users, The WordPress settings panel, Reading and writing settings, Permalinks and RSS feeds, Creating and managing posts, Setting up post categories, Creating and managing pages, Managing comments,Installing and updating plugins, Customising WordPress themes, WordPress theme options

Unit 5- INTRODUCTION TO WEB PUBLISHING OR HOSTING: Local server hosting, hosting on web, cpanel, file transfer

Unit 6- SEARCH ENGINE OPTIMIZATION: concepts of SEO, Web analytical tools, google dorks

Semester 4

Course Code BCA 401- PROGRAMMING IN JAVA
Credit 4, Hours 120

Learning Outcomes

- To understand the principles and concepts of object oriented programming
- To learn multithreading concepts
- To Store and retrieve the information from Files.
- To Implements various application like banking, inventory, etc.

Unit 1: Introduction to Object Orientated Programming, Abstraction, Object Oriented Programming Principles

Unit 2: Features of JAVA, Introduction to Java byte code, Java Virtual machine.

Unit 3: PROGRAM ELEMENTS: Primitive data types, variables, assignment, arithmetic, short circuit logical operators, Arithmetic operators, bit wise operators, relational operators

Unit 4: Boolean logic operators, the assignment operators, operator precedence, Decision and control statements, arrays.

Unit 5: CONTROL STATEMENTS - Java's Selection Statements, if statement, switch statement, Iteration Statements, while, do-while, for, for-each

Unit 6: Nested Loops, Jump Statements, Using break, Using continue, return.

Unit 7: OBJECTS AND CLASSES - Objects, constructors, returning and passing objects as parameter, Nested and inner classes, Single and Multilevel Inheritance

Unit 8: Extended classes, Access Control, usage of super, Overloading and overriding methods, Abstract classes, Using final with inheritance.

Unit 9: PACKAGE AND INTERFACES: Defining package, concept of CLASSPATH, access modifiers, importing package, Defining and implementing interfaces.
Unit 10: String constructors, special string operations, character extraction, searching and comparing strings, string Buffer class.
Unit 11: EXCEPTION HANDLING: Exception handling fundamentals, Exception types, uncaught exceptions, try, catch and multiple catch statements. Usage of throw, throws and finally
Unit 12: FILE HANDLING: I/O streams, File I/O.
Unit 13: CONCURRENCY - Processes and Threads, Thread Objects, Defining and Starting a Thread
Unit 14: Pausing Execution with Sleep, Interrupts, Joins, Synchronization. APPLET: Applet Fundamentals, using paint method and drawing polygons.
Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester - 4 **BCA 401- Programming in Java (4 Credits)** **Duration - 12 Weeks**	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 12 Hours**	**Open Source Videos = 8 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 120 Hours	**12 Hours**	**20 Hours**		**20 Hours**		**24 hours (2 hours/week)**	**44 Hours**	
Module 1								
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 2								
Java Virtual Machine	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 3								
Program Elements	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 4								
Operators	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 5								
Control Statements	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 6								
Nested Loops	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 7								
Objects and Classes	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	2 overall Assignments
Module 8								
Overloading	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 9		**Module 9**						
Package and Interface		1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 10								
String Operations	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 11								
Exception Handling	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Module 12								
File Handling	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Module 13		**Module 13**						
Concurrency		1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Module 14								
Interrupts, Applets	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**		**24 hours**	**44 Hours**	

Text/Reference Books:

1. Herbert Schildt: JAVA 2 - The Complete Reference, TMH, Delhi
2. Deitel: How to Program JAVA, PHI
3. U.K. Chakraborty and D.G. Dastidar: Software and Systems – An Introduction, Wheeler

Publishing, Delhi.
4. Joseph O'Neil and Herb Schildt: Teach Yourself JAVA, TMH, Delhi.

Course Code BCA 402 OPERATING SYSTEM

Credit 4, hours 120

Learning Outcomes

- To learn different types of Operating Systems
- To Perform Scheduling and memory management.
- To Handle Components of Operating System and Deadlocks.

Module 1: OS Concepts – Evolution of OS, OS Structures- Kernel, Shell, General Structure of MSDOS, Windows 2000, Linux. Introduction- UNIX and ANSI Standards: The ANSI C Standard

Module 2- The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards. Introduction and need of operating system, layered architecture/logical structure of operating system,

Module 3- Type of OS, operating system as resource manager and virtual machine, OS services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader.

Module 4: - Process & Threads – Process States - Process Control Block. Process Scheduling – Operations on Processes, Threads, CPU Scheduler – Preemptive and Non- Preemptive; Dispatcher, Scheduling Criteria, Scheduling Algorithms – Process Management in UNIX.

Module 5 UNIX Processes - The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries

Module 6- Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes. Process Control

Module 7 - Concurrent Processes, Co-operating Processes, Precedence Graph, Hierarchy of Processes, Critical Section Problem. Two process solution, Synchronization Hardware, Semaphores – Deadlock- detection, handling, prevention, avoidance, recovery, Starvation, Critical Regions, Monitors, Inter process communication.

Module 8 Objectives and functions, Simple Resident Monitor Program (No design), Overlays – Swapping; Schemes – Paging – Simple, Multi-level Paging; Internal and External Fragmentation

Module 9- Virtual Memory Concept, Demand Paging - Page Interrupt Fault, Page Replacement Algorithms; Segmentation – Simple, Multi-level, Segmentation with Paging, Memory Management in UNIX.

Module 10: - Virtual Memory– Concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation,

Module 11- Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores. Interprocess Communication –

Module 12- Shared Memory, Client-Server Properties, Stream Pipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions.

Module 13 - Files and Directories – Directory Structure –Directory Implementation – Linear List - Hash Table.

Module 14- Device Management: Dedicated, Shared and Virtual Devices - Serial Access Devices, Direct Access Devices, Direct Access Storage Devices – Channels and Control Units – Disk Scheduling methods.

Content Matrix

Semester	**Live Sessions**	**Quadrant - I e-Tutorial**		**Quadrant - II e-Content**		**Quadrant - III Discussion Forum**	**Quadrant - IV Assessment**
Semester -3 BCA 402- Operating systems (4 Credits) Duration - 12 Weeks	12 Live Sessions (1 session/week)	**Lecture Video Recordings = 12 Hours**	**Open Source Videos = 8 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**
Total = 120 Hours	**12 Hours**	**20 Hours**		**20 Hours**		**24 hours (2 hours/**	**44 Hours**

					week)		
Module 1							
OS Concepts	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Module 2							
C Standards	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Module 3							
Types of Operating systems	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Module 4							
Process and Threads	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Module 5		**Module 5**					
Unix processes		1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Module 6							
Memory management	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Module 7							
Concurrrent Processes	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Module 8							
Functions	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
		Module 9					

2 overall Assignments

Virtual Memory and Paging	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Module 10		**Module 10**					
Memory Fragmentation		1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)
Module 11							
IPC Methods	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)
Module 12							
Shared memory	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)
Module 13							
Files and Directories	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)
Module 14							
Device management	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)
Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**		**24 hours**	**44 Hours**

Text/Reference Books:

1. Operating Systems Concepts – Silberschatz, Galvin, Wiley Publications (2008)
2. Modern Operating Systems - Andrew S. Tenenbaum, Pearson Education Asia / PHI (2005)
3. UNIX System Programming Using C++,by Terrence Chan: Prentice Hall India, 1999.
4. Advanced Programming in UNIX Environment, by W. Richard Stevens: 2nd Ed, Pearson Education, 2005.
5. Operating Systems – William Stallings, Pearson Education Asia (2002)

BCA 403: COMPUTER GRAPHICS & VISUALIZATION

Credit 4, 120 hours

Learning Outcomes

- To provide main notions of graphics
- To learn Formal framework to draw basic elements
- To study graphics system along with completeness

Unit 1: History of computer graphics, applications, graphics pipeline, physical and synthetic images, synthetic camera, modeling

Unit 2: animation, rendering, relation to computer vision and image processing, review of basic mathematical objects (points, vectors, matrix methods)

Unit 3: OpenGL architecture, primitives and attributes, simple modeling and rendering of two- and three-dimensional geometric objects

Unit 4: indexed and RGB color models, frame buffer, double buffering

Unit 5: GLUT, interaction, events and callbacks, picking.

Unit 6: GEOMETRIC TRANSFORMATIONS - Homogeneous coordinates, affine transformations (translation, rotation, scaling, shear)

Unit 7: concatenation, matrix stacks and use of model view matrix in OpenGL for these operations.

Unit 8: Viewing - Classical three dimensional viewing, computer viewing, specifying views

Unit 9: parallel and perspective projective transformations; Visibility- z-Buffer

Unit 10: BSP trees, Open-GL culling, hidden-surface algorithms.

Unit 11: SHADING - Light sources, illumination model, Gouraud and Phong shading for polygons.

Unit 12: Rasterization- Line segment and polygon clipping, 3D clipping, scan conversion, polygonal fill

Unit 13: Bresenham's algorithm. Discrete Techniques- Texture mapping, compositing, textures in OpenGL; Ray Tracing- Recursive ray tracer, ray-sphere intersection

Unit 14: REPRESENTATION AND VISUALIZATION - Bezier curves and surfaces, B-splines, visualization, interpolation, marching squares algorithm

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester - 4 **BCA 403- Computer Graphics and Visualisation** **(4 Credits) Duration - 12 Weeks**	12 Live Sessions (1 session/week)	**Lecture Video Recordings =** 12 Hours	**Open Source Videos =** 8 hours	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 120 Hours	**12 Hours**	**20 Hours**		**20 Hours**		**24 hours (2 hours/week)**	**44 Hours**	
Module 1								
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 2								
Animation and Rendering	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 3								
OpenGL Architecture	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 4								
Color Models	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 5								
GLUT	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 6								
Geometric Transformations	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 7								
Model View Matrix	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	2 overall Assignments
Module 8								
Viewing	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 9		**Module 9**						
Projections and transformations		1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 10								
BSP Trees	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice Questions)	
Module 11								
Shading	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Module 12								
Rasterisation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Module 13		**Module 13**						
Bresenhams Algorithms		1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Module 14								
Visualisation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 Hours Discussion Forum	1 Assessment (Practice questions)	
Total = 120 Hours	**12 Hours**	**12 Hours (or more)**	**8 Hours (or more)**	**20 Hours**		**24 hours**	**44 Hours**	

Text / Reference Books:

1. Edward Angel, Interactive Computer Graphics. A Top-Down Approach Using OpenGL (fifth Edition), Pearson Education, 2008

2. Donald Hearn and Pauline Baker, Computer Graphics with OpenGL (third edition), Prentice Hall, 2003
3. F. S. Hill Jr. and S. M. Kelley, Computer Graphics using OpenGL (third edition), Prentice Hall, 2006
4. Peter Shirley and Steve Marschner, Computer Graphics (first edition), A. K. Peters, 2010

Course Code BCA 404: COMPUTER GRAPHICS LAB

Credit 4, hours 120

Learning Outcomes

- To provide main notions of graphics
- To learn Formal framework to draw basic elements
- To study graphics system along with completeness

1. Implementation of line generation using slope's method, DDA and Bresenham's algorithms.

2. Implementation of circle generation using Mid-point method and Bresenham's algorithm.

3. Implementation of ellipse generation using Mid-point method.

4. Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.

5. Implementation of 2D transformation: Translation, Scaling, Rotation, Mirror Reflection and Shearing (write a menu driven program).

6. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method.

7. Implementation of Polygon Clipping using Sutherland-Hodgman algorithm.

8. Implementation of 3D geometric transformations: Translation, Scalind and rotation.

9. Implementation of Curve generation using Interpolation methods.

10. Implementation of Curve generation using B-spline and Bezier curves.

11. Implementation of any one of Back face removal algorithms such as Depth-Buffer algorithm, Painter's algorithm, Warnock's algorithm, Scan-line algorithm)

Course Code BCA 405 : PROGRAMMING IN JAVA LAB

Credit 4, hours 120

Learning Outcomes

- To learn & practice the Object-Oriented concepts like Inheritance, Overloading etc.
- To learn & practice Interfaces and Packages
- To learn &practice Java applet programming

Programs in JAVA:

1. Creation of classes and use of different types of functions.
2. Count the number of objects created for a class using static member function.
3. Write programs on interfaces.
4. Write programs on packages.
5. Write programs using function overloading.
6. Programs using inheritance
7. Programs using IO streams.
8. Programs using files.
9. Write a program using exception handling mechanism.
10. Programs using AWT
11. Programs on swing.
12. Programs using JDBC

Semester 5

Course Code BCA 501 : SOFTWARE ENGINEERING

Credit 4, Hours 120

Learning objectives:

- Basic knowledge and understanding of the analysis and design of complex systems.
- Ability to apply software engineering principles and techniques.
- Ability to develop, maintain and evaluate large-scale software systems.
- To produce efficient, reliable, robust and cost-effective software solutions.
- Ability to perform independent research and analysis.
- To communicate and coordinate competently by listening, speaking, reading and writing english for technical and general purposes.

Module I: Introduction to software Engineering, Software characteristics, Software components, Software applications

Module II- Software Engineering Principles, Software metrics and measurement, monitoring and control.

Module III- Software development life-cycle, Water fall model, prototyping model, Incremental model, Iterative enhancement Model, Spiral model.

Module IV- Requirements Elicitation Techniques, Requirements analysis

Module V- Models for Requirements analysis, requirements specification, requirements validation.

Module VI DESIGN PRINCIPLES: Problem partitioning, abstraction. Top down and bottom up – design, structured approach. Functional versus object oriented approach of design

Module VII- Design specification, Cohesiveness and Coupling. Overview of SA/SD Methodology, structured analysis, data flow diagrams, extending DFD to structure chart.

Module VIII Verification and validation, code inspection, test plan, test case specification

Module IX- Level of testing: Unit, Integration Testing, Top down and bottom up integration testing, Alpha and Beta testing

Module X- System testing and debugging. functional testing, structural testing, Software testing strategies.

Module 11- Software Maintenance: Structured Vs. unstructured maintenance, Maintenance Models, Configuration Management, Reverse Engineering, Software Re-engineering

Module 12- Project planning and Project scheduling. Software Metrics: Size Metrics like LOC, Token Count, Function Count.

Module 13- Cost estimation using models like COCOMO. Risk management activities.

Module 14- Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, reliability models, Software quality, ISO 9000 certification for software industry, SEI capability maturity model.

Text / Reference Books:

1. R.S. Pressman, Software Engineering: A Practitioner's Approach, McGraw-Hill, Ed 7, 2010.
2. P. Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House, Edition 3, 2011.
3. R. Mall, Fundamentals of Software Engineering, Prentice-Hall of India, 3rd Edition, 2009.
4. I. Sommerville, Software engineering (9th edition), Addison Wesley, 2010

Course Code BCA 502 : SOFTWARE ENGINEERING LAB

Credit 4, Hours 120

Learning Outcomes

- To prepare SRS document, design document, test cases and software configuration management and risk management related document.
- Develop function oriented and object oriented software design using tools like rational rose.
- To perform unit testing and integration testing.

- Apply various white box and black box testing techniques
- Able to track the progress of a project using Openproj tool.

In this lab first 8 experiments are to practice software engineering techniques. Use any open source CASE tool. Many of them are available at www.sourceforge.net. You can choose any other CASE tool, as per choice.

Language: C++ / JAVA Design Approach : Object Oriented

These designing can be done on any automation system e.g. library management system, billing system, payroll system, bus reservation system, gas agency management system, book-shop management system, students management system.

1. Do feasibility study?

2. Document all the requirements as specified by customer in Software Requirement Specification

3. Design sequence diagrams for project

4. Design Collaboration diagram

5. Design Data Flow Diagram for the project

6. Design Entity Relation Diagram for the project

7. Design Class diagram

8. Design at least 10 test cases for each module.

9. -10: Code and test the project, which you have designed in last 8 labs.

Course Code BCA 503 PYTHON PROGRAMMING

Credit 4, Hours 120

Learning objectives:

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python

- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Unit 1: Introduction, What is Python, Origin, Comparison, Comments, Operators, Variables and Assignment, Numbers, Strings, Lists and Tuples
Unit 2: Dictionaries, if Statement, while Loop, for Loop and the range, Built-in Function
Unit 3: Files and the open() Built-in Function, Errors and Exceptions, Functions, Classes, Modules.
Unit 4: Statements and Syntax, Variable Assignment, Identifiers
Unit 5: Basic Style Guidelines, Memory Management, Python Application Examples.
Unit 6: Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators
Unit 7: Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types.
Unit 8: Introduction to Numbers, Integers, Floating Point Real numbers, Complex Numbers, Operators, Built-in Functions.
Unit 9: Sequences: Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings.
Unit 10: Operators, Built-in Functions, List Type Built-in Methods, Special Features of Lists
Unit 11: Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples.
Unit 12: Conditionals and Loops:-if statement, else Statement, else if Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement.
Unit 13: File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files
Unit 14: Command-line Arguments, File System, File Execution, Persistent Storage Modules

Text/Reference Books:

- Core Python Programming, Chun, J Wesley, 2nd Edition, Pearson,2010
- Head First Python, Barry, Paul, 2nd Edition, O Rielly, 2010.
- Learning Python, Lutz, Mark, 4th Edition, O Rielly, 2009.

Course Code BCA 504 PYTHON PROGRAMMING LAB

Credit 4, Hours 120

Learning objectives:

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

1. Learner will get guided to set of exercises to Implement a sequential search,
2. create a calculator program,
3. Explore string functions,

4. Implement Selection Sort,
5. Implement Stack,
6. Read and write into a file,
7. Demonstrate usage of basic regular expression,
8. Demonstrate use of advanced regular expressions for data validation,
9. Demonstrate use of List Demonstrate use of Dictionaries,
10. Create Comma Separate Files (CSV), Load CSV files into internal Data Structure,
11. Write script to work like a SQL SELECT statement for internal Data Structure made in earlier exercise,
12. Write script to work SQL Inner Join for an internal Data Structure made in earlier exercise

Course Code BCA 505 PROJECT FORMULATION AND APPRAISAL

Credit 4, 120 hours

Learning Outcomes

- Know the concept of Project Formulation
- Learn the significance of Project Formulation
- Identify the elements of Project Formulation
- Evaluate the common errors in Project Formulation
- Identify difference between Project Formulation and DPR
- Understand Environmental Impact Analysis

Unit 1: Project attributes; project life cycle; role of managers; Management scheduling; Gantt charts; CPM; PERT; crashing; Generation of project ideas – resource allocation;

Unit 2: Environment analysis – PEST analysis, porter's model; analysis of strategic capabilities value chain, BCG matrix, flexibility

Unit 3: Market appraisal; technical appraisal; environmental appraisal; evaluating intangibles, social appraisal – SCBA, UNIDO, LM, CSR,

Unit 4: FINANCIAL APPRAISAL**:** Time value of money; cost of capital – equity, debt, preference; weighted average cost; marginal and average cost

Unit 5: Capital budgeting – investment appraisal techniques; NPY; IRR; Payback period; replacement decisions; selection of exact discount factor – problems, inflation, taxation

Unit 6: single probability analysis; sensitivity analysis; break even analysis, Certainty equivalent; uncertainty analysis, simulation; decision tree model; risk and utility.

References & Text Books

1. Khatua Sitangshu. *Project Management and Appraisal*, Oxford University Press
2. Pandey, I.M. *Financial Management*. Vikas Publishing House
3. Prasanna, Chandra. *Financial Management*. Tata McGraw-Hill
4. Maheshwari, S .N. &Maheshwari, S. K. *Advanced Management Accounting Vol.1 & Vol.2*. Vikas Publishing House
5. Paresh Shah. *Management Accounting*. Oxford University Press

Semester 6

Course Code BCA 601: MAJOR PROJECT

Credit 14, hours 420

Learning Outcomes

- To simulate real life situations of engineering and impact adequate training to give students confidence to face and tackle any problem in the field is developed.
- Synthesizing and applying prior knowledge to designing and implementing solutions-to open-ended computational problems while considering multiple realistic constraints.

To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. Students will take up a project that aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.
Completion of project and presentation before a jury is intended to facilitate the transition from the thorough theoretical education, dispensed in this online degree program, into an industrial professional career.

Detailed syllabus of each BCA specialization:

Semester 1

Course Code BCA EL_1: MULTIMEDIA SYSTEM

Credit 2, 60 hours

Learning Objectives:

- be able to critically analyse and synthesise the key components of multimedia technologies including text, graphics, voice, video and animation;
- be able to evaluate the role of multimedia technologies in the online and web environment;
- be able to define the characteristics of each media type and describe their application;
- be able to develop, edit and improve interactive web pages that incorporate a variety of digital media such as graphics, voice, animation and video;
- be able to critically evaluate the implications of copyright in the use of multimedia;
- be able to research and analyse the protocols, standards and representation techniques used for storage and transmission of multimedia information.

Unit 1: Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products and Stages of Multimedia Projects, Multimedia hardware

Unit 2- Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools., Multimedia Building Blocks Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.
Unit 3: Data Compression Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling.
Unit 4: Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression. Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.
Unit 5: Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file format animations Images standards, JPEG Compression, Zig-Zag Coding, Multimedia Database.
Unit 6: Content based retrieval for text and images, Video: Video representation, Colours, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, Recent development in Multimedia
Text/Reference Books:
1. Tay Vaughan "Multimedia, Making IT Work" Osborne TMH.
2. Buford "Multimedia Systems" Addison Wesley.

3. Aagrawal & Tiwari "Multimedia Systems" Excel.

4. Sleinreitz "Multimedia System" Addison Wesley.

Semester 2

Course Code BCA EL 2 - BASIC PROGRAM IN ENTREPRENEURSHIP

Credit 2, 60 hours

Learning objectives:

- The goal of this Program is to provide a space and platform for discovery, both self – discovery and opportunity discovery.
- Students will discover their strengths in terms of an entrepreneurial founding team and learn basics such as opportunity discovery, prototyping, business plans, challenges etc.

Unit 1: Identification and classification of ideas. Entrepreneurial opportunities, environment scanning, Market assessment.

Unit 2: Value Proposition, Product and Service; Market segmentation, Product Life cycle; BCG Matrix, Environmental Scanning and SWOT analysis

Unit 3: Components of an ideal business plan – market plan, financial plan, operational plan, and HR plan.

Unit 4: Concept to Creation, Minimum Viable Product (MVP), Teething Problems of startup

Unit 5: Organizing and Marketing a Startup Selling on the web, launching e-commerce, Starting and growing an Enterprise, Growth Path

Unit 6: Students have to prepare a detailed business plan selecting a product(s), Presentation of such business plans and submission after necessary corrections suggested by subject faculty

References:

Online Courses through MOOC, Classroom learning through an experienced Facilitator/Faculty on campus (Games, Exercises, Videos, and Practical Experiences)

1. Tendon ,C: Environment and Entrepreneur; Cliugh Publications, Allahabad.

2. Siner A David: Enterpreneural Megabuks; John Wiley and Sons, New York.

3. Srivastava S. B: A Practical Guide to Industrial Entrepreneurs; Sultan Chand and Sons, New Delhi.

4. Prasanna Chandra: Protect Preparation, Appraisal, Implementation; Tata McGraw Hill. New Delhi.

5. Paudey I.M: Venture Capital - The Indian Experience; Prentice Hall of India. New Delhi

6. Holt: Entrepreneurship-New Venture Creation; Prentice Hall of India. New Delhi

Semester 3

Course Code BCA EL 3 - DISCRETE MATHEMATICS

Credit 2, hours 60

Learning Objectives

- Analyze logical propositions via truth tables.
- Understand sets and perform operations and algebra on sets.
- Determine properties of relations, identify equivalence and partial order relations, sketch relations.
- Identify functions and determine their properties., Define graphs, digraphs and trees, and identify their main properties.
- Evaluate combinations and permutations on sets.

Unit 1: Propositional Logic – Propositional equivalences-Predicates and quantifiers-Nested Quantifiers

Unit 2: Rules of inference-introduction to Proofs-Proof Methods and strategy

Unit 3: Mathematical inductions-Strong induction and well ordering- The basics of counting-The pigeonhole principle

Unit 4: Permutations and combinations-Recurrence relations-Solving Linear recurrence relations-generating functions-inclusion and exclusion and applications.

Unit 5: Algebraic systems-Semi groups and monoids-Groups-Subgroups and homomorphisms-Cosets and Lagrange's theorem- Ring & Fields (Definitions and examples

Unit 6: Partial ordering-Posets-Lattices as Posets- Properties of lattices-Lattices as Algebraic systems –Sub lattices –direct product and Homomorphism-Some Special lattices-Boolean Algebra

Text Books and References

1. Applied Discrete Structures, Levasseur K. and Doerr A. Lulu.com 2017 978-1105559297
2. Discrete Mathematics for Computing, Haggarty R. Pearson 2002 978-0201730470

BCA EL 4 - ARTIFICIAL INTELLIGENCE

Credit 2, hours 60

Learning objectives

- Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool**.**

Unit 1: What is intelligence? Foundations of artificial intelligence (AI). History of AI; Problem Solving- Formulating problems, problem types, states and operators, state space, search strategies.

Unit 2: INFORMED SEARCH STRATEGIES - Best first search, A* algorithm, heuristic functions, Iterative deepening A*(IDA), small memory A*(SMA), Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning

Unit 3: Representation, Inference, Propositional Logic, predicate logic (first order logic), logical reasoning, forward chaining, backward chaining; AI languages and tools - Lisp, Prolog, CLIPS.

Unit 4: Planning- Basic representation of plans, partial order planning, planning in the blocks world, hierarchical planning, conditional planning, representation of resource constraints, measures, temporal constraints

Unit 5: Basic probability, Bayes rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic, Decision making- Utility theory, utility functions, Decision- theoretic expert systems. Decision trees, rule-based learning, current-best-hypothesis search, least-commitment search

Unit 6: Neural networks, reinforcement learning, genetic algorithms. Communication - Communication among agents, Natural language processing, formal grammar, parsing, grammar

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 3 BCA EL4 - Artificial Intelligence (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	Lecture Video Recordings = 6 Hours	Open Source Videos = 4 hours	PPT	E-book/ PDF	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + Self Study	
Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hours	
Module I								
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Informed Search	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
Knowledge Representation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Planning	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
Probability	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Neural Networks	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	6 Hours	6 Hours (or more)	4 Hours (or more)	10 Hours		12 hours	22 Hours	

Reference Books:

1. Stuart Russell and Peter Norvig. Artificial Intelligence – A Modern Approach, Pearson Education Press, 2001.
2. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, 2008.
3. George F. Luger, Artificial Intelligence, Pearson Education, 2001.
4. Mils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002

Semester 4

Course Code BCA EL 5 MACHINE LEARNING
Credit 2, hours 60

Learning Objectives

- Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
- Have an understanding of the strengths and weaknesses of many popular machine learning approaches.
- Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
- Be able to design and implement various machine learning algorithms in a range of real-

world applications.

Unit 1: Introduction to Machine learning – Statistical Learning – types of Machine Learning – learning models: geometric, probabilistic and logistic models
Unit 2: Introduction to supervised, unsupervised and reinforcement learning – model evaluation – model implementation – model accuracy indicators.
Unit 3: Introduction to parametric machine learning method, assumptions of parametric machine learning methods, linear model and its assumptions, simple linear regression, scatter diagram
Unit 4: Simple linear Regression parameter estimation, properties of regression parameters, Analysis of variance and partial t test, estimation of σ^2, Interval Estimation of the Mean Response, R Square, Adjusted R Square, Normality of response variable, prediction of new observations, Confidence interval for β_0, β_1 and σ^2.
Unit 5: Multiple linear regression model, Least - Squares Estimation of the Regression Coefficients, Geometrical Interpretation of Least Squares, Properties of the Least Squares Estimators, Estimation of σ2, Inadequacy of Scatter Diagrams in Multiple Regression, Maximum Likelihood Estimation. Assumptions of Multiple linear regression variables, general equation of multiple linear regression
Unit 6: Introduction to multicollinearity, homoscedasticity, autocorrelation, effects of multicollinearity, homoscedasticity and auto autocorrelation in parameter estimation, techniques to handle multicollinearity, homoscedasticity and auto autocorrelation for better model.

Reference Text:
Introduction to Linear Regression Analysis, Fifth Edition DOUGLAS C. MONTGOMERY, ELIZABETH A. PECK, G. GEOFFREY VINING, A JOHN WILEY & SONS, INC., PUBLICATION

Course Code BCA EL 6 - INFORMATION SYSTEM SECURITY

Credit 2, hours 60

Learning Outcomes

- To apply knowledge of computing and mathematics appropriate to Information Systems and Technology.
- To use current techniques, skills, and tools necessary for Information Systems and Technology.
- To analyze a problem, and identify and define computing requirements appropriate to its solution.
- To function effectively on teams to accomplish a common goal.
- An understanding of security issues and responsibilities related to Information Systems and Technology.

Unit 1: Introduction to security attacks, services and mechanism, introduction to cryptography –Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers.
Unit 2: Introduction modular arithmetic, Euler's theorem, Euclid's Algorithm,

Chinese Remainder theorem. BLOCK CIPHER ALGORITHM**S:** Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, data encryption standard (DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES,

Unit 3: Strength of IDEA. PUBLIC KEY ALGORITHMS**:** Principals of public key crypto systems, RSA algorithm, security of RSA, key management

Unit 4: Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption. MESSAGE AUTHENTICATION: Authentication requirements, authentication functions, message authentication code

Unit 5: Hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, secure hash algorithm (SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS).

Unit 6: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME. Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV As
Semester 4 BCA EL6 Information System Security (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	Lecture Video Recordings = 6 Hours	Open Source Videos = 4 hours	PPT	E-book/ PDF	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Quest blanks, Short Answer (Answer Questions
Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hour
Module I							
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Module II							
Cipher Algorithms	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Module III							
Public Key Algorithms	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Module IV							
Message Authentication	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Module V							
Hash Functions	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Module VI							
Kerberos	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Total = 60 Hours	6 Hours	6 Hours (or more)	4 Hours (or more)	10 Hours		12 hours	22 Hour

Text/Reference Books:

- Computer Security, Dictergouman, John Wiley & Sons
- Computer Security: Art and Science, Mathew Bishop, Addison-Wisley
- Introduction to computer Security- Mathew Bishop, Addison-Wisley
- Network security, Kaufman, Perlman and Speciner, Pearson Education
- Cryptography and Network Security, william Stallings, Pearson Education
- William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.
- Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag.

Semester 5

Course Code BCA EL 7 DISTRIBUTED SYSTEMS

Credit 2, Hours 60

Learning Outcomes

- Outline the potential benefits of distributed systems
- Summarize the major security issues associated with distributed systems along with the range of techniques available for increasing system security
- Apply standard design principles in the construction of these systems
- Select appropriate approaches for building a range of distributed systems, including some that employ middleware

Unit 1: Definition, Issues, Examples of Distributed systems, Trends in Distributed system, Challenges of Distributed system & Approaches, Focus on resource sharing.

Unit 2: DEADLOCK DETECTION - System model, resource vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit 3: DISTRIBUTED OBJECTS AND REMOTE INVOCATION - Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study. Overview of security techniques, distributed file system, file service architecture, Sun Network File System, The Andrew File System, Recent advances.

Unit 4: Introduction to communication protocols, balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to Wave & traversal algorithms, Election algorithm.

Unit 5: CASE STUDY: CORBA services.

Unit 6: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control, Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

Text/Reference Books:

1. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed.

2. Gerald Tel, "Distributed Algorithms", Cambridge University Press

3. William Stalling, Distributed System, Addision Wesley

Course Code BCA EL 8 - REAL TIME SYSTEMS

Credit 2, hours 60

Learning Outcomes

- To study the basic of tasks and scheduling
- To understand programming languages and databases
- To analyze real time communication
- To analyze evaluation techniques and reliability models for Hardware Redundancy
- To understand clock synchronization

Unit 1: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

Unit 2: REAL TIME SCHEDULING - Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

Unit 3: Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols,

Unit 4: Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

Unit 5: Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol, Schedulability of Fixed-Priority End-to-End Periodic Tasks, Scheduling Algorithms for End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation of Dynamic Multiprocessor Systems, Scheduling of Tasks with Temporal Distance Constraints.

Unit 6: Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols, Real Time Protocols, Communication in Multicomputer System, An Overview of Real Time Operating Systems.

Text/Reference Books:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Real-Time Systems: Scheduling, Analysis, and Verification by Prof. Albert M. K.Cheng, John Wiley and Sons Publications.
3. Real Time System, Poonam Singh, DhanpatRai

Semester 6

Course Code BCA EL 9- CYBER CRIME & CYBER LAWS

Credit 2, 60 hours

Learning objectives

- Protect and defend computer systems and networks from cybersecurity attacks.
- Characterize privacy, legal and ethical issues of information security.
- Identify vulnerabilities critical to the information assets of an organization.
- Define the security controls sufficient to provide a required level of confidentiality, integrity, and availability in an organization's computer systems and networks.

Unit 1: Introduction- Computers and its Impact in Society, Overview of Computer and Web Technology, Statistics of digital world, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level, Indian IT act 2000, Indian IT act 2008 amendment, important amendment in IT act 2008.
Unit 2: Cyber Law International Perspectives:- UN & International Telecommunication Union (ITU) Initiatives, Council of Europe: Budapest Convention on Cybercrimes, Asia-Pacific Economic Cooperation (APEC) , Organization for Economic Co-operation and Development (OECD),World Bank, Commonwealth of Nations.
Unit 3: Constitutional & Human Rights Issues in Cyberspace:- Freedom of Speech and Expression in Cyberspace , Right to Access Cyberspace: Access to Internet , Right to Privacy. Right to Data Protection.
Unit 4: Cyber Crimes & Legal Framework: Definition, Cyber Crimes against Individuals, Institution and State
Unit 5- Hacking & cracking, Digital Forgery ,Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act, 2000, Cyber laws and law enforcement.
Unit 6- Interface with Copyright Law, Interface with Patent Law, Trademarks & Domain Names Related issues, domain squatting
Text/Reference Books:

1. Computer Law, Chris Reed & John Angel, OUP, New York, (2007).
2. Cyber Laws, Justice Yatindra Singh, Universal Law Publishing Co, New Delhi, (2012)
3. Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi, (2004)
4. Cyber Law, JonthanRosenoer, Springer, New York, (1997).
5. Information Technology Act, 2000, S. R. Bhansali, , University Book House Pvt. Ltd., Jaipur (2003).
6. Cyber Crimes and Law Enforcement, Vasu Deva, Commonwealth Publishers, (2013)

Course Code BCA EL 10 - SOFTWARE PROJECT MANAGEMENT

Credit 2, hours 60
Learning objectives

- Identify the different project contexts and suggest an appropriate management strategy.
- Practice the role of professional ethics unsuccessful software development.
- Identify and describe the key phases of project management.
- Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

Module 1: The management spectrum of the Project. The W5HH principle, Critical Practices Metrics, Process and Project: Metrics in the process and project Domains, software measurements, metrics for software quality, integrating metrics within software process, establishing a software metrics program.

Module 2 Observations, Project Planning Process, Software Scope and Feasibility, Resources, Software Project Estimation, Decomposition techniques, empirical estimation models, estimation for object oriented projects, estimation for Agile Development and Web Engineering Projects, The make/buy Decision.

Module 3 Reactive V/S Proactive Risk Strategies, Software Risks, Risk identification, Risk projection, Risk refinement, Risk mitigation, monitoring and management, The RMMM plan.

Module 4- Quality Concepts, Software Quality Assurances, Software Review, Formal Technical Reviews,Formal Approaches to SQA, Statistical Software Quality Assurances, Change Management: Software Configuration Management

Module 5- The SCM Repository, SCM Process, Configuration Management for Web Engineering.

Module 6 PROJECT EXECUTION AND CONTROL: The Review Process, Planning, Overview and Preparation for execution. One- Person Review, Guidelines for Review in Projects, Data Collection Analysis and Control Guidelines. Project Tracking, Activity Tracking, Defect Tracking, Issues Tracking, Status Reports.

Text/Reference Books:

1. R.S. Pressman, Software Engineering, TMH, 7th Edition.
2. PankajJalote, Software Project Management in Practice, Addison-Wesley.
3. B.Hughes& M. Cotterell, Software Project Management, TMH.

2.BCA UX

Semester 1

Course Code BCA UX 1: INTRODUCTION TO UX DESIGN

Credit 2, 60 hours

Learning Objectives:

- To understand the concept of UX design and how it has evolved
- Able to understand UX design process and methodology
- Able to understand how UX industry work
- To know the job, roles and responsibilities in UX industry
- To understand the importance of UX in digitalization and different types of industries

Unit 1: Evolution of UX Design

Understand the evolution of UX design as an industry practice and learning about UX industry experts, Design around us, Job roles and responsibilities in the UX industry, UX industry trends in various sectors, Ergonomics for UX Designers

Unit 2: Processes and Methodologies

Understanding UX design processes and methodologies – user centred design, ImaginXP 6D model of UX framework

Unit 3: Tools and technology, prototype, Industry standards, Technology, NFC, Chatbot, Siri

Unit 4- Introduction to Voice User Interface and Gesture Based Interfaces

Unit 5: UX industry trends in various sectors

Unit 6- Project on UX design process and industry trends

Reference Books:

1. Designing for Digital Age: How to create human-centered products and services - Kim Goodwin

2. Sketching the User experiences - Bill Buxton

3. The design of everyday things - Don Norman

4. The elements of user experience - Jesse James Garrett

Semester 2

Course Code BCA UX 2- EMPATHY AND USER RESEARCH

Credit 2, 60 hours

Learning objectives:

- To understand the concept of empathy and empathizing with users effectively
- Discern the facts after dully analyzing the information received from the user
- To learn how to define the problem on the basis of facts
- To grasp various empathy techniques and tools
- To practice various tools to comprehend root cause of the problem leading to correct definition

Unit 1: Introduction to Empathy

What is Empathy, Learn how to understand users & their problems, techniques to empathize with users and identify key user problems. Learn how to gain insights from empathy and define problems statements

Unit 2: Empathy Tools and Techniques

Empathy tools – techniques for getting empathy insights through interviews, Empathy maps, emotional mapping, observation, field study with actual users

Unit 3: Designing for people
Understanding people's psychology and Behaviour, Human attention and its application in design, Applying Principles of Memory in UX Design, Cognitive Load- what it is and why we must avoid it, Famous Case studies on people centric design, Tips to remember when designing for people, understanding mental models

Unit 4: Introduction to User Research
Introduction to User Research and its Importance, Understanding User interactions, User Research methodologies, Planning for a User Research User Segment, defining persona for research & recruiting users, desk research, primary research, preparing a Questionnaire for user research, focus group discussion, personal interviews, do and don'ts of interviewing, Online surveys, Analysis Interview

Unit 5 field study: Hands on practice of methodologies
Preparing and Conducting Stakeholder workshop, Preparing questionnaire for Interviews, and Online surveys

Unit 6: Tools of analysis
Analyzing qualitative and quantitative results, Transcribing interviews, Thematic analysis, Tools of empathy like Persona, Empathy Map, understanding user scenarios,
Storyboarding and when to use it, User Journey Map, Documenting Qualitative Research,
Documenting Qualitative and Quantitative Research

Reference Books:
1. A practitioner's guide to empathy and user research by Eshayat Taskin, Shashank Shwet, Sonam Agarwal, Vidhika Rohatgi
2. Empathy: Why it matters, how to get it - Roman Kizanie
3. Interviewing Users: How to Uncover Compelling Insights by Steve Portigal
4. Research Design: Quantitative, Qualitative, Mixed Methods, Arts-Based, and Community-Based Participatory
Research Approaches by Patricia Leavy
5. Well-Designed: How to Use Empathy to Create Products People Love by Jon Kolko
6. User Experience Mapping: Enhance UX with User Story Map, Journey Map and Diagrams by Peter W. Szabo

Semester 3

Course Code BCA UX 3- TECHNOLOGY IN EXPERIENCE DESIGN

Credit 2, hours 60

Learning Objectives

- Get to know futuristic technologies and their implementation in design
- Able to comprehend technology constraints on design
- To Understand technology for digital experience and product ecosystems

- Research project in design using latest technology

Unit 1: Technology for digital experience - Understanding technology for digital experience and product ecosystems

Unit 2: form factors, operating systems, wifi, Bluetooth, sensors and other hardware components.

Unit 3: Technological feasibility and viability- Understanding technological feasibility and viability. Technology constraints on design.

Unit 4: Futuristic Technologies- Learning about futuristic technologies and their implementation in design, Wearable medical devices

Unit 5: Futuristic Technologies Continued - Details of Internet of Things, Augmented reality and virtual reality, ATM, KIOSK

Unit 6: Research project on upcoming technologies and defining product ecosystems and constraints of key technologies

Reference Books:

1. Emotions, technology and design - Sharon Y. Tettegah
2. Augmented Reality: Principles and Practice - Dieter Schmalstieg
3. Augmented Reality: An emerging technologies guide - Gregory Kipper and Joseph Rampolla

BCA UX 4- INFORMATION ARCHITECTURE

Credit 2, hours 60

Learning objectives

- Understanding Information architecture
- Tools and techniques of Information architecture
- Hands on using excel as a tool for card sorting
- Creating IA for different industries,
- Learning types and structures and structures of IA
- Learn to create task flows
- Identify some potential disruptive innovations and take advantage of 'open' innovation

Unit 1- Innovation & Creativity

What is Innovation? What is creativity? Difference between innovation and creativity, dynamics of creative thinking, becoming creatively fit as an individual, creative insight, idea generation, learn what is innovation and how leading organization across the world are implementing innovation, Role of creativity and innovation in organizations, idea evaluation, creativity in teams

Unit 2- Ideation methods- brainstorming, crazy 8, six thinking hats, Moscow method, idea prioritization

Unit 3- Creating Task Flows

What are task flows, basics to create task flows, Task flow analysis, AS-IS and TO-BE process, Implementing into simple problems

Unit 4- Introduction to Information Architecture

What is Information architecture, Structure, hierarchy and types of Information architecture, Principles and steps of Information Architecture, Learning affinity mapping, Card sorting, Analysis of Information architecture, Using excel as a tool for card sorting, Activity based.

Unit 5- Designing Information Architecture for business strategy and exploring gaps

Designing Information Architecture for enterprise to meet its organizational goals using a tree structure. Making the case using the site mapping and content inventory and audit

Unit 6: Project submission on Information architecture on any Industry

Reference Books:

1. A Practical Guide to Information Architecture by Donna Spencer

2. The User's Journey: Story mapping Products That People Love by Donna Lichaw

3. User Is Always Right: A Practical Guide to Creating and Using Personas for the Web by Steve Mulder

Semester 4

Course Code BCA UX 5 – INTERACTION DESIGN

Credit 2, hours 60

Learning Objectives

- Learning the Importance and scope of Interaction design, User centered design
- Design of interactive products Methods of interaction design Tools for interaction design
- Get to know futuristic technologies and their implementation in design

Unit 1: Introduction to Interaction design

Understanding scope and history of interaction in design, case studies, what is User Centered Design, Ergonomics (Physical, cognitive and organizational), Learning the different methods which includes tools

Unit 2: Techniques of interaction design

Understanding micro-interactions, Introduction to UX writing, Gestalt's principle – 1, Hick's law, Fitts Law, The Pareto principle - 80/20 rule, Fitts' law, Occam's razor

Unit 3: Designing for Special Needs

Designing for Accessibility, designing for special needs, WCAG principles, how to design a touch interface that is comfortable to use?

Unit 4: UI Concept, design guidelines and tools

Creation of cross platform interface design and responsive design, Introduction to UI design concept and guidelines and Zeplin, The process of UI design documentation and design delivery documentation

Unit 5: Introduction to HMI

What is HMI? Who Uses HMI? Common Uses of HMI, What is the Difference Between HMI and SCADA?

Understanding the different technologies of HMI, Past trends and current technologies, High-Performance HMIs, Touch Screens and Mobile Devices, Remote Monitoring, Edge-of-Network and Cloud HMIs Case studies in detail, Understanding the current trends, exploring ways to implement Augmented Reality (AR) and Virtual Reality (VR) to visualize manufacturing functions.

Unit 6 Project : Students will design selected mobile or web pages and add micro-interactions to it, They will look at accessibility principles to design the pages, They will use UX writing principles to write microcopy in the prototype to make it clear, concise and useful

Reference Books:

1. Microinteractions: Designing with Details (Dan Saffer)
2. Designing Web Interfaces, Principles and Patterns for Rich Interactions (Bill Scott and Theresa Neil)
3. About Face: The Essentials of Interaction Design (Alan Cooper, Robert Reimann and David Cronin)

Course Code BCA UX 6 - WIREFRAMING AND PROTOTYPING

Credit 2, hours 60

Learning Outcomes

- Practice to learn the tools required to design wireframes and prototypes.
- Design wireframes on paper and translate paper concepts into digital wireframes.
- Understand and practice the techniques involved in designing digital wireframes for UI Platforms.
- Understand and practice the techniques involved in designing digital wireframes for HMI and other digital screens.
- Understand and practice the techniques involved in creating digital prototypes. Tools to be taught – AdobeXD, Figma

Unit 1: Basics guidelines of Wireframing and Prototyping
Introduction to wireframes, understanding responsive design, primary, secondary and utility navigation, content, inline links, indexes, search, what is Prototyping, when do we need it, understanding rapid prototyping, Types of Prototypes, Overview of wireframing and prototyping digital tools

Unit 2: Designing wireframes on paper
Header, footer, sidebar, navigation systems, use of whitespace, web fonts and typography

Unit 3:Designing wireframes on AdobeXD, Figma
Creating visual mockups, whitespace to style a form, scrolling, introduction to clickable prototypes, introduction to AdobeXD, Figma, importing and exporting assets, creating hotspots

Unit 4: Designing digital wireframe for different UI platforms
Practical hands-on demonstration of paper-based wireframes and clickable prototypes using digital tools, design documentation

Units 5-6: Practice and Project based – Designing for Web, Mobile Application, IOS, wearables

Reference Books:
1. Communicating Design: Developing Web Site Documentation for Design and Planning, Book by Daniel M. Brown
2. UI/UX Sketchbook For Wireframing And Prototyping: Big Size Edition Light Version
3. Mobile UI/UX Sketchbook: Wireframing and Prototyping Notebook for UI/UX Designers, Students, Mobile App Developers, and Hobbyists App Developer Notebooks

Semester 5
Course Code BCA UX 7- USABILITY TESTING
Credit 2, Hours 60

Learning Outcomes
- Learn the process of conducting usability tests Learning steps for digital products
- Learning Preparations for usability testing Understanding Usability testing methodologies
- To able to Conduct the Usability testing and document it

Unit 1: Process of Usability testing

What is Usability testing, Types of testing, Learning the steps to test different types of products/service/methods

Unit 2: planning, executing, information gathering and documentation, case studies

Unit 3: 10 Laws of Heuristic Evaluation, Understanding Heuristics through practical examples

Unit 4: Usability testing for Digital products

Learn how to create questionnaires, test cases and test moderation. Preparing for the testing of products, Understanding people's psychology and Behavior

Unit 5: Tools and Techniques of Usability Testing

Usability testing methodologies – task based user testing, A/B testing, lab based user testing, remote user testing, moderated & unmoderated user testing

Unit 6: Project Work

Project work on Usability Testing- students will pick up a real-life digital application and conduct end-to-end usability testing on the product and submit a report for evaluation.

Reference Books:

1. Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics (William Albert and Thomas Tullis)

2. Practical Guide to Usability Testing - Author: Joseph S. Dumas

3. Usability Inspection Methods - Authors: Jakob Nielsen

4. Usability Engineering - Author: Jakob Nielsen

5. Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests - Author: Jared Spool, Jeffrey Rubin, Dana Chisnell

Course Code BCA UX 8 – VISUAL DESIGN TOOLS

Credit 2, hours 60

Learning Outcomes

- Be able to Design vector artwork
- Able to prepare graphics for web and print
- To implement useful keyboard shortcuts
- Learn illustrator the way a professional would use it
- Practice everything you learn during the course

Unit 1: Photoshop

Photoshop – Interface & Workspace, Modifying workspace, tools and layers, blending options

Unit 2: Photoshop Continued

Photoshop – layer effect filters, Image editing and enhancing, mixing, layer masking, External Plug-ins

Unit 3: Illustrator

Illustrator - Interface & Workspace, Modifying workspace, tools and layers, blending options

Unit 4: Illustrator Continued

Illustrator – working with vectors, object libraries, layer effect filters, Image editing and enhancing, mixing, layer masking, drawing, External Plug-ins

Units 5-6: Project

Lab work on visual design tools, Project on visual design tools

Reference Books:

1. The Adobe Photoshop CC Book for Digital Photographers - Scott Kelby

2. Adobe Illustrator CC Classroom in a Book (2017 release) - Brian Wood

Semester 6

Course Code BCA UX 9- BUSINESS, UX AND DESIGN MANAGEMENT

Credit 2, 60 hours

Learning objectives

- Understanding business in UX
- Understanding the strategy involved in UX business
- Understanding design management
- Implementing design management in product design and business

Unit 1: Business UX

Understanding How a UX approach can help any business, The Business Value of UX Design, Strategy building, Aspects of key guidelines in UX business, values and emotions of user, Behavior and cognitive psychology of market and business, Design policies, Importance of understanding business requirements, Discovering business goals

UNIT 2: Internal and external stakeholders, stakeholder analysis, stakeholder interviewing, meeting stakeholder expectations and feedback, Direct and Indirect Competitors, Competitor Analysis and its practice, Steps to Conduct Competitor analysis, Parameters to conduct competitor analysis

Unit 3: Project Lifecycle Overview

Introduction and Importance of Product Management, Product Scope, Essential Elements for a Successful Product, Life Cycle of a Product, Project Environment, Feasibility Study, Product Selection, Product Integration Management, Communication Management Plan, Project Schedule, Determining Cost Budget, Cost Performance

Unit 4: Product Lifecycle
Identifying Customer Needs, Market Research Essentials, Technology Assessment, Introduction to Human Factors, Analyze Opportunities, Development Frameworks, Creativity in Design, Proof of Concept, Concept Testing, Enterprise Resource Planning, Product Failures, Concepts to Business Strategy, Strategic Frameworks, Identification of Target Markets, Behavioural Strategies, Rapid Prototyping, Agile Development, Market Testing, Beta Tests, Trial Run, Developing Brand Image, Advertising

Unit 5: Design Management
What is design management, Taking Charge of Processes and People the Evolution of Design Management, Areas of Design Management, Why Does Design Management Matter? Where Does Design Management Fall Within Businesses? Value Proposition Canvas, Creating a UX Roadmap

Unit 6: Zeplin and Jira
Learning how to develop and deliver documentation using Zeplin and How to communicate well and assign tasks among and within teams using Jira

Reference Books
1. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses by Eric Ries
2. Fundamentals of User-Centered Design by Still and Crane
3. UX Strategy: How to Devise Innovative Digital Products that People Want: Jaime Levy

Course Code BCA UX 10- DESIGN THINKING APPLICATION
Credit 2, hours 60
Learning objectives

- Deep dive into complex wicked problems to solve them through strategies
- To be able to understand the various ways in which innovative products can be built, To be able to follow the 5d process from scratch
- Understanding in the way of business advantages

Unit 1: Introduction to Design thinking

Learning the meaning of design thinking and how it has evolved to solve wicked problems around the world, four pillars of wicked problems, Deep dive into the Design process followed by Designers around the world, get to know the real-world applications and success stories of different industries

Unit 2: Design Thinking Frameworks

ImaginXP 6D process, AARRR framework, Customer Experience Index (CX Index), Google's HEART framework, Social Impact Metrics, Design Thinking Models - IDEO and Standford d.school

Unit 3: Business advantage of Design thinking

Case studies and aspects of design thinking on business of various sectors, Design Management, Learning tools like value proposition mapping and canvas, Feature mapping and ROI mapping

Unit 4: Strategic design thinking

Project based: Strategic Product design (prototypes) and making wearable devices with UX in it

Unit 5: Case studies of prominent brands and how they applied design thinking in creating innovative solutions

Unit 6: Project work

Reference Books:

1. Designing for Digital Age: How to create human-centered products and services - Kim Goodwin

2. Sketching the User experiences - Bill Buxton

3. The design of everyday things - Don Norman

3. BCA DATA SCIENCE

Semester 1

Course Code BCA EL_1: MULTIMEDIA SYSTEM

Credit 2, 60 hours

Learning Objectives:

- be able to critically analyse and synthesise the key components of multimedia technologies including text, graphics, voice, video and animation;
- be able to evaluate the role of multimedia technologies in the online and web environment;
- be able to define the characteristics of each media type and describe their application;

- be able to develop, edit and improve interactive web pages that incorporate a variety of digital media such as graphics, voice, animation and video;
- be able to critically evaluate the implications of copyright in the use of multimedia;
- be able to research and analyse the protocols, standards and representation techniques used for storage and transmission of multimedia information.

Unit 1: Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products and Stages of Multimedia Projects, Multimedia hardware

Unit 2- Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools., Multimedia Building Blocks Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit 3: Data Compression Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling.

Unit 4: Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression. Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit 5: Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file format animations Images standards, JPEG Compression, Zig-Zag Coding, Multimedia Database.

Unit 6: Content based retrieval for text and images, Video: Video representation, Colours, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, Recent development in Multimedia

Reference Books:

1. Tay Vaughan “Multimedia, Making IT Work” Osborne TMH.

2. Buford “Multimedia Systems” Addison Wesley.

3. Aagrawal & Tiwari “Multimedia Systems” Excel.

4. Sleinreitz “Multimedia System” Addison Wesley.

Semester 2

Course Code BCA DS 1 – MATHEMATICAL COMPUTATION OF DATA

Credit 2, 60 hours

Learning objectives:

- Demonstrate understanding of basic mathematical concepts in data science, relating to linear algebra, probability, and calculus
- Use appropriate technology to aid problem-solving and data analysis.

Unit 1: Probability, Convergence and Sampling

Probability: Sample Spaces, Conditional Probability and Independence, Density Functions, Expected Values, Variance, Joint – Marginal and Conditional Distributions, Bayes Rule and Bayesian Inference. Convergence and Sampling: Sampling and Estimation, Probably Approximately Correct (PAC), Concentration of measure with Union bound and examples, Sampling without replacement with Priority sampling

Unit 2: Distances and Nearest Neighbours, Gradient Descent

Metrics, Lp Distances and their Relatives, Distances for Sets and Strings, Modelling text with distances – k grams, Similarities, Locality Sensitive Hashing; Gradient Descent: Functions, Gradients, Fitting a model to data: Least Mean Squares Updates for Regression, Decomposable Functions

Unit 3: Linear Algebra

Vectors and Matrices, Matrix Algebra, Vector Spaces, Norms, Linear Independence, Rank, Inverse regression, Multiple Explanatory Variables, Polynomial Regression, Cross Validation, Regularized Regression

Unit 4: Principal Component Analysis and Clustering

Data Matrix, Singular Value Decomposition, Eigen Values and Eigen Vectors, Power methods, Multidimensional Scaling; Voronoi Diagrams, Gonzalez Algorithm for k-Centre Clustering, Lloyd's Algorithm for k-Means Clustering, Mixture of Gaussians, Hierarchical Clustering, Mean Shift Clustering

Unit 5: Classification and Graphs

Linear Classifiers: Loss Functions - Cross Validation - Regularization; Perceptron Algorithm, Kernels, KNN Classifiers, Neural Networks; Markov Chains, Page Rank, Spectral Clustering on Graphs, Laplacian and Eigen Structure, Communities in Graph: Preferential Attachment - Betweenness – Modularity

Unit 6: Assignments/practical exercises

Reference books

1. Practical Statistics for Data Scientists: 50 Essential Concepts by Peter Bruce and Andrew Bruce
2. Introduction to Linear Alegbra by Gilbert Strang
3. Elements of Statistical Learning

Semester 3

Course Code BCA DS 2: INTRODUCTION TO DATA SCIENCE
Credit 2, 60 hours

Learning Objectives:

- Introduction to data analytics techniques.
- Model Evaluation of Data Analytics

Unit 1: Introduction

Introduction to Data Science, Evolution of Data Science, Data Science Roles, Stages in a Data Science Project, Applications of Data Science in various fields, Data Security Issues.

Unit 2: Data Collection and Data Pre-Processing

Data Collection Strategies, Data Pre-Processing Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization.

Unit 3: Exploratory Data Analytics

Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis, Box Plots, Pivot Table, Heat Map, Correlation Statistics, ANOVA.

Unit 4: Model Development

Simple and Multiple Regression, Model Evaluation using Visualization, Residual Plot, Distribution Plot, Polynomial Regression and Pipelines, Measures for In-sampleEvaluation, Prediction and Decision Making.

Unit 5: Model Evaluation

Generalization Error, Out-of-Sample Evaluation Metrics, Cross Validation, Overfitting, Under Fitting and Model Selection, Prediction by using Ridge Regression, Testing Multiple Parameters by using Grid Search.

Unit 6- assignments

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 3 BCA DS2 - Introduction to Datascience (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	Lecture Video Recordings = 6 Hours	Open Source Videos = 4 hours	PPT	E-book/ PDF	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + Self Study	
Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hours	
Module I								
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Data Collection and Data Processing	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
Exploratory Data Analysis	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Model Development	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
Model Evaluation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Assignments	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	6 Hours	6 Hours (or more)	4 Hours (or more)	10 Hours		12 hours	22 Hours	

Reference books

1. Practical Statistics for Data Scientists.
2. Introduction to Probability.
3. Introduction to Machine Learning with Python: A Guide for Data Scientists.
4. Python for Data Analysis.
5. Python Data Science Handbook.

Course Code BCA DS 3- BIG DATA ANALYTICS

Credit 2, hours 60

Learning Objectives

- Explain the motivation for big data systems and identify the main sources of Big Data in the real world.
- Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store retrieve and process Big Data for Analytics.
- Implement several Data Intensive tasks using the Map Reduce Paradigm
- Apply several newer algorithms for Clustering Classifying and finding associations in Big Data
- Design algorithms to analyze big data like streams, Web.

Unit 1: Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications, Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.

Unit 2: Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out of Hadoop

– Understanding inputs and outputs of Map Reduce - Data Serialization.

Unit 3: Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read., Name Node, Secondary Name Node, and DataNode, Hadoop Map Reduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

Unit 4: Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features- Name Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.

Unit 5: Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Sub queries

Unit 6: HBase concepts- Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 3 BCA DS3 - Big Data Analytics(2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	Lecture Video Recordings = 6 Hours	Open Source Videos = 4 hours	PPT	E-book/ PDF	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + Self Study	
Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hours	
Module I								
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Hadoop and map reduce	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
Hadoop Architecture	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Hadoop Components	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
Hive Architecture	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Hbase	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	6 Hours	6 Hours (or more)	4 Hours (or more)	10 Hours		12 hours	22 Hours	

Reference Books:

1. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley.

2. Understanding Big data, Chris Eaton, Dirk deroos et al. , McGraw Hill, 2012.

3. HADOOP: The definitive Guide, Tom White, O Reilly 2012.

4. Big Data Analytics with R and Haoop, Vignesh Prajapati, Packet Publishing 2013.

5. Oracle Big Data Handbook, Tom Plunkett, Brian Macdonald et al, Oracle Press, 2014.

Semester 4

Course Code BCA EL 5 MACHINE LEARNING

Credit 2, hours 60

Learning Objectives

- Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
- Have an understanding of the strengths and weaknesses of many popular machine learning approaches.
- Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
- Be able to design and implement various machine learning algorithms in a range of real-world applications.

Unit 1: Introduction to Machine learning – Statistical Learning – types of Machine Learning – learning models: geometric, probabilistic and logistic models
Unit 2: Introduction to supervised, unsupervised and reinforcement learning – model evaluation – model implementation – model accuracy indicators.
Unit 3: Introduction to parametric machine learning method, assumptions of parametric machine learning methods, linear model and its assumptions, simple linear regression, scatter diagram
Unit 4: Simple linear Regression parameter estimation, properties of regression parameters, Analysis of variance and partial t test, estimation of σ^2, Interval Estimation of the Mean Response, R Square, Adjusted R Square, Normality of response variable, prediction of new observations, Confidence interval for β_0, β_1 and σ^2.
Unit 5: Multiple linear regression model, Least - Squares Estimation of the Regression Coefficients, Geometrical Interpretation of Least Squares, Properties of the Least Squares Estimators, Estimation of σ2, Inadequacy of Scatter Diagrams in Multiple Regression, Maximum Likelihood Estimation. Assumptions of Multiple linear regression variables, general equation of multiple linear regression
Unit 6: Introduction to multicollinearity, homoscedasticity, autocorrelation, effects of multicollinearity, homoscedasticity and auto autocorrelation in parameter estimation, techniques to handle multicollinearity, homoscedasticity and auto autocorrelation for better model.

Reference Book:
Introduction to Linear Regression Analysis, Fifth Edition DOUGLAS C. MONTGOMERY, ELIZABETH A. PECK, G. GEOFFREY VINING, A JOHN WILEY & SONS, INC., PUBLICATION

Course Code BCA DS 4- R FOR DATA SCIENCE

Credits 2, hours 60

Learning Outcomes:

- To construct and manipulate R data structures, including vectors, factors, lists, and data frames.
- To control program flow with conditions and loops, write functions, perform character string operations, write regular expressions, handle errors.
- To enable students to read, write, and save data files and scrape web pages using R.

UNIT-1 Introduction to R Programming

Overview of R Programming, Downloading and installing, Viewing documentation, General issues in R, Package Management, Data Types, Subsetting, Writing data, Reading from CSV files, Creating a vector and vector operation, Initializing data frame, Control structure, Re-directing R Output

UNIT-2 Data Visualization

Creating bar chart and dot plot, Creating histogram and box plot, Plotting with base graphics, Plotting and coloring in R

UNIT-3 Basic Statistic

Computing Basic Statistics, Comparing means of two samples, Testing a proportion, Data Munging Basics

UNIT-4 Functions and Programming in R

Flow control: For loop, If condition, Debugging tools, List Management, Data Transformation, Merging Data Frames, Outlier Detection, Combining multiple vectors

UNIT-5 R Database

Performing queries, RODBC and DBI Package, Advanced Data handling, Combined and restructuring data frames, Logical Regression, Hierarchical Clustering PCA for Dimensionality Reduction

UNIT 6- Assignments

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Conter		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 4 BCA DS4 R for Data Science (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	Lecture Video Recordings = 6 Hours	Open Source Videos = 4 hours	PPT	E-book/ PDF	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + Self Study	
Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hours	
Module I								
Introduction to R	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Data Visualisation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
Basic Statistics	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Functions and Programming in R	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
R Database	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Assignments	1 Live Session					2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	6 Hours	6 Hours (or more)	4 Hours (or more)	10 Hours		12 hours	22 Hours	

Reference Books:

1. R for Data Science: Import, Tidy, Transform, Visualize, and Model Data
2. The Book of R: A First Course in Programming and Statistics
3. R For Dummies
4. Discovering Statistics Using R
5. The Art of R Programming: A Tour of Statistical Software Design

Semester 5

Course Code BCA DS 5 - INFORMATION EXTRACTION AND RETRIEVAL

Credit 2, 60 hours

Learning Outcomes:

- Understand the basic concepts of information extraction and retrieval
- Understand the involvement of the information retrieval in modern lifestyle & social media
- Understand data pre-processing, indexing, retrieval methods and concepts
- Understand how to evaluate the effectiveness and efficiency of different information retrieval methods

UNIT 1: INTRODUCTION TO INFORMATION EXTRACTION (IE)

Overview of Information Extraction, preparing raw data, Collecting- Training and Testing data set, Text Preprocessing – Tokenization – Sentence Segmentation - Lexical Analysis – Finite

State Morphonology – Finite State Morphology – Paradigm based Lexical Analysis - Syntactic Parsing – Cocke-Kasami-Younger Algorithm – Deductive Parsing – LR Parsing – Constraint based Grammars – Issues in Parsing - Semantic Analysis.

UNIT 2: DATA LABELING AND EXTRACTION

Sequence Labeling, Speech labeling and Tagging, Named Entity Recognition, Relation Extraction, Event Extraction, Opinion Extraction, Temporal Information Extraction, Event Extraction, Open Information Extraction, Common Sense Knowledge Extraction.

UNIT 3: INTRODUCTION TO INFORMATION OF RETRIEVAL(IR)

Impact of the web on IR, Basic IR models: Boolean and vector space retrieval models, ranked retrieval, TF-IDF, weighting and cosine similarity, Basic Tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors; Java implementation

UNIT 4: TEXT REPRESENTATION, CATEGORIZATION AND CLUSTERING

Word statistics; index term selection using thesauri. Metadata and markup languages, Search engines; spidering; metacrawlers; directed spidering; link analysis, shopping agents, Categorization algorithms. Applications to information filtering and organization, naive Bayes for ad hoc retrieval. Smoothing of document retrieval, Text Clustering, Collaborative filtering and content-based recommendation of documents and products.

UNIT 5: ETHICAL ISSUES IN IR

Privacy, Fairness, Fake news and disinformation, Filter bubble, Viewpoint diversity, fostering extremism, Internet addiction, extracting data from text; semantic web; collecting and integrating specialized information on the web, Semantic parsing. Question Answering from structured data and text, Deep learning for IR: Word embeddings. Neural language models.

UNIT 6: Assignments

Reference Books:

1. Gerald J Kowalski, Mark T Maybury Information Storage and Retrieval Systems: Theory and Implementation, Springer, 2004.
2. David A. Grossman, OphirFrieder, Information Retrieval – Algorithms and Heuristics, Springer, 2nd Edition(Distributed by Universal Press), 2004.
3. Christopher D Manning, PrabhakarRaghavan, HinrichSchutze, An Introduction to Information Retrieval By Cambridge University Press, England, 2009.

Course Code BCA DS 6 – DATA MINING AND PREDICTION

Credit 2, hours 60

Learning Outcomes:

- Student will be able to understand data handling, interpretation and analyse

- Data Mining and its interpretation for intelligent Applications

Unit 1: Introduction to Data Warehousing & Data Mining

Overview of concepts like star schema, fact, and dimension tables, OLAP operations, From OLAP to Data Mining, Data Mining-Definition & Functionalities, Classification of DM systems, DM task primitives, Integration of a Data Mining system with a Database or a Data Warehouse, Major issues in Data Mining, KDD Process.

Unit 2: Mining Frequent Patterns, Associations, and Correlations

Association Rule Mining, Mining Single- Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

Unit 3: Classification and Prediction

Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy.

Unit 4: Data Mining for Business Intelligence Applications

BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities, Data mining for business Applications, Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance, and CRM etc.

Unit 5: Enterprise Reporting

Multidimensional data model, ER Modeling vs. multi-dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS, Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS

Unit 6: Assignments

Reference Books

1. Introduction to Data Mining by Tan, Steinbach & Kumar
2. An Introduction to Statistical Learning: with Applications in R by Gareth James & Daniela Witten
3. Data Science for Business: What you need to know about data mining and data-analytic thinking by Foster Provost & Tom Fawcett

Semester 6

Course Code BCA DS 7- DATA HANDLING & VISUALISATION

Credit 2, 60 hours

LEARNING OUTCOMES:

- Learn assigning data to appropriate chart elements, using glyphs, parallel coordinates, and streamgraphs
- Learn in implementing principles of design and colour to make your visualizations more engaging and effective.

UNIT-1 Introduction to Visualization

What is visualization, its importance in expressing data, how it makes displaying data simpler, Introduction to form and space, tables, graphs, and chart.

UNIT-2 Visualization of Numerical Data

Data, Mapping, Glyphs, Parallel Coordinates, Stacked Graphs, Tufte's Design Rules, Using Colour

UNIT-2 Visualization of Non – Numerical Data

Graphs and Networks, Embedding Planar Graphs, Graph Visualization, Tree Maps, Principal Component Analysis (PCA), Multidimensional Scaling, Packing

UNIT-4 Visualization Dashboard

Visualization Systems, The Information Visualization Mantra, Database Visualization, Visualization System Design

UNIT 5 – Data Visualization Project

TEXTBOOKS:

T1. Deitel and Deitel, "C How to Program", Prentice Hall 2010 (Reprint).

T2. Herbert Schildt, "C++: The Complete Reference", McGraw - Hill Osborne Media; 3rd edition 2012 (Reprint).

T3. Yashvant Kanetkar, "Let Us C 13E", BPB Publications – 13th Edition, 2013.

Course Code BCA EL 10 - SOFTWARE PROJECT MANAGEMENT

Credit 2, hours 60

Learning objectives

- Identify the different project contexts and suggest an appropriate management strategy.
- Practice the role of professional ethics unsuccessful software development.
- Identify and describe the key phases of project management.
- Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

UNIT 1: The management spectrum of the Project. The W5HH principle, Critical Practices Metrics, Process and Project: Metrics in the process and project Domains, software measurements, metrics for software quality, integrating metrics within software process, establishing a software metrics program.
UNIT 2: Observations, Project Planning Process, Software Scope and Feasibility, Resources, Software Project Estimation, Decomposition techniques, empirical estimation models, estimation for object oriented projects, estimation for Agile Development and Web Engineering Projects, The make/buy Decision.
Module 3 Reactive V/S Proactive Risk Strategies, Software Risks, Risk identification, Risk projection, Risk refinement, Risk mitigation, monitoring and management, The RMMM plan.
Module 4- Quality Concepts, Software Quality Assurances, Software Review, Formal Technical Reviews,Formal Approaches to SQA, Statistical Software Quality Assurances, Change Management: Software Configuration Management
Module 5- The SCM Repository, SCM Process, Configuration Management for Web Engineering.
Module 6 PROJECT EXECUTION AND CONTROL: The Review Process, Planning, Overview and Preparation for execution. One- Person Review, Guidelines for Review in Projects, Data Collection Analysis and Control Guidelines. Project Tracking, Activity Tracking, Defect Tracking, Issues Tracking, Status Reports.

Reference Books:

1. R.S. Pressman, Software Engineering, TMH, 7th Edition.
2. PankajJalote, Software Project Management in Practice, Addison-Wesley.
3. B.Hughes& M. Cotterell, Software Project Management, TMH.

4. BCA RPA

Semester 1

Course Code RPA 1- Introduction to RPA

Credits 2, 60 Hours

Learning Outcomes:

- Understanding the lifecycle of RPA and various software used in RPA

- Students will learn how automation is done using RPA
- Students will learn the current technology trends in RPA and its future.

UNIT I: INTRODUCTION TO ROBOTIC PROCESS AUTOMATION

Emergence of Robotic Process Automation (RPA), Evolution of RPA, Definition of RPA, identifying types of automation, Distinguishing RPA from traditional automation, Discovering the digital workforce platform, RPA candidates, Feasibility Matrix using Complex Calculator

UNIT II: AUTOMATION ASPECTS

Benefits and Application of RPA, Features of RPA, Types of RPA, 6 step RPA, Robotic Spectrum, Top RPA vendors, what to look for in RPA software, C – level decision making around RPA, Where RPA market is heading to, Levels of automation, RPA software tools, RPA services, Industries adopting RPA

UNIT III: RPA LIFECYCLE

Initial Process Analysis (Discovery Phase), Define – Process Definition Document (PDD), Design – Solution Design Document (SDD), Automation Development, Testing Definition Document (TDD), Deployment Model, Design and Architecture practices

UNIT IV: APPLICATIONS OF RPA

Industry applications, medical, telecom, finance, management, stock market, back end, and front-end office, top – companies making use of RPA technology, profits

UNIT V and VI - CASE STUDIES

Reference books

- Robotic Process Automation Projects: Build real-world RPA solutions using UiPath and Automation Anywhere by Nandan Mullakara
- UI path academy handbooks

Semester 2

Course Code RPA 2- Variables, Arguments and Workflows

Credits 2, 60 Hours

Learning Outcomes:

- Students will learn the various functions of UiPath tool
- Students will learn how automation is done using UiPath tool

UNIT I: UNDERSTANDING OF UIPATH

Introduction to UiPath platform and its components, what is Studio? What is Orchestrator? What is RE Framework? Installation details of UiPath's Community Edition, Creating first Bot, User Interface

UNIT II: WORKFLOWS IN UIPATH

Flowcharts, State Machine, Sequence, Global Exception Handler

UNIT III: UIPATH VARIABLES AND ARGUMENTS

Difference between Variables and Arguments, Types of Variables, Types of Arguments, Use of Variables, and arguments with examples, how to pass argument from one workflow to another

UNIT IV: UIPATH EXCEL ACTIVITIES

Use of Excel application Scope, Use Excel File, Read Cell Value, read range, append range, Copy/paste range, Write range activity, Excel Use Cases, Workbook Activities

UNIT V and VI: USE CASES

Reference books

- UI path academy handbooks

Semester 3

Course Code RPA 3 - SELECTORS AND CONTROL FLOW IN STUDIO

2 credits, 60 hours

Learning Outcomes:

- Learn how to use selectors while automating a process
- Familiarize in decision control activities such as loop and switch

Unit I
Introduction to Selectors, The UI Explorer, Types of Selectors, Wildcards

UNIT II
Full Vs Partial Selectors, Fine – Tuning, Get and Sort Data, Set Data, Highlight WFT Type Items

Unit III
About Control flow, Control Flow Activities, The Assign Activity, The Delay Activity, The Do While Activity

UNIT IV
The If Activity, The Switch Activity, The While Activity, The For Each Activity, The Break Activity

Unit V
Selectors Use Cases

Unit VI
Control Flow Use Cases

Reference books

- UI path academy handbooks

COURSE CODE RPA 4 - AUTOMATION CONCEPTS AND TECHNIQUES

2 credits, 60 hours

Learning Outcomes:

- Acquire knowledge of fundamental UI automation concepts
- Learn how to extract text and image from documents
- Learn how to automate an excel process using various activities of excel and workbook.
- Learn how to automate email activities such as to send an email, delete, mark read and unread an email, and work with email files and folders.
- Adept in extracting the text using PDF activities and OCR activities.

Unit 1: Image and Text Automation
Introduction to Image and Text Automation, Mouse and Keyboard Activities, Guides/Text Activities, Guides/OCR Activities, Image Activities, Mouse and Keyboard Automation, Text Automation, OCR and Image Automation

Unit 2: Excel and Workbook Automation
Classic and Modern Activities of Excel, Use Excel File, Excel Application Scope, Append Range, Autofill, Delete Rows, Delete Columns, Duplicate Sheet

Unit 3
Filter, Insert Columns, Insert Rows, Read Cell Formula, Read Range, VLookup, Write Cell, Write DataTable to Excel, Workbook Activities

Unit 4: Email Automation
Iterating through Outlook Mails and Attachments, Saving, Renaming and Moving Attachments, Extracting Data from automated emails and moving it to a desktop application, working with files and folders, Use Exchange 365 Account, Use Gmail, Archive Email, Delete Email, For Each Email, Forward Email, Get Email by ID, Mark Email as Read/Unread, Move Email, Reply to Email, Save Email, Save Email Attachments, Send Calendar Invite, Send Email

Unit 5: PDF Automation
Manage Packages of PDF, Read PDF Text Activity, Read PDF with OCR Activity, Get Full Text, Get OCR Text Activity, Anchor Base Activity, Find Element, Find Image, Use – Cases,

Citrix and SAP Automation

Unit 6: Practice Session
Use Cases of Excel Automation, Use Cases of PDF Automation, Use Cases of Email Automation, Image and Text Automation

Reference books

- UI path academy handbooks

Semester 4

Course Code RPA 5- ORCHESTRATOR

Credit 2, hours 60

Learning Outcomes:

- Describe the Orchestrator entities and what they are meant for, as well as differentiate between the tenant context and the folder context.
- Create, configure, and provision unattended robots from Orchestrator.
- Execute jobs using unattended robots in diverse ways - as individual jobs, with queues, or in large scale deployments.
- Describe how licenses are allocated and consumed in Orchestrator.

UNIT I: INTRODUCTION TO ORCHESTRATOR

Introducing UiPath Orchestrator, Orchestrator Entities, Tenants, and Folders, Robot Provisioning and License Distribution, Unattended Automation with Folders, Libraries and Templates in Orchestrator

UNIT II: MONITORING OF ORCHESTRATOR

Storage Buckets, Queues, Intermission - Transaction Processing Models, Triggers and SLAs, Monitoring and Alerts

UNIT III: UIPATH ORCHESTRATOR, FRONT + BACK-OFFICE ROBOTS
Orchestrator Overview, Orchestrator Hosting, Robots Hosting, Processing Hosting, Process Monitoring, Queues

UNIT IV: RE- FRAMEWORK

Computer Vision Basic, Introduction to REFramework, About REFramework, Purpose of REFramework, Using State Machine Layout, States of the State Machine, Workflows Involved, Workflows of the Framework, Rules of Developing a Process using REFramework

UNIT V and VI: PRACTICE EXERCISES USING ORCHESTRATOR

Reference books

1. UI path academy handbooks

COURSE CODE RPA 6- PROJECT ORGANISATION, DEBUGGING AND ERROR HANDLING

Credit 2, 60 hours

Learning Outcomes:

- Analyze the process thoroughly, identify the requirements and plan accordingly
- Analyze and group the workflows of the project into different folders based on the target application
- Familiarize in breaking the process into smaller workflows for a better understanding of the code, independent testing, and reusability
- Learn how to keep consistent naming convention across the project
- Demonstrate how to pick an appropriate layout for each workflow (sequence/flowchart/state machine)

Unit 1: Project Organization

Introduction to Project Organization, Project layouts and their types, Choosing a Project Layout, Project Templates

Unit 2: State Machines

Introduction and Example of a State Machine, Foreground Process vs Background Process, Introduction to Version Control, Version Control in Studio, Modularity in Workflows, Reusing parts of a project

Unit 3: Debugging

Introduction to Debugging, Troubleshoot, Debug and Modify processes, Debugging Actions – Step Into, Step Over, Step Out, Retry, Ignore, Restart, Break, Focus, Slow – Step, Execution Trail, Highlight Elements, Log Activities

Unit 4

Continue Exception, Picture in Picture, Open Logs, Logging Levels, how to do logging? Activity Project Settings – Project Settings, General, Workflow Analyzer, Activities Settings, Workflow Analyzer rules, how to use workflow analyser

Unit 5: Error Handling

Introduction to Errors and Exceptions, Error Handling Activities, Global Exception Handler, Difference between errors and exceptions, Introduction to Picture in Picture, Starting Picture

in Picture

Unit 6: Use – Cases

Project Organization Use Cases, State Machines Use Cases, Debugging Use – Cases, Error Handling Use Cases

Reference books

1. UI path academy handbooks

Semester 5

Course Code RPA 7- Web and Windows Automation

Credit 2, Hours 60

Learning Outcomes:

- Use App and wen recording to automate tasks.
- Learn about dot net programming to modify the selectors in UI Explorer.

UNIT I: APP AND WEB RECORDER

Use of App recorder, Use of Web recorder, use – cases

UNIT II: WEB AND WINDOWS AUTOMATION

UI Automation, Open Browser, Get Browser data, Get URL, Navigate Browser, Use of Selector, putting data into Web, Set web attributes, Advance Web automation

UNIT III: PROGRAMMING OVERVIEW WITH DOT NET

Dynamic Selector, Static Selector, Passing Variables and Wildcards in Selector

UNIT IV: USE – CASES

UNIT V and VI- assignments

Reference books

1. UI path academy handbooks

Course Code RPA 8- Input Activities and Input Methods

Credit 2, hours 60

Learning outcomes:

- Demonstrate how to scrape data using Data Scraping Wizard by building a workflow that scrapes data.
- Build a workflow using Data Scraping wizard that scrapes Whitepaper's details from UiPath Whitepaper webpage.
- Use Tesseract engine for smaller areas in the document and Microsoft OCR for larger

ones.
- Invoke the scraping done with Microsoft OCR via a separate workflow
- Discuss the use cases of Input Activities and Input Methods.

Unit 1: Input Activities and their Properties
Introduction to Input Activities, Common Properties – Continue on error, Delay after, Delay Before, Time Out, Wait for Ready, Target, Specific Properties – Click, Type Into, Send Hotkey

Unit 2: Input Methods
Introduction to Input Methods, Comparison of Input Methods, Use Cases

Unit 3: Extraction Techniques
Get Text, Get Full Text, Get Visible Text, Get OCR Text, Other Techniques – Data Scraping, Screen Scraping, PDF Extraction

Unit 4: Extraction Wizards
Screen Scraping Extraction wizard – Screen Scraping Methods – Full, Native and OCR, Types of OCR – Tesseract OCR, Microsoft OCR, UiPath Screen OCR, Data Scraping Extraction Wizard

Unit 5 and 6: Practice Exercises
Use Cases of Input Activities and Input Methods, Use Cases of Extraction Techniques and Extraction Wizards

Reference books

1. UI path academy handbooks

Semester 6

Course Code RPA 9- UI Synchronisation Activities

Credit 2, 60 hours

Learning Outcomes:
- Provide descriptive annotations for the activities to ensure easy recall in the future.
- Use Find Relative Element activity for static elements that cannot be accessed directly.
- Use UI Explorer with Find Children activity to understand the structure of the interface and identify the parent-child relationships among elements.
- Learn various UI Synchronization Activities such as: Find, Exists, Wait, Vanish, Appear and Trigger Activities.
- Learn various case studies of RPA which helped in the productivity of the company.

Unit 1: Find and Exists Activities
Introduction to UI Synchronization Activities, Find Activities – Element, Image and Text, Element Activities – Element, Image and Text

Unit 2: Wait and Vanish Activities
Wait Activities – Elements, Image and Attribute, Vanish Activities – Element and Image

Unit 3: Appear and Trigger Activities
Appear Activities – Element and Image, Introduction to Triggers, Trigger Activities, Trigger Based Attended Automation

Unit 4: Case Study - RPA for Logistics and Transportation
Create Carrier Corporation Revolutionizes Logistics Operations with Robotic Process Automation.

Unit 5: Case Study - RPA for Insurance
Safe-Guard Products Adjudicates Claims 75% Faster with Kofax

Unit 6: Use cases and exercises

Reference books

UI path academy handbooks

Course Code RPA 10- Robotic Enterprise Framework

2 credits, 60 hours
Learning Outcomes:

- Download and customize the framework specific to project needs.
- Implement concepts such as word blogs, exception handling, and logging messages.
- Work with config files and orchestrator to read and write data.
- Create and modify workflows to handle business data and processes.
- Learn different methods to customize the Enhanced Robotic Enterprise Framework to create simple automations for multiple applications.

Unit 1: Introduction to Robotic Enterprise Framework
Re-framework Overview, Type of Processes – Linear, Repetitive and Transactional. Initialize Process, Get and manage GET Transaction Data, Processing Transaction, Real time use case of framework

Unit 2: RE – Framework Architecture
RE – Framework in UiPath Studio, States in RE – Framework, Workflows in RE – Framework states, RE – Framework Transitions, Shared Variables

Unit 3: RE – Framework Features
Introduction to RE – Framework Features, Config file – Settings, Constants, Assets, Exception Handling – Business Rule Exception, System Exception, Logging – Default Logs and Custom Logs

Unit 4: RE – Framework and Orchestrator
Implementation of RE- Framework: RE-Framework without Orchestrator and RE – Framework with Orchestrator, Dispatcher and performer process, advantages of Dispatcher and Performer

Unit 5: Cognitive Automation: IBM Watson
What is Cognitive RPA, Cognitive RPA – features, Cognitive RPA platform overview, Cognitive RPA use cases, Natural Language Processing (NLP): Text Analysis, Sentiment Analysis, NLP API consumption

Unit 6
Build your own social media monitoring tool, Analysis of Email, Image Analytics: Computer Vision, Image Classification, Unstructured data to structure conversion, Aadhar/PAN/Invoice extraction

Reference books

1. UI path academy handbooks

5. BCA CLOUD TECHNOLOGY AND INFORMATIONS SECURITY

Semester 1

Course Code BCA EL 1: MULTIMEDIA SYSTEM

Credit 2, 60 hours

Learning Objectives:

- be able to critically analyse and synthesise the key components of multimedia technologies including text, graphics, voice, video and animation;
- be able to evaluate the role of multimedia technologies in the online and web environment;
- be able to define the characteristics of each media type and describe their application;
- be able to develop, edit and improve interactive web pages that incorporate a variety of digital media such as graphics, voice, animation and video;
- be able to critically evaluate the implications of copyright in the use of multimedia;
- be able to research and analyse the protocols, standards and representation techniques used for storage and transmission of multimedia information.

Unit 1: Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products and Stages of Multimedia Projects, Multimedia hardware

Unit 2- Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools., Multimedia Building Blocks Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit 3: Data Compression Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling.

Unit 4: Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression. Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit 5: Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file format animations Images standards, JPEG Compression, Zig-Zag Coding, Multimedia Database.

Unit 6: Content based retrieval for text and images, Video: Video representation, Colours, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, Recent development in Multimedia

Reference Books:

1. Tay Vaughan "Multimedia, Making IT Work" Osborne TMH.

2. Buford "Multimedia Systems" Addison Wesley.

3. Aagrawal & Tiwari "Multimedia Systems" Excel.

4. Sleinreitz "Multimedia System" Addison Wesley.

Semester 2

Course Code BCA CTIS 1 - INTRODUCTION TO CRYPTOGRAPHY

Credit 2, 60 hours

Learning objectives:

- To understand basics of Cryptography and Network Security.
- To be able to secure a message over insecure channel by various means.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To understand various protocols for network security to protect against the threats in the

networks

Unit 1: Introduction: The Need for Security, Security Approaches, Principles of Security, Text and Cipher Text, Substitution and Transposition Techniques

Unit 2: Encryption and Decryption, Symmetric and Asymmetric Cryptography, Steganography, Key Range and Key Size-Types of Attacks.

Unit 3: Symmetric Key Cryptographic Algorithms: Algorithm Types and Modes,Overview, DES, IDEA, RC5, AES, Linear and Differential Cryptanalysis

Unit 4: Asymmetric Key Cryptographic Algorithms: Overview, RSA, Digital Signature, Knapsack Problem

Unit 5: Public Key Infrastructure: Digital Certificates, Private Key Management, Public Key Cryptographic Standards, PKI and Security, Internet Security Protocols: SSL, SHTTP, SET, Electronic Money, Email Security, WAP Security

Unit 6: User Authentication Mechanism: Authentication Basics, Password, Authentication Tokens, Certificate-based Authentication, Biometric Authentication, Kerberos

Content Matrix

Reference books

1. Cryptography and Network Security: C K Shyamala, N Harin i, Dr T R Padmanabhan, Wiley India, 1”
2. Cryptography and Network Security : Forouzan Mukhopadhyay, MC Graw Hill, 2″” Edition
3. Information Security, Principles and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning

Semester 3

Course Code BCA CTIS 2- Principles of Virtualisation

Credit 2, hours 60

Course Outcomes:

- Installing and configuring the SDDC using VMware products.

- Implementing Fault tolerance and High availability for the Virtual machines
- Securing the Virtual environment.
- Resource Optimization and monitoring

Unit 1: Introduction to Virtualization - Types of virtualization - Difference between cloud and virtualization - Physical infrastructure and virtual infrastructure - Virtualization approaches - Partitioning - Hosting - Isolation - Hardware independence - Virtual machine - Hypervisor - Types of hypervisor - Virtual machine manager - Types of hypervisor

Unit 2: Introduction to datacenter virtualization Esxi - Difference between Esxi and Esx - Versions of Esxi - Installation and configuration of Esxi 6.0 - vSphere 6.0.

Unit 3: Components of VMware vSphere - vSphere 6.0: Overview and Architecture - Topology of vSphere 6.0 Data Center - vSphere 6.0 Configuration MaximumsvCenter Server - vCenter Server Features - Certificate Management - Alarms and Alerts - Monitoring Features - Template Management - Linked Mode Deployment .

Unit 4: Storage Features in vSphere: Storage Features in vSphere - Shared Storage - Storage Protocols - Datastores - Virtual SAN - Virtual Volumes - Networking Features in vSphere - Virtual Networking - Virtual Switches and its types.

Unit 5: Features of vSphere and NSX:vSphere Resource Management Features - vMotion - Distributed Resource Scheduler (DRS) - - Distributed Power Management (DPM) - Storage vMotion - Storage DRS - Storage I/O Control - Network I/O Control - vSphere Availability Features - vSphere Data Protection - High Availability - Fault Tolerance - vSphere Replication - Introduction to NSX., Security - features and benefits of VMware Platform Services Controller - Configure ESXi host access and authorization - Secure ESXi - vCenter Server - and virtual machines - Upgrade ESXi and vCenter Server instances.

Unit 6: Resource Optimization: Network Optimization - Configure and manage vSphere distributed switches - Migrate virtual machines from standard switches to distributed switches - Explain distributed switch features such as port mirroring - LACP - QoS tagging - and NetFlow - CPU Optimization

Content Matrix

Semester	**Live Sessions**	**Quadrant - I e-Tutorial**		**Quadrant - II e-Content**		**Quadrant - III Discussion Forum**	**Quadrant - IV Assessment**
Semester - 3 BCA CTIS2 - Principles of Virtualisation (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	**Lecture Video Recordings = 6 Hours**	**Open Source Videos = 4 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**

Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hours	
Module I								
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Datacenter virtualisation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
VMware Vsphere	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Storage Features	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
vSphere and NSX	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Resource Optimisation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	

Reference Books

1. Hyperconverged Infrastructure Data Centers Demystifying HCI Sam Halabi
2. VMware Horizon View 6 Desktop Virtualization Cookbook Jason Ventresco

Course Code BCA CTIS 3 – FUNDAMENTALS OF CLOUD TECHNOLOGY

Credit 2, 60 hours

Learning Objectives

- Understand the concepts, characteristics, delivery models and benefits of cloud computing
- Understand the key security and compliance challenges of cloud computing
- Understand the key technical and organisational challenges
- Understand the different characteristics of public, private and hybrid cloud deployment models.

Unit 1: Introduction to Cloud computing, Shift from distributed computing to cloud computing, Principles and characteristics of cloud computing- IaaS, PaaS, SaaS
Unit 2: Service oriented computing and cloud environment, Microservices Architecture, Client systems, Networks, server systems and security from services perspectives
Unit 3: Platforms, Accessing the cloud with platforms and applications; cloud storage, Infrastructure As A Service – conceptual model and working Platform as a Service – conceptual model and functionalities
Unit 4: Software as a Service – conceptual model and working Technologies, Trends in Service provisioning with clouds, Cloud collaborative applications and services – technology, applications
Unit 5: Case studies with calendars, schedulers and event management, Cloud applications in project management.
Unit 6: CASE STUDIES - Microsoft Azure, AWS, GCP, Open source clouds- Open-Nebula and Eucalyptus, Current trends and research

Content Matrix

Semester	**Live Sessions**	**Quadrant - I e-Tutorial**		**Quadrant - II e-Content**		**Quadrant - III Discussion Forum**	**Quadrant - IV Assessment**
Semester - 3 BCA CTIS3 - Fundamentals of Cloud Technology (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	**Lecture Video Recordings = 6 Hours**	**Open Source Videos = 4 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordin	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**

						ator or his team	
Total = 60 Hours	**6 Hours**	**10 Hours**		**10 Hours**		**12 hours (2 hours/ week)**	**22 Hours**
Module I							
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Module II							
Service Oriented Computing	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Module III							
Platforms	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Module IV							
SaaS	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Module V							
Cloud in Schedulers, Project Management	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Module VI							
Case Studies	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/ PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Total = 60 Hours	**6 Hours**	**6 Hours (or more)**	**4 Hours (or more)**	**10 Hours**		**12 hours**	**22 Hours**

1 Overall Assignment

Text / Reference Books:

1. Anthony T.Velte, Toby J.Velte and Robert E, Cloud Computing – A Practical Approach, TMH , 2010
2. Michael Miller, Cloud Computing – Web based Applications, Pearson Publishing, 2011

Semester 4

Course Code BCA CTIS 4- Network Security

Credit 2, hours 60

Learning Outcomes

- Relate fundamental concepts of information security with network and connectivity.
- Understand various characteristics of network security, threats and risks to securing network.
- Learn important network security protocols and means of achieving an effective network security
- Apply their understanding of network security in identifying common issues and propose suitable solutions.
- Articulate the importance of managing the network using policies, processes and framework for effective and efficient security

Module 1

Perimeter Security – Overview of Network Security, Access Control, Device Security, Security features on Switches, Firewall, Types of firewall, Access Management, Multifactor Authentication, Wireless LAN (WLAN) Security and Network Admission Control (NAC).

Module 2

Threat; Vulnerabilities; Attacks – Application Attack, Network Attack and Mitigating & Deterring Attacks; Network Security – Security through network devices, Security through Network Technologies and Security through Network Design Elements, Administering a Secure Network

Module 3

Secure Socket Layer (SSL) – Introduction to SSL, Open SSL basics, Problems with SSL, Cryptography, Message Digits Algorithms, Digital Signature and Public Key Infrastructure (PKI);

Module 4

Data Privacy – IPsec VPN, Dynamic Multipoint VPN (DMVPN), Group Encrypted Transport VPN (GET VPN), Secure Sockets Layer VPN (SSL VPN) and Multiprotocol Label Switching VPN (MPLS VPN)

Module 5

Network Intrusion Prevention – Overview of Intrusion Prevention System (IPS), Intrusion Detection System (IDS), Deploying IPS and IPS high Availability; host Intrusion Prevention; Anomaly Detection and Mitigation.

Module 6

Security Monitoring and correlation; Security Management - Security and Policy Management and Security Framework and Regulatory Compliance; Best Practices Framework, Case Studies

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 4 BCA CTIS4 Network Security (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	**Lecture Video Recordings = 6 Hours**	**Open Source Videos = 4 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 60 Hours	**6 Hours**	**10 Hours**		**10 Hours**		**12 hours (2 hours/week)**	**22 Hours**	
		Module I						
Overview	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
		Module II						
Threats and Vulnerabilities	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
		Module III						
SSL	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
		Module IV						
Data Privacy	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
		Module V						
Intrusion prevention	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
		Module VI						
Monitoring and Management	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	**6 Hours**	**6 Hours (or more)**	**4 Hours (or more)**	**10 Hours**		**12 hours**	**22 Hours**	

Reference Books

1. Network Security Bible by Eric Cole
2. Network Security: Private Communication in a Public World by Charlie Kaufman, Radia Perlman, Mike Speciner
3. Network Security and Administration by Adesh K. Pandey, S.K. Kataria
4. Network Security: A Beginners Guide by Eric Maiwald

Course Code BCA CTIS 5 – CLOUD WEB SERVICES

Credit 2, 60 hours

Learning Objectives:

- Concept and uses of Amazon web services
- Recognise the business applications of cloud

Unit 1: Introduction to Amazon Web Services, AWS Storage Options, AWS Compute Options, AWS Database Options,
Unit 2: AWS Workflow Automation And Orchestration Options, AWS Systems Management And Monitoring Options, AWS Virtual Private Cloud Introduction, Pricing Concepts
Unit 3: Introduction To EC2, Instance Types And Uses, Autoscaling Instances, Amazon Machine Images (AMIS), Modifying Existing Images, Creating New Images Off Of Running Instances
Unit 4: Converting An Instance Store AMI To An EBS AMI, Instances Backed By Storage Types, Creating A Web Server Using Ec2, Elastics Block Storage (EBS), Elastic IPS, Route 53 DNS System, Cloudfront SNS Pricing
Unit 5: Introduction To S3, Buckets And Objects, Security, Creating A Web Server Using S3 Endpoints, Introduction To Cloudwatch, Creating Alarm Notifications, Autoscaling Instances
Unit 6: Deploying Scalable Application On AWS, Selecting And Launching An Application Environment, Provisioning Application Resources with Cloud formation

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 4 BCA CTIS5 Cloud Web Services (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	Lecture Video Recordings = 6 Hours	Open Source Videos = 4 hours	PPT	E-book/ PDF	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + Self Study	
Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hours	
Module I								
Introduction to AWS	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
AWS Workflows	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
EC2	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
EBS	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
S3 and Cloudwatch	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Deploying Applications on AWS	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	6 Hours	6 Hours (or more)	4 Hours (or more)	10 Hours		12 hours	22 Hours	

Reference Text:

1. Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg, Andrzej M. Goscinski,, John Wiley and Sons Publications, 2011
2. Brief Guide to Cloud Computing, Christopher Barnett, Constable & Robinson Limited, 2010
3. Amazon Web Services for Dummies, Bernald Golden, John Wiley & Sons, 2013

Semester 5

Course Code BCA CTIS 6- Database Security Fundamentals

Credit 2, hours 60

Learning Outcomes

- Relate concepts of information security with databases.
- Justify the need for securing database in mitigating important vulnerabilities.
- Get the basic knowledge of NoSQL database
- Acquire the knowledge about the encryption and permission used in SQL server 2012.
- Acquire the knowledge about the security and auditing in SQL server 2012.

Module 1

Database security concept, Importance of data, Levels of data security, Authorization in databases, Issues in database security, Concept of Least Privilege in User ID for databases. Perimeter security, firewalls, intrusion detection, and intrusion prevention.

Module 2

No SQL databases introduction, Differences from classical DBMS concepts with NoSQL, Advantages of NoSQL like Elastic Scaling, Big Data, Goodbye DBAs', Economics/Cost, Flexible Data models. Non/ partial applicability of ACID (Atomicity, Consistency, Isolation, Durability), BASE Properties, CAP theorem, comparison to traditional RDBMS databases. Horizontal scalability, Benefits of NoSQL Databases compared to traditional Databases

Module 3

Concept of UnSQL or Unstructured Query Language, Concept of Key Value & Tuple Store Databases, Concept of Graph Databases, Concept of Multimodel Databases

Module 4

Understanding permissions, Creating and using database roles, using schemas for security, configuring cross-database security. Code and Data Encryption- Using service and database master keys, creating and using symmetric and asymmetric keys, creating and storing hash values, Authenticating stored procedure by signature

Module 5

User authorization, authentication and security, protecting data using permissions, roles, schemas, SQL firewall, web application firewall, securing dynamic SQL from injections, protecting SQL server from DoS and injection attacks.

Module 6

Auditing – Using the profiler to audit SQL server access, using DML trigger for auditing data modification, Using DDL triggers for auditing structure modification, configuring SQL server auditing, auditing and tracing user configurable events, policy based management, system centre advisor to analyze instances

Reference Books

1. Database security by Silvana Castano
2. Microsoft SQL server 2012 Security Cookbook by Rudi Bruchez
3. Handbook of database security: Applications and Trends by Michael Gertz, Sushil Jajodia
4. Network Security: A Beginners Guide by Eric Maiwald

COURSE CODE BCA CTIS 7 Ethical Hacking

Credit 2, Hours 60

Learning objectives:

- Explain the importance of ethical hacking in achieving the goals of information security.
- Differentiate the processes of vulnerability assessment and ethical hacking from penetration testing.
- Comprehend the importance of appropriate countermeasures for managing vulnerabilities.
- Justify the need for meticulous documentation in writing reports for consumption of both technical and management audiences.
- Articulate the rationale for having an adequate legal framework for dealing with hacking and ethical hacking.

Unit 1

Hacking Methodology, Process of Malicious Hacking, and Foot printing and scanning: Foot printing, scanning. Enumeration: Enumeration.

Unit 2

System Hacking and Trojans: System Hacking, Trojans and Black Box Vs. White Box Techniques, Denial of Service, Sniffers, Session Hijacking and Hacking Web Servers: Session Hijacking, Hacking Web Servers.

Unit 3

Web Application Vulnerabilities and Web Techniques Based Password Cracking: Web Application Vulnerabilities, Web Based Password Cracking Techniques

Unit 4

SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security. Linux Hacking: Linux Hacking. Evading IDS and Firewalls: Evading IDS and Firewalls.

Unit 5

Introduction to Report Writing & Mitigation, requirements for low level reporting & high level reporting of Penetration testing results, Demonstration of vulnerabilities and Mitigation of issues identified including tracking

Unit 6

Overview of India's Information Technology Amendment Act 2008 (IT Act 2008), hacker vs cracker, liabilities – civil and penal, cyber theft and IPC sec 378, IT Act 2008 – sections 43, 65 and 66, how to file a complaint of suspected hacking, Case Studies, understanding how hacking is legally dealt with among BRICS countries

Reference Books

1. Gray Hat Hacking The Ethical Hackers Handbook by Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle
2. CEH v9: Certified Ethical Hacker Version 9 Study Guide by Sean-Philip Oriyano
3. Hacking for Beginners: Ultimate 7 Hour Hacking Course for Beginners. Learn Wireless Hacking, Basic Security, Penetration Testing by Anthony Reynolds

Semester 6

Course Code BCA CTIS 8 Infrastructure Solutions on Cloud

Credit 2, hours 60

Learning Outcomes

- Critically appraise the opportunities and challenges of information management in complex business environments
- Evaluate information storage management design in a cloud environment and how it relates to the business objectives of an organization
- Analyze the role technology plays in the design of a storage solution in a cloud architecture
- Investigate how a global storage solution can be optimized so that it can be delivered successfully from the cloud
- Analyze how best to provide reliable access to information both locally and remotely using storage technologies

Module 1

Cloud infrastructures; public, private, hybrid. Service provider interfaces; Saas, Paas, Iaas. VDC environments; concept, planning and design, business continuity and disaster recovery principles. Managing VDC and cloud environments and infrastructures. SRM-M.Tech Cloud Computing 2015 – 16

Module 2

Storage strategy and governance; security and regulations. Designing secure solutions; the considerations and implementations involved. Securing storage in virtualized and cloud

environments. Monitoring and management; security auditing and SIEM.

Module 3

Architecture of storage, analysis and planning. Storage network design considerations; NAS and FC SANs, hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, host system design considerations.

Module 4

Global storage management locations, scalability, operational efficiency. Global storage distribution; terabytes to petabytes and greater. Policy based information management; metadata attitudes; file systems or object storage.

Module 5

Designing backup/recovery solutions to guarantee data availability in a virtualized environment. Design a replication solution, local remote and advanced.

Module 6

Investigate Replication in NAS and SAN environments. Data archiving solutions; analyzing compliance and archiving design considerations.

Reference Books

1. Cloud and Virtual Data Storage Networking by Greg Schu
2. Foundations of Green IT by Marty PoniatowskiInformation Storage and Management by EMC

Course Code BCA EL 10 - SOFTWARE PROJECT MANAGEMENT

Credit 2, hours 60

Learning objectives

- Identify the different project contexts and suggest an appropriate management strategy.
- Practice the role of professional ethics unsuccessful software development.
- Identify and describe the key phases of project management.
- Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

Module 1: The management spectrum of the Project. The W5HH principle, Critical Practices Metrics, Process and Project: Metrics in the process and project Domains,

software measurements, metrics for software quality, integrating metrics within software process, establishing a software metrics program.
Module 2 Observations, Project Planning Process, Software Scope and Feasibility, Resources, Software Project Estimation, Decomposition techniques, empirical estimation models, estimation for object oriented projects, estimation for Agile Development and Web Engineering Projects, The make/buy Decision.
Module 3 Reactive V/S Proactive Risk Strategies, Software Risks, Risk identification, Risk projection, Risk refinement, Risk mitigation, monitoring and management, The RMMM plan.
Module 4- Quality Concepts, Software Quality Assurances, Software Review, Formal Technical Reviews,Formal Approaches to SQA, Statistical Software Quality Assurances, Change Management: Software Configuration Management
Module 5- The SCM Repository, SCM Process, Configuration Management for Web Engineering.
Module 6 PROJECT EXECUTION AND CONTROL: The Review Process, Planning, Overview and Preparation for execution. One- Person Review, Guidelines for Review in Projects, Data Collection Analysis and Control Guidelines. Project Tracking, Activity Tracking, Defect Tracking, Issues Tracking, Status Reports.

6. BCA BLOCKCHAIN TECHNOLOGY

SEMESTER 1

Course Code BCA EL_1: MULTIMEDIA SYSTEM

Credit 2, 60 hours

Learning Objectives:

- be able to critically analyse and synthesise the key components of multimedia technologies including text, graphics, voice, video and animation;
- be able to evaluate the role of multimedia technologies in the online and web environment;
- be able to define the characteristics of each media type and describe their application;
- be able to develop, edit and improve interactive web pages that incorporate a variety of digital media such as graphics, voice, animation and video;
- be able to critically evaluate the implications of copyright in the use of multimedia;
- be able to research and analyse the protocols, standards and representation techniques used for storage and transmission of multimedia information.

Unit 1: Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products and Stages of Multimedia Projects, Multimedia hardware

Unit 2- Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools,

card and page based authoring tools., Multimedia Building Blocks Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit 3: Data Compression Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling.

Unit 4: Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression. Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit 5: Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file format animations Images standards, JPEG Compression, Zig-Zag Coding, Multimedia Database.

Unit 6: Content based retrieval for text and images, Video: Video representation, Colours, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, Recent development in Multimedia

Semester 1	**Live Sessions**	**Quadrant - I e-Tutorial**		**Quadrant - II e-Content**		**Quadrant - III Discussion Forum**	**Quadrant - IV Assessment**	
BCA EL1 - Multimedia Systems (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	**Lecture Video Recordings = 6 Hours**	**Open Source Videos = 4 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 60 Hours	**6 Hours**	**10 Hours**		**10 Hours**		**12 hours (2 hours/week)**	**22 Hours**	
Module I								
Multimedia Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Convergence		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Multimedia hardware		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			

Module II							
Memory and Storage Devices	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Presentation Tools		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Multimedia-Sound		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module III							
Data Compression introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Data compression Algorithms		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Adaptive Coding		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module IV							
Finite Context Modelling	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)
Compression		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Lossy and Lossless compression		1 recorded video	1 open source video	1 PPT	1 E-book/PDF		
Module V							

Multiple monitors	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Image Standard		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Multimedia Database		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Module VI								
Content based retrieval for text and images	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Indexing and retrieval of video		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Recent Developments in Multimedia		1 recorded video	1 open source video	1 PPT	1 E-book/PDF			
Total = 60 Hours	**6 Hours**	**6 Hours (or more)**	**4 Hours (or more)**	**10 Hours**		**12 hours**	**22 Hours**	

Reference Books:

1. Tay Vaughan "Multimedia, Making IT Work" Osborne TMH.

2. Buford "Multimedia Systems" Addison Wesley.

3. Aagrawal & Tiwari "Multimedia Systems" Excel.

4. Sleinreitz "Multimedia System" Addison Wesley.

SEMESTER 2

Course Code BCA CTIS 1: INTRODUCTION TO CRYPTOGRAPHY

Credit 2, 60 hours

Learning objectives:

- To understand basics of Cryptography and Network Security.
- To be able to secure a message over insecure channel by various means.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To understand various protocols for network security to protect against the threats in the networks

Unit 1: Introduction: The Need for Security, Security Approaches, Principles of Security, Text and Cipher Text, Substitution and Transposition Techniques

Unit 2: Encryption and Decryption, Symmetric and Asymmetric Cryptography, Steganography, Key Range and Key Size-Types of Attacks.

Unit 3: Symmetric Key Cryptographic Algorithms: Algorithm Types and Modes,Overview, DES, IDEA, RC5, AES, Linear and Differential Cryptanalysis

Unit 4: Asymmetric Key Cryptographic Algorithms: Overview, RSA, Digital Signature, Knapsack Problem

Unit 5: Public Key Infrastructure: Digital Certificates, Private Key Management, Public Key Cryptographic Standards, PKI and Security, Internet Security Protocols: SSL, SHTTP, SET, Electronic Money, Email Security, WAP Security

Unit 6: User Authentication Mechanism: Authentication Basics, Password, Authentication Tokens, Certificate-based Authentication, Biometric Authentication, Kerberos

Content Matrix

Reference books

1. Cryptography and Network Security: C K Shyamala, N Harin i, Dr T R Padmanabhan, Wiley India, 1”
2. Cryptography and Network Security : Forouzan Mukhopadhyay, MC Graw Hill, 2″” Edition
3. Information Security, Principles and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning

SEMESTER 3

Course Code BCA BL_1: Fundamentals of Blockchain

Credit 2, 60 hours

LEARNING OUTCOMES:

- Understand the fundamentals behind Blockchain technology and how it works
- Appreciate the business use cases, and future possibilities for blockchain

- Understand the basic of security for blockchain
- Understand the Blockchain ecosystem, Platforms, Services and service providers, Regulators

Unit 1: Overview of Blockchain Technology, Historical Developments

Unit 2: Smart contracts and Consensus Algorithms, Merkle Tree and Hashing, Blocks, Wallets and Addresses

Unit 3: Public and Private Key, Cryptography and Cryptographic Algorithms, Transaction Execution and Distribution

Unit 4: Block chain components, Blockchain Architecture, Blockchain Usecases

Unit 5: Block chain Trends, Scalable Blockchain, Blockchain as a Service

Unit 6: Research Problems in Blockchain, Cryptocurrency and Blockchain

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester -3 BCA BL1 - Fundamentals of Blockchain technology (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	**Lecture Video Recordings = 6 Hours**	**Open Source Videos = 4 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 60 Hours	**6 Hours**	**10 Hours**		**10 Hours**		**12 hours (2 hours/week)**	**22 Hours**	
Module I								
Overview	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Smart contracts	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
Cryptography	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Components of Block chain	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
Blockchain Trends	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Crypto and Blockchain	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	**6 Hours**	**6 Hours (or more)**	**4 Hours (or more)**	**10 Hours**		**12 hours**	**22 Hours**	

Reference books

1. Kirankalyan Kulkarni, Essentials of Bitcoin and Blockchain, Packt Publishing.
2. Anshul Kaushik, Block Chain & Crypto Currencies, Khanna Publishing House.
3. Tiana Laurence, Blockchain for Dummies, 2nd Edition 2019, John Wiley & Sons.
4. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Imran Bashir, Packt Publishing (2017).

Course Code BCA BL_2: DISTRIBUTED LEDGER TECHNOLOGY

Credit 2, 60 Hours

Learning Objectives:

- Understand block chain technology.
- Develop block chain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks.

Unit 1. Smart Contracts in Practice - Coding smart contracts - What is going on under the hood - Rigidity of coding versus nuance of law
Unit 2: Enterprise DLT platforms - Blockchain vs. distributed ledger - Hyperledger, R3, Enterprise Ethereum Read Swanson, Consensus-as-a-Service Valenta & Sandner
Unit 3: Comparison of Ethereum, Hyperledger, Corda Coindesk
Unit 4: State of Blockchain, Enterprise Blockchains
Unit 5: DLT Implementation - Consortia and other DLT structures
Unit 6: Industry applications - Business value proposition - Practical challenges

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester -3 BCA BL2- Distributed Ledger Technology (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	Lecture Video Recordings = 6 Hours	Open Source Videos = 4 hours	PPT	E-book/ PDF	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + Self Study	
Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hours	
Module I								
Coding Smart contracts	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module II								
Enterprise DLT	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
Comparsion between DLT platforms	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module IV								
Enterprise Block Chain	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
DLT implementation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Industry and Business Value proposition	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	6 Hours	6 Hours (or more)	4 Hours (or more)	10 Hours		12 hours	22 Hours	

Reference Books:

1. Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing

SEMESTER 4

Course Code BCA BL_3: SOLIDITY PROGRAMMING

Credit 2, hours 60

Learning Objectives

- To understand the working and importance of smart contracts.
- To learn the solidity language required for coding Ethereum smart contracts.
- To create and deploy an App on a Ethereum test network.

Unit 1: Introduction to Blockchain and Ethereum, Blockchain Architectural Overview, The Web of Trust, Ethereum's main components, Ethereum's sub-protocols, The new generation of the Web (i.e., Web3.0), Smart Contracts and Decentralized Applications (dApps) ,Web apps vs. dApps

Unit 2: The Solidity Programming Language: A simple Solidity Contract (Contract Walk-through), The Solidity compiler o Ethereum Contract ABI, Deployment with the Web3.js or Web3J library, Virtual Machines and Beyond, History of Virtual Machines, State replication, consensus and the Ethereum Architecture

Unit 3: Smart contract layout, The structure of .sol source file, Understanding the different compiler versions and pragmas, Authoring smart contracts o Contract definitions, Basic data types, Local and State Variables, Global Variables and Functions , Predefined Global Variables, Structs and Enums, Mapping and Arrays, Build-in Functions (e.g., addmod, keccak256), User Functions, Expressions and Control Structures ,Valid expressions of the language, Exception Handling (e.g., assert, require, revert, throw)

Unit 4: Events and Logging , Conditional logic o Implementation of loops, Object Oriented Constructs, Contract constructor and selfdestruct, Function Modifiers and Fallback functions , Calling other contracts, Inheritance and Multiple Inheritance, Declaring Abstract Classes and Interfaces o Implementation of Abstract interfaces, Function Overloading

Unit 5: Experimenting with Front-end Libraries o Intro to front-end web interfaces, Decentralized Data Storage,The Ethereum Name Services (ENS)

Unit 6: Unit Testing and Debugging Contracts ,Estimating Gas Costs, Basics of using Truffle for testing, Troubleshooting and Debugging ,Common design patterns, Smart Contract Security – overview of attacks on Ethereum smart contracts

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Conter		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 4 BCA BL3 Solidity Programming (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	Lecture Video Recordings = 6 Hours	Open Source Videos = 4 hours	PPT	E-book/ PDF	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + Self Study	
Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hours	
Module I								
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Solidity Programming	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
Smart Contracts	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Event Logging	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
Front End library	1 Live Session	1 recorded video		1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Unit test and debugging	1 Live Session	1 recorded video		1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	6 Hours	6 Hours (or more)	4 Hours (or more)	10 Hours		12 hours	22 Hours	

Reference Books

- Tiana Laurence, Blockchain for Dummies, 2nd Edition 2019, John Wiley & Sons.
- Anshul Kaushik, Block Chain & Crypto Currencies, Khanna Publishing House.

Course Code BCA BL _4: SMART CONTRACT DEVELOPMENT

Credit 2, hours 60

Learning objectives

- Prove your Ethereum and Smart Contract Development skills & understanding.
- Grasp the in-depth understanding of Ethereum & how it is implemented.
- Implement your skills in creating Smart Contracts over Solidity.
- Build your own Blockchain enterprises with acquired knowledge.

Unit 1- Smart Contract Basics: Why Smart Contracts?, Smart Contracts Defined, Smart Contracts Defined, Processing Smart Contracts, Deploying Smart Contracts

Unit 2- Solidity: Structure, Basic Data Types & Statements (Bidder Data & Functions Demos), Specific Data Types, Specific Data Types, Data Structures, Data Structures, Access Modifiers & Applications

Unit 3- Understanding Aim,Writing Smart Contract for Depositing and withdrawing Money (Back-End), Deploying it on Remix with Metamask, Front End Development, Interacting Smart Contract with Front End

Unit 4- Decentralized Image Sharing, Understanding Crucial Files Required to Run a Project, Writing Smart Contract: Backend for Project, Front-End Development for Project, Adding

Functionalities to a Web Page, Project Execution

Unit 5- Create your own token- Understanding Objective and Writing Basic Smart Contract for creating a Token, Adding More Functionalities to our Smart Contract, Storing Token in a Wallet and Listing it on Sushiswap

Unit 6- practical

Smart Contracts in Real Estate, Understanding Aim of the Project, Writing and Deploying Smart Contract, Front-End Development, Front End Styling and Testing the application

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 4 **BCA AI1 Deep Learning (2 Credits)** **Duration - 6 Weeks**	6 Live Sessions (1 session/week)	**Lecture Video Recordings = 6 Hours**	**Open Source Videos = 4 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 60 Hours	**6 Hours**	**10 Hours**		**10 Hours**		**12 hours (2 hours/week)**	**22 Hours**	
Module I								
Fundamentals of Deep Learning	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Gradient descent	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
CNN and RNN	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Generative Deep Learning	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
Boltzman Learning	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Assignments	1 Live Session					2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	**6 Hours**	**6 Hours (or more)**	**4 Hours (or more)**	**10 Hours**		**12 hours**	**22 Hours**	

SEMESTER 5

Course Code BCA BL _5: BLOCKCHAIN ARCHITECTURE

Credit 2, hours 60

Learning objectives

- Identifying the decisions and participants in a successful blockchain implementation

• Learn about various blockchain platforms – Open Source and Commercial

• Understand the hosting and mining options

• Awareness of associated technologies

• Understand the primary programming languages

• Determining the decisions surrounding the security of blockchains

• Learn about blockchain architecture for building a private or hybrid blockchain

Unit I: Introduction to Blockchain

Digital Money to Distributed Ledgers, Design Primitives: Protocols, Security, Consensus, Permissions, Privacy. Blockchain Architecture and Design: Basic crypto primitives: Hash, Signature,) Hashchain to Blockchain, Basic consensus mechanisms

Unit 2

Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Blockchain consensus protocols Permissioned Blockchains: Design goals, Consensus protocols for Permissioned Blockchains

Unit 3

Hyperledger Fabric (A): Decomposing the consensus process, Hyperledger fabric components, Chaincode Design and Implementation Hyper ledger Fabric (B): Beyond Chaincode: fabric SDK and Front End (b) Hyperledger composer tool

Unit 4

Use case 1: Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv) Insurance

Use case 2: Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc

Unit 5

Use case 3: Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain

Unit 6- project / assignments

Text books:

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos

2. Blockchain by Melanie Swa, O'Reilly

3. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric

4. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits -

https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

Course Code BCA BL _6: BLOCKCHAIN PLATFORMS AND ETHEREUM

Credit 2, hours 60

Learning Outcomes

- Learn Basic Cryptographic primitives used in Blockchain – Secure, Collison-resistant hash functions, digital signature, public key cryptosystems, zero-knowledge proof systems
- Explore Basic Blockchain (Blockchain 1.0) – concepts germane to Bitcoin and contemporary proof-of-work based consensus mechanisms, operations of Bitcoin blockchain, crypto-currency as application of blockchain technology
- Familiarise in Blockchain 2.0 – Blockchains with smart contracts and Turing complete blockchain scripting – issues of correctness and verifiability, Ethereum platform and its smart contract mechanism
- Learn Blockchain 3.0 – Plug-and-play mechanisms for consensus and smart contract evaluation engines, Hyperledger fabric platform

UNIT I: Basic Crypto primitives

Hash functions, Puzzle friendly Hash, Collison resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems

UNIT II: Introduction, Blockchain Technology, Hash Functions, Ethereum Overview, Ethereum Wallet, Using Ethereum

UNIT III: Ethereum API, Introduction, Solidity Compiler, Using Solidity Compiler, Ethereum Client, Geth Client, Using Geth, Promises in JavaScript, Web3 API, Deploying a Smart Contract, Generating New Blocks, Ethereum Mining, Interacting with a Smart Contract, Block Limitations

UNIT IV: Web Applications with Ethereum- Deploying Crowdfunding Contract, React Overview, Creating a Web Application, Interacting with Ethereum, Display Contract Data, Sending a Transaction, Getting Contract Addresses

UNIT V: Privacy, Security issues in Blockchain

Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks - -advent of algorand, and Sharding based consensus algorithms to prevent these

Unit VI- practical assignments

Reference books

1. Ethereum: Blockchains, Digital Assets, Smart Contracts, Decentralized Autonomous Organizations Paperback – by Henning Diedrich
2. Mastering Ethereum: Building Smart Contracts and DApps by Andreas M. Antonopoulos (Author), Gavin Wood Ph. D. (Author)

SEMESTER 6

Course Code BCA BL _7: BLOCKCHAIN ECONOMICS
Credit 2, Hours 60

Learning Outcomes

- Understand the variations and differences of existing major blockchain platforms.
- Understand the limitations and outstanding issues of existing blockchain technology.
- Learn how many large corporations are already implementing blockchain technology.
- Learn how to think of innovative application models, leveraging the blockchain
- Technology.

Unit I: Introduction to Blockchain Economics
Introduction, Economic Theory for Blockchain, Game Theory & Blockchain, Type of Goods

Unit II: The Crypto Economy
Introduction, what is the Crypto Economy? Blockchain Business Models: The Internal Economics of Blockchain Networks, Mixed Blockchain Business Models

Unit III: Ledgers
Static Ledger Choice: Competition between distributed ledgers, A realistic "hard fork", competition between traditional ledgers, Dynamic Ledger Choice: Permissionless and Permissioned Blockchain, Monopolistic Ledger Security

Unit IV
Cost of Networking, equilibrium characterizations and allegedly irreducible tensions among consensus formation

Unit V
decentralization, and scalability, major issues including network security, overconcentration, energy consumption and sustainability, adoption, multi-party computation and encryption, smart contracting, and information distribution and aggregation

Unit VI: Project

Reference books

1. Understanding the Blockchain Economy: An Introduction to Institutional Cryptoeconomics-Book by Chris Berg, Jason Potts, and Sinclair Davidson
2. Blockchain Economics: Implications Of Distributed Ledgers - Markets, Communications Networks, And Algorithmic Reality
3. Cryptoeconomics: Igniting a New Era of Blockchain Book by Jian Gong and Wei Xu

Course Code BCA EL 10 - SOFTWARE PROJECT MANAGEMENT

Credit 2, hours 60

Learning objectives

- Identify the different project contexts and suggest an appropriate management strategy.
- Practice the role of professional ethics unsuccessful software development.
- Identify and describe the key phases of project management.
- Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

Module 1: The management spectrum of the Project. The W5HH principle, Critical Practices Metrics, Process and Project: Metrics in the process and project Domains, software measurements, metrics for software quality, integrating metrics within software process, establishing a software metrics program.
Module 2 Observations, Project Planning Process, Software Scope and Feasibility, Resources, Software Project Estimation, Decomposition techniques, empirical estimation models, estimation for object oriented projects, estimation for Agile Development and Web Engineering Projects, The make/buy Decision.
Module 3 Reactive V/S Proactive Risk Strategies, Software Risks, Risk identification, Risk projection, Risk refinement, Risk mitigation, monitoring and management, The RMMM plan.
Module 4- Quality Concepts, Software Quality Assurances, Software Review, Formal Technical Reviews,Formal Approaches to SQA, Statistical Software Quality Assurances, Change Management: Software Configuration Management
Module 5- The SCM Repository, SCM Process, Configuration Management for Web Engineering.
Module 6 PROJECT EXECUTION AND CONTROL: The Review Process, Planning, Overview and Preparation for execution. One- Person Review, Guidelines for Review in Projects, Data Collection Analysis and Control Guidelines. Project Tracking, Activity Tracking, Defect Tracking, Issues Tracking, Status Reports.

Reference Books:

1. R.S. Pressman, Software Engineering, TMH, 7th Edition.
2. PankajJalote, Software Project Management in Practice, Addison-Wesley.
3. B.Hughes& M. Cotterell, Software Project Management, TMH

7. BCA Artificial Intelligence

SEMESTER 1

Course Code BCA EL_1: MULTIMEDIA SYSTEM

Credit 2, 60 hours

Learning Objectives:

- be able to critically analyse and synthesise the key components of multimedia technologies including text, graphics, voice, video and animation;
- be able to evaluate the role of multimedia technologies in the online and web environment;
- be able to define the characteristics of each media type and describe their application;
- be able to develop, edit and improve interactive web pages that incorporate a variety of digital media such as graphics, voice, animation and video;
- be able to critically evaluate the implications of copyright in the use of multimedia;
- be able to research and analyse the protocols, standards and representation techniques used for storage and transmission of multimedia information.

Unit 1: Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products and Stages of Multimedia Projects, Multimedia hardware

Unit 2- Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools., Multimedia Building Blocks Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit 3: Data Compression Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling.

Unit 4: Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression. Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit 5: Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file format animations Images standards, JPEG Compression, Zig-Zag Coding, Multimedia Database.

Unit 6: Content based retrieval for text and images, Video: Video representation, Colours, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, Recent development in Multimedia

Reference Books:

1. Tay Vaughan "Multimedia, Making IT Work" Osborne TMH.

2. Buford "Multimedia Systems" Addison Wesley.

3. Aagrawal & Tiwari "Multimedia Systems" Excel.

4. Sleinreitz "Multimedia System" Addison Wesley.

SEMESTER 2

Course Code BCA DS_1: MATHEMATICAL COMPUTATION OF DATA

Credit 2, 60 hours

Learning objectives:

- Demonstrate understanding of basic mathematical concepts in data science, relating to linear algebra, probability, and calculus
- Use appropriate technology to aid problem-solving and data analysis.

Unit 1: Probability, Convergence and Sampling

Probability: Sample Spaces, Conditional Probability and Independence, Density Functions, Expected Values, Variance, Joint – Marginal and Conditional Distributions, Bayes Rule and Bayesian Inference. Convergence and Sampling: Sampling and Estimation, Probably Approximately Correct (PAC), Concentration of measure with Union bound and examples, Sampling without replacement with Priority sampling

Unit 2: Distances and Nearest Neighbours, Gradient Descent

Metrics, Lp Distances and their Relatives, Distances for Sets and Strings, Modelling text with distances – k grams, Similarities, Locality Sensitive Hashing; Gradient Descent: Functions, Gradients, Fitting a model to data: Least Mean Squares Updates for Regression, Decomposable Functions

Unit 3: Linear Algebra

Vectors and Matrices, Matrix Algebra, Vector Spaces, Norms, Linear Independence, Rank, Inverse regression, Multiple Explanatory Variables, Polynomial Regression, Cross Validation, Regularized Regression

Unit 4: Principal Component Analysis and Clustering

Data Matrix, Singular Value Decomposition, Eigen Values and Eigen Vectors, Power methods, Multidimensional Scaling; Voronoi Diagrams, Gonzalez Algorithm for k-Centre Clustering, Lloyd's Algorithm for k-Means Clustering, Mixture of Gaussians, Hierarchical Clustering, Mean Shift Clustering

Unit 5: Classification and Graphs

Linear Classifiers: Loss Functions - Cross Validation - Regularization; Perceptron Algorithm, Kernels, KNN Classifiers, Neural Networks; Markov Chains, Page Rank, Spectral Clustering on Graphs, Laplacian and Eigen Structure, Communities in Graph: Preferential Attachment - Betweenness – Modularity

Unit 6: Assignments/practical exercises

Reference books

1. Practical Statistics for Data Scientists: 50 Essential Concepts by Peter Bruce and Andrew Bruce
2. Introduction to Linear Alegbra by Gilbert Strang
3. Elements of Statistical Learning

SEMESTER 3

Course Code BCA EL 3 - DISCRETE MATHEMATICS

Credit 2, hours 60

Learning Objectives

- Analyze logical propositions via truth tables.
- Understand sets and perform operations and algebra on sets.
- Determine properties of relations, identify equivalence and partial order relations, sketch relations.
- Identify functions and determine their properties., Define graphs, digraphs and trees, and identify their main properties.
- Evaluate combinations and permutations on sets.

Unit 1: Propositional Logic – Propositional equivalences-Predicates and quantifiers-Nested Quantifiers
Unit 2: Rules of inference-introduction to Proofs-Proof Methods and strategy
Unit 3: Mathematical inductions-Strong induction and well ordering- The basics of counting-The pigeonhole principle
Unit 4: Permutations and combinations-Recurrence relations-Solving Linear recurrence relations-generating functions-inclusion and exclusion and applications.
Unit 5: Algebraic systems-Semi groups and monoids-Groups-Subgroups and homomorphisms-Cosets and Lagrange's theorem- Ring & Fields (Definitions and examples
Unit 6: Partial ordering-Posets-Lattices as Posets- Properties of lattices-Lattices as Algebraic systems –Sub lattices –direct product and Homomorphism-Some Special lattices-Boolean Algebra

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 3 BCA EL3 - Discrete Mathematics (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	Lecture Video Recordings = 6 Hours	Open Source Videos = 4 hours	PPT	E-book/ PDF	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + Self Study	
Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hours	
Module I								
Propositional Logic	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Rules of Inference	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
Mathematical Induction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Permutations and Combinations	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
Algebraic Systems	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Partial Ordering	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	6 Hours	6 Hours (or more)	4 Hours (or more)	10 Hours		12 hours	22 Hours	

Reference Books:

1. Applied Discrete Structures, Levasseur K. and Doerr A. Lulu.com 2017 978-1105559297
2. Discrete Mathematics for Computing, Haggarty R. Pearson 2002 978-0201730470

BCA EL 4 - ARTIFICIAL INTELLIGENCE

Credit 2, hours 60

Learning objectives

- Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool**.**

Unit 1: What is intelligence? Foundations of artificial intelligence (AI). History of AI; Problem Solving- Formulating problems, problem types, states and operators, state space, search strategies.

Unit 2: INFORMED SEARCH STRATEGIES - Best first search, A* algorithm, heuristic functions, Iterative deepening A*(IDA), small memory A*(SMA), Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning

Unit 3: Representation, Inference, Propositional Logic, predicate logic (first order logic), logical reasoning, forward chaining, backward chaining; AI languages and tools - Lisp, Prolog, CLIPS.

Unit 4: Planning- Basic representation of plans, partial order planning, planning in the blocks world, hierarchical planning, conditional planning, representation of resource constraints, measures, temporal constraints

Unit 5: Basic probability, Bayes rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic, Decision making- Utility theory, utility functions, Decision- theoretic expert systems. Decision trees, rule-based learning, current-best-hypothesis search, least-commitment search

Unit 6: Neural networks, reinforcement learning, genetic algorithms. Communication - Communication among agents, Natural language processing, formal grammar, parsing, grammar

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 3 BCA EL4 - Artificial Intelligence (2 Credits) Duration - 6 Weeks	6 Live Sessions (1 session/week)	Lecture Video Recordings = 6 Hours	Open Source Videos = 4 hours	PPT	E-book/ PDF	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + Self Study	
Total = 60 Hours	6 Hours	10 Hours		10 Hours		12 hours (2 hours/week)	22 Hours	
Module I								
Introduction	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Informed Search	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
Knowledge Representation	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Planning	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
Probability	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Neural Networks	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	6 Hours	6 Hours (or more)	4 Hours (or more)	10 Hours		12 hours	22 Hours	

Reference Books:

1. Stuart Russell and Peter Norvig. Artificial Intelligence – A Modern Approach, Pearson Education Press, 2001.
2. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, 2008.
3. George F. Luger, Artificial Intelligence, Pearson Education, 2001.
4. Mils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002.

SEMESTER 4

Course Code BCA EL 5 MACHINE LEARNING

Credit 2, hours 60

Learning Objectives

- Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
- Have an understanding of the strengths and weaknesses of many popular machine learning approaches.
- Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
- Be able to design and implement various machine learning algorithms in a range of real-world applications.

Unit 1: Introduction to Machine learning – Statistical Learning – types of Machine Learning – learning models: geometric, probabilistic and logistic models
Unit 2: Introduction to supervised, unsupervised and reinforcement learning – model evaluation – model implementation – model accuracy indicators.
Unit 3: Introduction to parametric machine learning method, assumptions of parametric machine learning methods, linear model and its assumptions, simple linear regression, scatter diagram
Unit 4: Simple linear Regression parameter estimation, properties of regression parameters, Analysis of variance and partial t test, estimation of σ^2, Interval Estimation of the Mean Response, R Square, Adjusted R Square, Normality of response variable, prediction of new observations, Confidence interval for β_0, β_1 and σ^2.
Unit 5: Multiple linear regression model, Least - Squares Estimation of the Regression Coefficients, Geometrical Interpretation of Least Squares, Properties of the Least Squares Estimators, Estimation of σ2, Inadequacy of Scatter Diagrams in Multiple Regression, Maximum Likelihood Estimation. Assumptions of Multiple linear regression variables, general equation of multiple linear regression
Unit 6: Introduction to multicollinearity, homoscedasticity, autocorrelation, effects of multicollinearity, homoscedasticity and auto autocorrelation in parameter estimation, techniques to handle multicollinearity, homoscedasticity and auto autocorrelation for better model.

Reference Book:

1. Introduction to Linear Regression Analysis, Fifth Edition DOUGLAS C. MONTGOMERY, ELIZABETH A. PECK, G. GEOFFREY VINING, A JOHN WILEY & SONS, INC., PUBLICATION

Course Code BCA AI 1 - DEEP LEARNING

Credit 2, hours 60

Learning objectives

- Understand the fundamentals of Deep Learning
- Familiarize with Neural Networks aspects
- Recognize the tangible applications of ML and Neural Networks.

Unit 1: The Fundamentals of Deep Learning

Differentiate Deep Learning from machine learning, Evolution of AI, and ML: Historical Epochs, Deep Learning relevance. The matrix magic: Scalars->Vectors->Matrices->Tensors. Real-world data representation. Tensor operations and visualization, Visualizing Deep Learning, Elephant in the room.

Unit 2: Gradient Descent

Gradient Descent: Derivatives and tensors, Stochastic gradient descents, Backpropagation: our very own chain rule of differentiation! Layers: the atoms of DL, Models: the molecules of DL, Loss functions, Optimizers, Activation Functions, Application and types, Deep Learning in Action, Multiclass Classification and Regression. Overfitting and underfitting.

Unit 3: Convolutional Neural Networks and Recurrent Neural Networks

Introduction to Neural Networks, Convolution operation, Max pooling, Power of CNNs: abstraction across layers, reusing popular CNNS & fine-tuning. Recurrent Networks, LSTMs & GRU, Examples of simple RNNs, Complex recurrent neural networks: Overfitting in RNNs, Multi-layer RNNs, Multi-directional RNNs. Real-life examples: One-dimensional sequence processing, CNN+RNN.

Unit 4: Generative Deep Learning

Using LSTMs to synthesize text, Neural Style transfer and applications, Image synthesis with auto encoders, Generative Adversarial Networks, Generator, Discriminator, Generator vs Discriminator, Training GANs. MIMO Deep Learning models, Layers graphs: acyclic and directional, Bag of tricks: ensemble of models.

Unit 5: Tangential Topics of ML and Neural Networks

Information-Theoretic Machine Learning, Hebbian Learning, Competitive Learning, Boltzmann Learning, Radial Basis Function Networks.

Unit 6: assignments

Content Matrix

Semester	Live Sessions	Quadrant - I e-Tutorial		Quadrant - II e-Content		Quadrant - III Discussion Forum	Quadrant - IV Assessment	
Semester 4 **BCA AI1 Deep Learning (2 Credits)** **Duration - 6 Weeks**	6 Live Sessions (1 session/week)	**Lecture Video Recordings = 6 Hours**	**Open Source Videos = 4 hours**	**PPT**	**E-book/ PDF**	Forum Topics - For raising of doubts and clarifying the same on real time basis by the Course Coordinator or his team	Multiple Choice Questions, Fill in the blanks, Short Answer Questions, Long Answer Questions + **Self Study**	
Total = 60 Hours	**6 Hours**	**10 Hours**		**10 Hours**		**12 hours (2 hours/week)**	**22 Hours**	
Module I								
Fundamentals of Deep Learning	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module II								
Gradient descent	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module III								
CNN and RNN	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	1 Overall Assignment
Module IV								
Generative Deep Learning	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module V								
Boltzman Learning	1 Live Session	1 recorded video	1 open source video	1 PPT	1 E-book/PDF	2 hours Discussion Forum	1 Assessment (Practice Questions)	
Module VI								
Assignments	1 Live Session					2 hours Discussion Forum	1 Assessment (Practice Questions)	
Total = 60 Hours	**6 Hours**	**6 Hours (or more)**	**4 Hours (or more)**	**10 Hours**		**12 hours**	**22 Hours**	

Reference Books

1. Grokking Artificial Intelligence Algorithms by Rishal Hurbans published by Manning Publications
2. Deep Learning From Scratch: Building with Python from First Principles by Seth Weidman published by O`Reilley

SEMESTER 5

Course Code BCA AI 2 – REINFORCEMENT LEARNING

Credits 2, 60 Hours

Learning Objectives:

- Provide an over view of what constitute the main component of a Reinforcement Learning method.
- Explain about the modern solution frameworks used in contemporary Reinforcement Learning.
- Describe problem representation that contains variables and solving relational and first order logical Markov decision process.

Unit 1: Introduction to Reinforcement Learning: Introduction- Reinforcement Learning - Examples of Reinforcement Learning: Tic-Tac-Toe -Elements of Reinforcement Learning- - History of Reinforcement Learning-N-armed Bandit Problem-The agent Environment Interface-Goal and Rewards-The Markov Property. Markov Decision Process.

Unit 2: Dynamic Programing Model Based Solution Technique-Reinforcement Learning Model

Free Solution Technique.

Unit 3: Efficient Solution Framework **-** Introduction- The Batch Reinforcement Learning Problem- Foundations of Batch Reinforcement Learning Algorithms- Batch Reinforcement Learning for Learning in Multi-agent Systems- Deep Fitted Q Iteration. Constructive-Representational Directions Reinforcement learning in continuous state and action space

Unit 4: Function Approximation- Approximate Reinforcement Learning.- Solving Relational and first-order logical Markov decision: Approaches to hierarchical reinforcement learning.

Unit 5: Probabilistic Model For Self and Other: Bayesian Reinforcement Learning: Model free Bayesian Reinforcement Learning - Model based Bayesian Reinforcement Learning- Partially observable Markov decision process: Decision making in partially observable environments-model based techniques-Predictively defined representation of state

Unit 6: PSRs- Learning a PSR model- Game theory and multi agent Reinforcement Learning – Reinforcement Learning in Repeated games- Sequential games.

Reference Books:

1. Reinforcement Learning: An Introduction, Second Edition by Richard S. Sutton and Andrew G. Barto
2. Algorithms for Reinforcement Learning Csaba Szepesvári Morgan & Claypool, 2010 of the Art by Marco Wiering, Martijn van OtteReinforcement Learningo

Course Code BCA AI 3 - NATURAL LANGUAGE PROCESSING

Credits 2, 60 Hours

Learning Objectives:

- Understand the pre-processing of text for natural language processing.
- Understand the importance of considering syntactic parsing.
- Understand the mechanism of natural language generation in processing of natural language.
- Understand the different statistical techniques used in natural language processing

Unit 1: Introduction to Natural Language Processing: Introduction to text pre-processing, terminologies related with text processing, challenges of text pre-processing, tokenization, sentence segmentation

Unit 2: Introduction to lexical analysis, finite state morphonology, finite state morphology, morphology vs lexical analysis, paradigm based lexical analysis.

Unit 3: Syntactic Parsing and Semantic Analysis: Introduction to syntactic parsing, The Cocke–Kasami–Younger Algorithm, parsing as deduction, Implementing Deductive Parsing, LR Parsing, Constraint-based Grammars, Issues in Parsing

Unit 4: Basic Concepts and Issues in Natural Language Semantics, Theories and Approaches to Semantic Representation, Relational Issues in Lexical Semantics, Fine-Grained Lexical-Semantic Analysis.
Unit 5: Context- Natural Language Generation: Introduction to natural language generation, simple Examples of Generated Texts, The Components of a Generator: Components and level of representation

Unit 6: Approaches to Text Planning: The Linguistic Component: Surface Realization Components, Relationship to Linguistic Theory, Chunk Size, Assembling vs. Navigating, Systemic Grammars, Functional Unification Grammars

Text Books:

1. Hand Book of Natural Language Processing, Second Edition – NITIN INDURKHYA FRED J. DAMERAU, CRC Press.
2. Natural Language Processing with Python – Steven Bird, Ewan Klein, Edward Loper

SEMESTER 6

Course Code BCA AI 4 – CHAT BOT DEVELOPMENT

Credits 2, Hours 60

Learning Objectives

- Gain knowledge about usage of advanced NLP techniques.
- Understand word embedding and filtering of texts.
- Understand seq-2-seq architecture and its training.
- Understand language modelling.
- Understand the working and implementation of chat bot.

Unit 1: Deep NLP Intuition: Overview of NLP with Deep learning intuition, Types of NLP, Classical vs Deep learning models, Building End-to-End Deep learning models, Bag of words, Seq-2-Seq Architecture & training, beam search decoding, Attention Mechanisms.
Unit 2: Language Modeling: Bigrams and language models, Neural bigram model, Improving the efficiency, word embedding, CBOW, Hierarchical softmax, word2Vec using tensorflow and Theano.

Unit 3: Data Preprocessing: POS tagging, RNN using Theano and Tensorflow, Hidden

markov model(HMM), Named entity recognition(NER), word embedding, word analogies, TF-IDF and t-SNE concepts, comparing POS and NER, NER with Theano and TensorFlow.

Unit 5: Building Chatbot: Building the seq-2-seq model, training the model, understand the skip-gram method in word2vec, Understand and implement GloVe using gradient descent and alternating least squares, Using RNN for names entity recognition

Unit 6: Implementing recursive neural networks for the sentiment analysis.

Reference Books:

1. Deep learning with application by Navin Kumar Manaswi
2. Deep Learning for NLP by Palash Goyal and Sumit Pandey.

Course Code BCA EL 10 - SOFTWARE PROJECT MANAGEMENT

Credit 2, hours 60

Learning objectives

- Identify the different project contexts and suggest an appropriate management strategy.
- Practice the role of professional ethics unsuccessful software development.
- Identify and describe the key phases of project management.
- Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

Module 1: The management spectrum of the Project. The W5HH principle, Critical Practices Metrics, Process and Project: Metrics in the process and project Domains, software measurements, metrics for software quality, integrating metrics within software process, establishing a software metrics program.
Module 2 Observations, Project Planning Process, Software Scope and Feasibility, Resources, Software Project Estimation, Decomposition techniques, empirical estimation models, estimation for object oriented projects, estimation for Agile Development and Web Engineering Projects, The make/buy Decision.
Module 3 Reactive V/S Proactive Risk Strategies, Software Risks, Risk identification, Risk projection, Risk refinement, Risk mitigation, monitoring and management, The RMMM plan.
Module 4- Quality Concepts, Software Quality Assurances, Software Review, Formal Technical Reviews,Formal Approaches to SQA, Statistical Software Quality Assurances, Change Management: Software Configuration Management
Module 5- The SCM Repository, SCM Process, Configuration Management for Web Engineering.
Module 6 PROJECT EXECUTION AND CONTROL: The Review Process, Planning, Overview and Preparation for execution. One- Person Review, Guidelines for Review in Projects, Data Collection Analysis and Control Guidelines. Project Tracking, Activity Tracking, Defect Tracking, Issues Tracking, Status Reports.

Reference Books:

1. R.S. Pressman, Software Engineering, TMH, 7th Edition.
2. PankajJalote, Software Project Management in Practice, Addison-Wesley.
3. B.Hughes& M. Cotterell, Software Project Management, TMH.

Annexure II- Mandatory Documents for Admission

To be uploaded on the Online Admission Portal by the Prospective students

Admission Documents	Format (Jpeg/PNG/PDF)	Documents Size
Duly filled online application form with student signature	Digital signature/Student signature JPEG/PNG	20 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
If foreign student: colour scan copy of passport	PDF/JPEG	500 KB
Fees submission transaction details or receipt as per University policy for respective online programs	PDF/JPEG	500 KB
Digitally Signed undertaking as per the process	PDF	500 KB

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

Annexure III- Content uploading protocol: Internal Process

1. All academic content [pdfs, ppt and video] is to be mapped for each module of a subject and stored in a separate sub- folder and ultimately compiled under a Course Folder named after the Course Code. Along with this please provide a combined pdf for all modules of the study material

of each subject for plagiarism check by VGU. For website links for open content, please share the links in a doc file.

Example: For MBM 101, there should be a folder named MBM 101. There are 14 modules, so there should be 14 sub-folders each folder containing pdfs (e-books, practical assignments, plagiarism reports etc), 1 ppt and 1 recorded lecture video. And 1 compiled study material pdf for MBM 101.

2. A Google drive link is to be created and provided for content sharing by the Program Coordinator. These folders are to be uploaded on drive and the drive link is to be shared with the following members for reviewing:

   Deputy Director [dydirector@onlinevgu.com]
   Program Coordinator [pcmgmt@onlinvgu.com]

3. Suggestions and reviews will be shared by the Program Coordinator.
4. The revised contents are to be shared similarly following Step 1 and Step 2 by renaming the files as MBM101_corrected etc.
5. Final approval shall be communicated by the Deputy Director to upload the contents on LMS to the Technical Manager.
6. Once uploaded on LMS, Program Coordinator will ensure they are uploaded under the correct subject name and program.
7. Students are to be notified for availability of approved content on LMS

Annexure IV – Branding Guidelines for E-Learning Material

Refer to the Branding Guidelines pdf

Annexure V- Academic Bank of Credit Id Creation Process

All students must be registered with ABC (Academic Bank of Credits) a central scheme for depositing credit formulated by the Ministry of Education, Govt. of India. ABC Id creation is mandatory for all the enrolled students especially students of Indian nationality.

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 shall also extend support to the students to create ABC Id. The same documents shall be required by the University as stated above.

Annexure VI - Guidelines and Pre-requisites for Proctored Examination

The minimum hardware, software and connectivity requirements for taking Exams through Online Proctored Examination Platform is provided below. Students should review the following requirements for your camera, operating system, upload/download speeds, RAM, ports, microphones and browsers. Also included is a list of technology not currently supported.

TYPE	MINIMUM	RECOMMENDED
Internet Connection	Wifi Connection	Wired Connection

PC Users	Windows 8 (Windows 10 S mode is not supported)	Windows 10 (10 S mode is not supported)
Mac Users	MacOS 10.13 (Oldest Still Maintained Version)	MacOS 10.15
CPU	more than 2 core CPU less than 85% CPU Usage	more than 4 core CPU less than 50% CPU Usage
Webcam	640x480 resolution	1280x720 resolution
Internet Download Speed	1 Mbps	12 Mbps
Internet Upload Speed	1 Mbps	3 Mbps
RAM	4 GB less than 90% Ram Usage	16 GB less than 70% Usage
Connectivity Ports	1935, 843, 80, 443, 61613, UDP/TCP	1935, 843, 80, 443, 61613, UDP/TCP
Screen Resolution	1366 x 768	1920 x 1080 and above
Chromebook Users (Only for Automated Proctoring. Is not Supported for Live Proctoring)	Chrome device is running the latest version of Chrome OS.	Chrome device is running the latest version of Chrome OS.

1.1 Additional Requirements:

- A functioning microphone (some web cameras have them built-in); microphone should not be part of headphones
- Headphones are generally not permitted, check with your testing organization to determine if headphones are permitted
- A compatible browser: Google Chrome (preferred) or Mozilla Firefox
- Webcam and microphone (built-in or external) – test your webcam at https://webcamtests.com/
- Connection to network with sufficient internet speed: at least 1 Mbps download speed and 1 Mbps upload – test internet speed at www.speedtest.net

1.2 Not Supported:

- Microsoft Edge browser
- Google Chromebooks (for Live Proctoring only)

- Tablets (Nexus, iPad, Tab, Note, etc.)
- Smartphones
- Linux operating systems
- Windows 10 in S mode or Surface RT
- Connecting from within a virtual machine. You will be asked to reconnect using your host operating system to take your exam
- Apple Boot Camp
- Remote Access Software
- Inactive Version of Windows and Test Builds/Test Mode

1.3 Pop-up blocker

Pop-up blockers must be either off or disabled. Disable your pop-up blocker like this:

- Open Chrome on your computer.
- Click on the icon with three vertical dots.
- Click More, then Settings on the top right.
- Go to Privacy and security and click Site settings.
- Click Pop-ups and re-directs.
- Turn the setting to Allowed at the top.

Important : The Institute regularly takes actions to optimize its examination system and hence please note that the above mentioned Hardware, software, equipment and connectivity requirements might change at institute's discretion. All students will need to 100% comply with any such changed specifications announced by the Institute.

General Instructions

The timing for the Proctored Online Examinations will strictly be as per the time table schedule (Indian standard Time) communicated. This is also applicable to the candidates appearing for the examination from OUTSIDE India.

• Exams can be taken on devices such as Laptop/ Desktop. Charge the Laptop /Tablet well in advance to last for at least 2 hours.

• The device should have continuous internet connectivity. Do not share the phone's hotspot with any other device while writing the examination.

• For the smooth attempt of the online examination, students are advised to:

a) Sit in a closed room having enough light for the Camera to detect himself/herself. Make sure that you sit, facing the light during the examination. Do not sit against or near the window.

b) Please make sure that there is no noise around you during the examination, otherwise it may be detected and captured as deviation.

c) Position the device in such a way that the front camera captures your face properly and you can sit for one hour to take up the examination conveniently without moving the device.

d) If your device is using a Wi-Fi router, make sure to sit near the Wi-Fi Router/Modem to avoid any signal related issues.

• The student should compulsorily login into the portal 30 minutes before the commencement of the examination.

• The following activities are not permitted during the conduct of the online examination:

a) Presence of any other person in the room where the student is taking the examination.

b) Movement from one place to another during the examination.

• You are Not Allowed to refer to any textbook(s) or any other material during the notified examination time.

• You are permitted to use Rough paper and pen /pencil for solving only analytical questions appearing in the question paper and also you can make use of permitted scientific calculators. Before using rough papers and calculator kindly show it in your PC/Mobile camera and then start using it.

• Once a user logs into the system with Username and Password and Please allow camera, location access, and audio device access when prompted. If you do not give access to any of these, you will not be able to appear for the examination or the remote proctor can disable your examination in due course of time.

• In case of disconnection of network/power failure during the examination, First wait for internet connectivity (do it as fast and resume test within 2 minutes) and click on “Resume “ button, If not able to reconnect after 2 minutes, call concern administration for providing appropriate solutions to further proceed with test.

• It is advised to use the same Laptop/ Desktop to appear for the mock examination and for the final online examination.

• A helpdesk number will be provided to troubleshoot technical issues during the examination process. The student can reach out to this number in such cases.

2. Examination Rules

• Every student will be required to login through the secure ID and password on the online examination taking platform on the day of the examination (the time schedule, URL, User ID and password will be provided in the LMS portal and will also be sent to the registered e-mail ID / SMS will be sent to the registered mobile phone).

• At the beginning of each session, the student undergoes an identity verification at 2 levels,

- Level 1: Capture of facial photo. During the examination, the AI tool constantly monitors the picture of the student taking the examination with the facial photo captured initially for any mismatch. In case of any mismatch, the system will capture the anomaly and a notification to the student / live proctor is also instantly displayed.
- Level 2: Student must display College ID / Government authorized ID Proof at the beginning of the examination.

• Only 2 attempts will be allowed for every students for every session of the day for a test. After two attempts test student will not be able to take test again for the respective session of the day

• The student should ensure that he/she Clicks on “Finish“ button available on right top position of the screen before logging out of the exam.

• The Online Examination system will issue regular warnings for any deviations of the norms specified, on the screen of your device. The maximum number of warning will be 10 after which the test gets terminated.

• If a student is violating any rules during the examination or trying to adopt any unfair means, the system will automatically collect data based on the following deviations and alert the student and will immediately alert the online live-proctor.

o Focus changed to a different window: student tabs out of the examination taking window.

o Browser not supported: Student is using an older browser version or a non-compatible browser.

o Webcam is disabled: Students webcam is disabled.

o Face is not visible in the camera: Student is not looking into the camera.

o Several faces in front of the camera: There are other people along with the examination taker.

o Face does not match the profile: Student taking the examination is not the same person whose photo was captured before starting the examination and the photo of the student as available in the University database.

o Microphone muted or its volume is low: Student has muted the microphone.

o Conversation or noise in the background: System has captured background noise.

o Screen activities are not shared: student has stopped screen share activity. Sharing of screen is not necessary for the users of smartphones.

o Second display is used: Additional display like extended monitor has been connected.

o Full-screen mode is disabled: student has disabled full screen mode.

3. Examination code of conduct and Malpractices

• Students are not allowed to leave their seat during the examination.

• Students are not allowed to consult other people for any information during the time of the examination.

• The system uses Artificial Intelligence to detect and record face emotions, eyeball movement, and all other activities.

• If a student indulges in suspicious and objectionable activities as detected and recorded by the system, he/she will be booked under malpractice and action will be taken as per the rules and regulations of the University.

• The Online Examination system will issue regular warnings on the screen of your device. The number of warnings issued to each student will be duly recorded in the online examination system and this will affect the overall credibility score of the student, which may lead to cancellation of your examination.

• Taking photos or recording videos and sharing it with others or indulging in suspicious and objectionable activities during the examination will be automatically recorded and will be treated as malpractice.

• Do not use headphones, noise cancellation devices, Bluetooth devices during the examination. If used, it will be considered as malpractice.

• In addition to auto proctoring by the online examination system, Manual Proctors (Invigilators) will continuously watch and monitor the students during the entire duration of the examination

• Students are not allowed to refer to any textbook(s) in the notified examination time and they should appear for the examination without moving out from their seat during the examination.

• Students are not allowed to consult other people for any information during the time of the examination.

• You are NOT allowed to take photos, take screen shots, hear audio, or record videos of the examination and then share it with others during the online examination, a remote proctor would watch such unwanted activities. If found doing such activities, it will be treated as malpractice.

• If a student indulges in suspicious and objectionable activities as detected and recorded by the system, he/she will be booked under malpractice and action will be taken as per the rules and regulations of the Institution

• Do not use headphones, noise cancellation devices, Bluetooth devices during the examination. If used, it will be considered as malpractice.

• Do not try to navigate from the main screen. Doing so will automatically terminate your examination.

• While using laptop or desktop, you are advised not to use the keyboard while you are attempting the examination other than chatting with the proctor; you are only allowed to scroll the cursor with the mouse to answer the question.

• You are not allowed to start the examination from multiple devices at a time. However, you may change the device, if there is a fault during the examination and login again in the new device.

• Do not leave your place for any reason during the examination.

• Do not have any light source behind your face.

• Do not cover your face with Hair, clothing (mask), hands or anything else.

• Do not use headphones, ear-buds, or any other type of listening equipment.

• Do not have any background noise/ voices / music or Television.

• Do not wear sunglasses during the examination.

• Do not entertain any other people in the room near you.

• Do not communicate with any person by any means during the examination.

• Do not have any programs or applications like MS Teams, Zoom, Google Meet etc. that use the webcam, microphone & screen-share during the examination.

• Do NOT take photos, screen shots, hear audio, or record videos of the examination and then share it with others during the online examination, a remote proctor would watch such unwanted activities. If found doing such activities, it will be treated as malpractice.

Annexure VII – Continuous Internal Assessment Pattern for UG Courses

Particular	A1 (Objective Type)	A2 (Subjective Type)	A3 (Discussion Forum)
Weightage %	10%	15%	5%

Question Pattern for the three CIA Components
A-1 1.There will be 10 Objective type Multiple Choice Questions (MCQs), each carrying mark 1 mark 2. The time for the A-1 assignment will be 10 mins 3. All questions are compulsory 4. There will be NO NEGATIVE MARKING for the wrong answers. **A-2** 1. The examination will comprise of 3 Subjective Type Questions each carrying 5 marks 2. The assignment will have to be submitted within a specified deadline 3. The assignment questions will be uploaded on the LMS platform 4. The Subjects or topics covered in the examination will be as per the Syllabus. 5. The questions will be analytical and case study/problem based.

[For assignment submission, student can submit their answers in following mode. 1. Type the answer in the format bar 2. Drag & drop the Answer Word file 3. Upload the Math table and Diagram from upload options. (jpeg and pdf format)] A-3 1. Students have to attend a separate Graded Discussion Forum for each course 2. The students will be graded out of a maximum of 5 marks The Time of the examination begins only when the 'Start Test' button is pressed.

Annexure VIII – End-term Examination Pattern for UG Courses

Vivekananda Global University

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 is divided into 2 sections. Section A comprises of 49 compulsory objective questions of 1 mark each and Section B of 3 essay type subjective questions carrying 7 marks with internal choices.	
SECTION – A (49 X 1 = 49 Marks)	
Answer all the questions. Each question carries one mark.	
Q. No. 1 to Q. No. 49 - Objective questions with four multiple choices.	

SECTION – B (3 X 7 = 21 Marks)
Q. No. 50 to Q. No. 52 - 3 Essay Type Question with internal choices (either (a) or (b) type)

Annexure IX Laboratory Support and Requirements

Sem	Code	Course	Lab Needs
1	BCA 104	Fundamental of C Lab	Students to load IDE on their personal systems and solve the set of exercises provided.
1	BCA 105	PC Software and Automation	Students to utilise MS Office or Open Source Office Suite to learn the exercises provided
2	BCA 204	Object Oriented Programming with C++ Lab	Students to load IDE on their personal systems and solve the set of exercises provided.
2	BCA 205	Data Structures Lab	Students to load IDE on their personal systems and solve the set of exercises provided.
3	BCA 304	Database Management System Lab	Student can use My Sql (preferred open source DBMS) or any other Commercial DBMS tool (MS-Access / ORACLE) at backend and C++ (preferred) VB/JAVA at front end.
3	BCA 305	Internet & Web Programming Lab	Students to use Open Source tools for performing the exercises provided
3	BCA CTIS2	Elective 3: Principles of Virtualisation	Theoretical introduction. But students can practice the concepts using free credits available on AWS/Azure
4	BCA 404	Computer Graphics Lab	Student to use Open Source software like Freeglut to perform the exercises provided
4	BCA 405	Programming in Java Lab	Students to load IDE on their personal systems and solve the set of exercises provided.
5	BCA 502	Software Engineering Lab	Student to use Open Source software or evaluation version of MS Project to perform the exercises provided
5	BCA 504	Python Programming Lab	Students to load IDE like Anaconda on their personal systems and solve the set of exercises provided.
5	BCA CTIS7	Ethical Hacking	Theoretical introduction. But students can practice the concepts using opensource Kali Linux

Annexure X – E-Resource Access

DELNET	User id: rjvgu Password: vguj5113

Annexure XI - Major Project Guidelines (BCA 601)

Major Project BCA 601 (14 Credits)

Name of the Course and Code	**Credits**	**External Assessment (Presentation &Viva)**	**Continuous Internal Assessment**	**Interactive session with Faculty Supervisor**	**Practical/ Lab**
Major Project BCA 601	14	70%	30%	3	2
TOTAL	14	70%	30%	3	2

Detailed Bifurcation of Internal and External Marks

Project Proposal/ Synopsis (30%) • Choice and Relevance of the project topic • Clarity about Objectives, proposed Methodology and Scope		5% 25%
Project Report (50%)		
ANALYSIS	• SRS with proper structure based on S/W Engg concepts	10%
	• ER diagrams/Class diagrams/any related diagrams, data flow /other similar diagrams	10%
DESIGN	• Modularization & User Interface Design	5%
	• Data Integrity & constraints, including Database Design Procedural design	5%
CODING	• Comments and descriptions. Standardization of coding/Detailed specification instead of code	5%
TESTING	• Test case design	5%
	• Test Reports	5%

REPORT ORGANIZATION	• Proper binding or project report, Content page and page numbering, Organization of content, proper printout of text and image	5%
	Viva-Voce (20%) **4 questions** based on the following criteria should be framed: • Identification of the problem. Clarity about objectives, scope and coverage of the study	5%
	• Ability to discuss the report design with reference to Analysis, Design, Coding, Testing etc.	10%
	• Significance of project in terms of solves real life problems related to industry, academic institutions and research laboratories.	5%

Note: Project reports with plagiarism above 15% will not be accepted.

If the student is unsuccessful in the project, she/he should re-do the whole cycle, right from the submission of the project synopsis. Students are advised to select a new topic for the project and should prepare and submit the project synopsis on the LMS as per the project guidelines. There are no separate slots for the submission of the project synopsis / project reports for the failed students. It should be done strictly as per the academic calendar of the next session for the BCA project. Along with the resubmission of the project report the student is required to remit the pro-rata fee (subject to change as per university rule)

- **Guidelines for Submission of BCA Final Year Project**

The objective of the BCA project work is to develop a quality software solution by following the software engineering principles and practices. During the development of the project the students should involve in all the stages of the software development life cycle (SDLC). The main objective of this project course is to provide learners a platform to demonstrate their practical and theoretical skills gained during five semesters of study in BCA Program.

Students are encouraged to spend maximum time of the sixth semester working on a project preferably in a software industry or any research organization. Topics selected should be complex and large enough to justify as a BCA final semester project. The courses studied by the students during the BCA Program provide them the comprehensive background knowledge on diverse subject areas in computer science such as computer programming, data structure, DBMS, Computer Organization, SAD,

Software Engineering, Computer Networks etc., which will be helping students in doing project work.

- **Project summary/abstract**

  All students must submit a summary/abstract separately with the project report. Summary, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up.

  The write up must adhere to the guidelines and should include the following:

  - Name / Title of the Project
  - Statement about the Problem
  - Why is the particular topic chosen?
  - Objective and scope of the Project
  - Methodology (including a summary of the project)
  - Hardware & Software to be used
  - Testing Technologies used
  - What contribution would the project make?

Project summary/abstract uploaded only through online mode on LMS by using respective login credentials.

- The following suggested guidelines must be followed in preparing the Final project Report: Good quality white A4 size paper should be used for typing and duplication. Care should be taken to avoid smudging while duplicating the copies.

  Page Specification :(Written paper and source code)

  - Left margin - 3.0 cms
  - Right margin- 2.0 cms
  - Top margin 2.54 cms
  - Bottom margin 2.54 cms
  - Page numbers - All text pages as well as Program source code listing should be numbered at the bottom center of the pages.

Normal Body Text: Font Size: 12, Times New Roman, Double Spacing, Justified. 6 point above and below para spacing

Paragraph Heading Font Size: 14, Times New Roman, Underlined, Left Aligned. 12 point above & below spacing.

Chapter Heading Font Size: 20, Times New Roman, Centre Aligned, 30 point above and below spacing. Coding Font size : 10, Courier New, Normal

- **Synopsis:** The project synopsis needs to be prepared keeping in mind the following points.

  a) Title of the project

  b) Introduction and Objectives of the Study - Maximum 200 words

  c) Problem Statement

  d) Research Methodology and References

  A project's synopsis should be prepared in consultation with the 'project supervisor' and uploaded only through online mode on the LMS by using respective login credentials.

V. Submission of Project Report to the University: The student will submit his/her project report in the prescribed format on the LMS. The Project Report should include:

1. One copy of the summary/abstract.
2. Project Report.
3. Running code(.exe file)

Note: The Project Report may be about 75 pages (excluding coding).

- **FORMAT OF THE STUDENT PROJECT REPORT ON COMPLETION OF THE PROJECT**

  - Cover Page as per format
  - Acknowledgement
  - Certificate of the project guide/ Certificate of the Company/Organisation

- Synopsis of the Project
- Main Report
  - Objective & Scope of the Project
  - Theoretical Background Definition of Problem
  - System Analysis & Design vis-a-vis User Requirements
  - System Planning (PERT Chart)
- Methodology adopted, System Implementation & Details of Hardware & Software used System Maintenance & Evaluation
  - Cost and benefit Analysis
  - Detailed Life Cycle of the Project
    - ✓ ERD, DFD
    - ✓ Input and Output Screen Design
    - ✓ Process involved
    - ✓ Methodology used testing
    - ✓ Test Report, Printout of the Report & Code Sheet

Note:

- The project must be uploaded online only; no other format of project submission will be accepted by the University.
- For uploading project reports to the student portal, guidelines will be provided by the Course Coordinator on the portal (https://lms.onlinevgu.com/).
- Communication about approval/rejection/acceptance with suggestion will be made available in the login dashboard of the learners.
- Incomplete submission of the Project Report will not be considered for evaluation.
- The learners must ensure that while submitting the final Project Reports through online mode, the proposal Pro-forma is duly approved in original, along with "Synopsis" and Bio-data of the Project Guide and originality certificate is duly signed by both the student and the Project Guide with date to be incorporated (wherever applicable)
- The learners may ensure that while uploading of Project through online mode, scanned pages are clear and not blurred sequence is correct, pages are well lighted

and not dim; orientation of pages is same – should not change between portal and landscape.

- The learners may ensure that the Original Project Report is to be scanned in a single pdf format file.
- Revaluation of Project Report is not allowed.
- Resubmission of Project Report for Class Improvement is not allowed.

- **Formats of various certificates are as:**

(1)

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)

BACHELOR OF COMPUTER APPLICATIONS

PROFORMA FOR PROJECT PROPOSAL

Enrolment .No.....

Name and Address of Student.....

Ph.No. :..... Email ID: .....

Title of the Project:.....

Subject Area Specify.....

Name, Designation and Official Address of the Project Guide.....

……

……..…..

Signature of the student Signature of the Guide Date:

Date:

(For Office use only)

Synopsis

Approved

Not Approved

Comments / Suggestions for reformulation of the project. Date: Signature of the Evaluator

(2)

ACKNOWLEDGEMENTS

In the "Acknowledgements" page, the writer recognizes his indebtedness for guidance and assistance of the thesis adviser and other members of the faculty. Courtesy demands that he also recognize specific contributions by other persons or institutions such as libraries and research foundations. Acknowledgements should be expressed simply, tastefully, and tactfully.

(3)

CERTIFICATE FROM THE GUIDE

CERTIFICATE

This is to certify that this project entitled " _____" submitted in partial fulfilment of the degree of Bachelor of Computer Applications to the "_____" through _____done by Mr./Ms._____, Roll No. _____ is an authentic work carried out by him/her at _____ under my guidance. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Signature of the student **Signature of the Guide**

Name of the Student

Roll No

(4)

(Project Report Cover Page Format)

Title of the Project/report

(Times New Roman, Italic, Font size = 24)

Submitted in partial fulfilment of the requirements for the award of the degree

of

Bachelor of Computer Applications

(Bookman Old Style, 16 point, centre)

Guide

(Guide Name & Signature)

Submitted by:

(Student's name)

Roll No:

(5)

SELF CERTIFICATE BY THE STUDENTS

SELF CERTIFICATE

This is to certify that the dissertation/project report entitled "_____ _____" is done by me is an authentic work carried out for the partial fulfilment of the requirements for the award of the degree of Bachelor of Computer Applications under the guidance of_____. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Signature of the student

Name of the Student

Enrolment No.