Study & Evaluation Scheme

of

Bachelor of Computer Application

[Applicable w.e.f. Academic Session - 2020-21 till revised]

[As per CBCS guidelines given by UGC]

COLLEGE OF COMPUTING SCIENCES & INFORMATION TECHNOLOGY

TEERTHANKER MAHAVEER UNIVERSITY

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

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TEERTHANKER MAHAVEER UNIVERSITY
(Established under Govt. of U.P. Act No. 30, 2008)
Delhi Road, Bagarpur, Moradabad (U.P.)

Study & Evaluation Scheme	
SUMMARY	
Institute Name	*College of Computing Sciences & Information Technology (CCSIT), Delhi Road, Moradabad*
Programme	*BCA*
Duration	*Three Years full time (Six Semesters)*
Medium	*English*
Minimum Required Attendance	*75%*
Credits	
Maximum Credits	*134*
Minimum Credits Required for Degree	*122*

Assessment:					
Evaluation			**Internal**	**External**	**Total**
Theory			40	60	100
Practical/ Dissertations/ Project Reports/ Viva-Voce			50	50	100
Class Test-1	**Class Test-2**	**Class Test-3**	**Assignment(s)**	**Attendance& Participation**	**Total**
Best two out of three					
10	10	10	10	10	40
Duration of Examination			**External**	**Internal**	
			3 Hours	1.5 Hours	

To qualify the course a student is required to secure a minimum of 45% marks in aggregate including the semester end examination and teachers continuous evaluation.(i.e. both internal and external).A candidate who secures less than 45% of marks in a course shall be deemed to have failed in that course. The student should have at least 45% marks in aggregate to clear the semester.

Question Paper Structure	
1	*The question paper shall consist of six questions. Out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question no. 2 to 6 (from Unit-I to V) shall have explanatory answers (approximately 350 to 400 words) along with having an internal choice within each unit.*
2	*Question No. 1 shall contain 8 parts from all units of the syllabus with at least one question from*

	each unit and students shall have to answer any five, each part will carry 2 marks.
3	*The remaining five questions shall have internal choice within each unit; each question will carry 10 marks.*
IMPORTANT NOTES:	
1	*The purpose of examination should be to assess the Course Learning Outcomes (CLO) that will ultimately lead to of attainment of Programme Specific Outcomes (PSOs). A question paper must assess the following aspects of learning: Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy).*
2	*Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.*
3	*There shall be continuous evaluation of the student and there will be a provision of fortnight progress report.*

Program Structure-BCA

A. Introduction:

High-quality technical education is essential for the digital age and using technology is powerful way to enhance changing requirements of the corporate, business enterprises and society. BCA students should be equipped to work across timezones, languages, and cultures. Employability, innovation, theory to practice connectedness is the central focus of BCA curriculum. The curriculum is designed as such that the students can gain an in-depth learning of the academic disciplines and applied functional areas necessary to meet the requirements of business enterprises and the industry.

The institute emphasis on the following courses ***balanced with core and elective courses:*** The curriculum of BCA program emphasizes an intensive, flexible technical education with 64 credits of core courses (all types), 32 credits of electives and 38 credits of field/internship projects. Total 134 credits are allotted for the BCA degree.

The programme structure and credits for BCA are finalized based on the stakeholders' requirements and general structure of the programme. Minimum number of classroom contact teaching credits for the BCA program will be 96 credits (one credit equals 10 hours); 6 credits for comprehensive viva-voce and fieldwork/internship will be of 12 credits. However, the minimum number of the credits for award of BCA degree will be 122 credits. Out of 96 credits of classroom contact teaching, 40 credits are to be allotted for core courses (CC), 24 credits are allotted to ability enhancement courses (AECC), 14 credits are allotted to skill enhancement courses (SEC), 6 credits are allotted to open/generic elective courses (GEC), 6 credits are allotted to open elective courses (OEC), and rest of 6 credits for discipline specific elective courses (DSEC).

BCA : Three-Year (6-Semester) CBCS Programme			
Basic Structure: Distribution of Courses			
S.No.	**Type of Course**	**Credit Hours**	**Total Credits**
1	Core Course (CC)	12 Courses of 3 Credit Hrs. each (Total Credit Hrs. 12X3) 1 Course of 4 Credit Hrs. each (Total Credit Hrs. 1X4)	40
2	Ability-Enhancement Compulsory Course (AECC)	8 Courses of 3 Credit Hrs. each (Total Credit Hrs. 8X3)	24
3	Skill Enhancement Course (SEC)	2 Courses of 3 Credit Hrs. each (Total Credit Hrs. 2X3) 2 Courses of 4 Credit Hrs. each (Total Credit Hrs. 2X4)	14
4	Open/Generic Elective Course (GEC)	2 Courses of 3 Credit Hrs. each (Total Credit Hrs. 2X3)	6
5	Program/Departmental Specific Elective (DSE)	2 Courses of 3 Credit Hrs. each (Total Credit Hrs. 2X3)	6
6	Value Added Course (VAC)	6 Courses of 0 Credit Hrs. each (Total Credit Hrs. 6X0)	0
7	Open Elective Courses (OEC)	2 Course of 3 Credit Hrs. each (Total Credit Hrs. 2X3)	6
8	Laboratory Course (LC)	13 Courses of 2 Credit Hrs. each (Total Credit Hrs. 13X2) 2 Courses of 6 Credit Hrs. each (Total Credit Hrs. 2X6)	38
Total Credits			**134**

Contact hours include work related to Lecture, Tutorial and Practical (LTP), where our institution will have flexibility to decide course wise requirements.

Course handouts for students will be provided in every course. A course handout is a thorough teaching plan of a faculty taking up a course. It is a blueprint which will guide the students about the pedagogical tools being used at different stages of the syllabus coverage and more specifically the topic-wise complete plan of discourse, that is, how the faculty members treat each and every topic from the syllabus and what they want the student to do, as an extra effort, for creating an effective learning. It may be a case study, a role-play, a classroom exercise, an assignment- home or field, or anything else which is relevant and which can enhance their learning about that particular concept or topic. Due to limited availability of time, most relevant topics will have this kind of method in course handout.

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our University.

The following is the course module designed for the BCA program:

Core Course (CC): Core courses of BCA program will provide a holistic approach to technical education, giving students an overview of the field, a basis to build and specialize upon. These core courses are the strong foundation to establish technical knowledge and provide broad multi-disciplined knowledge can be studied further in depth during the elective phase.

The core courses will provide more practical-based knowledge, case-based lessons and collaborative learning models. It will train the students to analyse, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding, develop decision-making ability and contribute to the business and community at large.

A wide range of core courses provides groundwork in the basic technology disciplines: programming, software engineering, networking, database, organizational architecture etc.

The integrated foundation is important for students because it will not only allow them to build upon existing skills, but they can also explore career options in a range of industries, and expand their understanding of various business fields.

We offer core courses in semester I, II, III, IV, V & VI during the BCA program. There will be 3 credits for each core course offered.

Ability Enhancement Compulsory Course (AECC):As per the guidelines of Choice Based Credit System (CBCS) for all Universities, including the private Universities, the Ability Enhancement Compulsory Course (AECC) is a course designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. We offer **eight** AECCs in semester I, II, III, IV, V of the program. Each AECC will be of 3 credits.

Skill Enhancement Course (SEC): This course may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge. We offer **four** SECs- one each in II & V Semester and two in VI Semester. Each SEC will be of 3 credits.

Open/Generic Elective Course (GEC): Open/Generic Elective is an interdisciplinary additional subject that is compulsory in the third, fourth and fifth semester of a program. The score of Generic Elective is counted in your overall aggregate marks under Choice Based Credit System (CBCS). Each Generic

Elective paper will be of 3 Credits and students will have the choice of taking 4 GE's: 2 each in Semester III & IV. Each student has to take Open/Generic Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Generic Electives.

Value Added Course (VAC): A value added course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be one course each in Semester I & Semester II and will carry no credit, however, it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in the specific course of the respective semesters.

Program/Departmental Specific Elective (DSE): The departmental specific elective course is chosen to make students specialist or having specialized knowledge of a specific domain like ethical hacking, mobile architecture, enterprise resource planning, distributed operating system, digital forensic, gamification, etc. It will be covered in two semesters (IV&V) of the program relevant to chosen disciplines of core courses of the program. Each student will have to choose **two** departmental specific elective courses (DSE) in Semester IV and V respectively. Each DSE will carry 3 credits.

Laboratory Course (LC): Laboratory courses of BCA program will provide a holistic approach to technical education, giving students an overview of the field, a basis to build and specialize upon practical learning. These laboratory courses are the strong foundation to establish practical knowledge and skills in the respective field of computer science.

We offer laboratory courses in semester I, II, III, IV, V & VI during the BCA program. There will be 2 credits for each laboratory course and 6 credits each for in-house project in semester V & VI.

C. Programme Outcomes (POs)

PO1.**Critical Thinking**: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2.**Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. **Social Interaction**: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4. **Effective Citizenship**: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. **Ethics**: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6. **Environment and Sustainability**: Understand the issues of environmental contexts and sustainable development.

PO7. **Self-directed and Life-long Learning**: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

D. Programme Specific Outcomes (PSOs)

The learning and abilities or skills that a student would have developed by the end of three-year **BCA programme:**

PSO-No.	Intended Programme Specific Outcomes
PSO-1	Understand how to identify, formulate and design solutions in the areas of Computer Science and Application.
PSO-2	Demonstrate the abilities to design and develop algorithms and implement them as programs, with analysis and interpretation of data.
PSO-3	Develop skills in software development so as to enable the graduates to take up employment/self-employment in local, Indian & global software market.
PSO-4	Enhance Employability by developing leadership, effective communication & time management skills and also by incorporating ethics & team work ability.

E. Pedagogy & Unique practices adopted: "Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will **emphasize on experiential learning:**

***1. Case Based Learning*:** Case based learning enhances student skills at delineating the critical decision dilemmas faced by organizations, helps in applying concepts, principles and analytical skills to solve the delineated problems and develops effective templates for technical problem solving. Case method of teaching is used as a critical learning tool for effective learning and we encourage it to the fullest. We make it compulsory to teach at least one case study in each unit of every course in BCA program.

2. Role Play & Simulation: Role-play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play & simulation exercises such as virtual share trading, technical simulation etc. are being promoted for the practical-based experiential learning of our students.

3. Video Based Learning (VBL) &Learning through Movies (LTM): These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during their discourses. Making students learn few

important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL & LTM, wherever possible.

***4. Field/Live Projects*:** The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

5. Industrial Visits: Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

6. MOOCS: Students may earn credits by passing MOOCS as decided by the college from time to time. Graduate level programs may award Honors degree provided students earn pre-requiste credits through MOOCs.

7. Special Guest Lectures (SGL)&Extra Mural Lectures (EML): Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and insights.

8. Student Development Programs (SDP): Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced ms-office training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

9. Industry Focused programme: Establishing collaborations with various industry partners to deliver the programme on sharing basis. The specific courses are to be delivered by industry experts to provide practice based insight to the students.

10. Special assistance programme for slow learners & fast learners: Write the note how would you identify slow learners, develop the mechanism to correcting knowledge gap. Terms of advance topics what learning challenging it will be provided to the fast learners.

11. Orientation program:

Orientation programs not only improve the rate at which student's are able to perform their academic activities but also help student's satisfy their personal desires to feel they are part of the university's environment.

A 15 days orientation program was scheduled with various day to day basis motivational and inspirational activities.

Motivational Quotes Inspirational Messages for Students: From inspiring messages about studying hard to motivational quotes about doing well in school and college – this orientation schedule is packed with encouraging words for students.

12. Mentoring scheme: There are two parts of this: supporting the mentoring process and the content of learning. This role includes helping the learner to clarify their goals, or their learning style. The mentor may also help the learner to reflect on their experience and draw out learning.

13. Career & personal counseling: Helps Gain Confidence and Insight. Career Counselling helps a counselee understand the hurdles in his/her career path. This knowledge helps to develop the confidence to overcome these hurdles. It is the duty of a good counselor to provide such insight and confidence to the counselee.

14. Competitive exam preparation: It is true that competitive exams are not that easy to face it, but it is also not something impossible. With proper guidance and hard work of faculties, student's can easily crack any competitive exam such as GATE, Bank Services, Civil Services or any other govt. administrative platform.

15. Extracurricular Activities: Organizing & participation in extracurricular activities will be mandatory to help students develop confidence & face audience with care.

16. Participation in Workshops, Seminars & writing & Presenting Papers: A seminar may have several purposes or just one purpose. For instance, a seminar may be for the purpose of education, such as a lecture, where the participants engage in the discussion of an academic subject for the aim of gaining a better insight into the subject. Other forms of educational seminars might be held to impart some skills or knowledge to the participants.

17. Formation of Student Clubs, Membership, Organizing & Participating events: Computer Science clubs channelize the energies of students and make use of their skills and talents, which satisfy their instincts and urges and helps in their overall personality development. Through activities of a computer science club, learning of computer science and its applications become joyful. The computer science club caters to freedom for expression, where as the classroom atmosphere leads to conformity and repression. Students organize thought and translate into action.

18. Capability Enhancement & Development Schemes: The development of soft skills has become important in today's fast growing world. The students at the college are taught to communicate and interact at a professional level. The qualities of confidence and critical thinking are developed making the students better at soft skills. Soft skill development courses inculcate ethical attitude towards others and also help in the nurturing of better interpersonal skills. Much of the communication related activities are developed and taught to students who are willing and interested to enhance their skills.

19. Library Visit & Utilization of E-Learning Resources: Library is the physical building or a room with the collection of books and resources accessible to a community. It consists of books and e-learning resources on diverse genres and subjects. Libraries are important for healthy development of society. Libraries provide valuable services to meet the learning needs of the people. Libraries also benefit the economy of our nation as people use them for research purposes and to improve their job skills. They play an essential part in overall educational development of people and community.

BCA Curriculum

Semester-I

S. No.	Category name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-1	BCA 107	Fundamental of Computer's and MS - Office	2	1	0	3	40	60	100
2	CC-2	BCA 110	Digital Logic and basics of Computer Organization	2	1	0	3	40	60	100
3	AECC-1	BCA 111	Human Values & Professional Ethics	2	1	0	3	40	60	100
4	AECC-2	TMU 101	Environmental Studies	2	1	0	3	40	60	100
5	AECC-3	TMUGE 101	English Communication – I	2	0	2	3	40	60	100
6	LC-1	BCA 151	MS-Office and Internet Lab	0	0	4	2	50	50	100
7	LC-2	BCA 153	Digital Electronics Lab	0	0	4	2	50	50	100
			Total	**10**	**4**	**10**	**19**	**300**	**400**	**700**

Value Added Course / Semester- I

Value added course is an audit course which will be compulsory to pass with 45% marks. However, it will not be added towards overall result.

S. No.	Category name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	VAC-1	TMUGA-101	Foundation in Quantitative Aptitude	2	1	0	0	40	60	100

Semester-II

S. No.	Category name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-3	BCA 202	Programming in C	2	1	0	3	40	60	100
2	SEC-1	BCA 212	Web Technologies	2	1	0	3	40	60	100
3	CC-4	BCA 215	Mathematics –I	2	1	0	3	40	60	100
4	AECC-4	BCA 213	Management concept and Organization Behaviors	3	0	0	3	40	60	100
5	AECC-5	TMUGE 201	English Communication – II	2	0	2	3	40	60	100
6	LC-3	BCA 251	C Language Lab	0	0	4	2	50	50	100
7	LC-4	BCA 255	Web Technologies Lab	0	0	4	2	50	50	100
			Total	**11**	**3**	**10**	**19**	**300**	**400**	**700**

Value Added Course / Semester - II

Value added course is an audit course which will be compulsory to pass with 45% marks. However, it will not be added towards overall result.

S. No.	Category name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	VAC-2	TMUGA-201	Analytical Reasoning	2	1	0	0	40	60	100

Semester-III

S. No.	Category name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-5	BCA 306	Operating System	2	1	0	3	40	60	100
2	CC-6	BCA 309	Computer Network	2	1	0	3	40	60	100
3	CC-7	BCA 313	Data Structure using C++	2	1	0	3	40	60	100
4	CC-8	BCA 314	OOPs & C++	2	1	0	3	40	60	100
5	**Select one out of list GEC-I**			2	1	0	3	40	60	100
6	AECC-6	TMUGE 301	English Communication – III	2	0	2	3	40	60	100
7	LC-5	BCA 355	Data Structure lab Using C++	0	0	4	2	50	50	100
8	LC-6	BCA 356	OOPs & C++ Lab	0	0	4	2	50	50	100
			Total	**12**	**05**	**10**	**22**	**340**	**460**	**800**

Generic Elective Courses - I

Semester- III

S. No.	Course Name Type	Course Code	Course Name
1	GEC-I	BCA 308	System Analysis and Design
		BCA 315	Management Information System

Value Added Course / Semester - III

Value added course is an audit course which will be compulsory to pass with 45% marks. However, it will not be added towards overall result.

S. No.	Category name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	VAC-3	TMUGA-302	Modern Algebra and Data Management	2	1	0	0	40	60	100
2	VAC-4	TMUGS-301	Managing Self	2	1	0	0	50	50	100

Semester-IV

S. No.	Category name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-9	BCA 402	Software Engineering	2	1	0	3	40	60	100
2	CC-10	BCA 407	Computer Graphics	2	1	0	3	40	60	100
3	CC-11	BCA 416	Database Management System	2	1	0	3	40	60	100
4	**Select one out of list DSE - I**			2	1	0	3	40	60	100
5	**Select one out of list GEC - II**			2	1	0	3	40	60	100
6	AECC-7	TMUGE 401	English Communication – IV	2	0	2	3	40	60	100
	OEC-1	**Open Elective - I**		3	0	0	3	40	60	100
7	LC-7	BCA 454	DBMS Lab	0	0	4	2	50	50	100
8	LC-8	BCA 453	Computer Graphics Lab	0	0	4	2	50	50	100
			Total	**15**	**5**	**10**	**25**	**380**	**520**	**900**

Departmental Specific Elective - I, Semester- IV

Sr. No.	Course Name Type	Course Code	Course Name
1	DSE-I	BCA 411	Ethical Hacking Fundamental
		BCA 412	Mobile Device and Network Architecture
		BCA 417	Discrete Mathematics
		BCA 418	Enterprise Resource Planning

Generic Elective Courses - II, Semester- IV

Sr. No.	Course Name Type	Course Code	Course Name
1	GEC-II	BCA408	Fundamentals Of Accounting
		BCA 414	Retail Management
		BCA 415	Digital Marketing
		BCA 419	Sales and Production Management

Value Added Course / Semester - IV

Value added course is an audit course which will be compulsory to pass with 45% marks. However, it will not be added towards overall result.

S. No.	Category name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	VAC-5	TMUGA-402	Advance Algebra and Geometry	2	1	0	0	40	60	100
2	VAC-6	TMUGS-401	Managing Work and Others	2	1	0	0	50	50	100

Semester-V

S. No.	Category name	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-12	BCA 512	Core Java Programming	3	1	0	4	40	60	100
2	SEC-2	BCA 519	PHP & MySQL	3	1	0	4	40	60	100
	AECC-8	BCA 515	Entrepreneurship	2	1	0	3	40	60	100
3	**Select one out of list DSE- II**			2	1	0	3	40	60	100
4	OEC-2	**Open Elective - II**		3	0	0	3	40	60	100
5	LC-9	BCA 551	Mini Project (Industrial Training)	0	0	12	6	50	50	100
6	LC-10	BCA 555	Core Java Programming Lab	0	0	4	2	50	50	100
7	LC-11	BCA 558	PHP & MySql Lab	0	0	4	2	50	50	100
8	**Select one out of list Lab Based on DSE-II**			0	0	4	2	50	50	100
			Total	**13**	**04**	**24**	**29**	**400**	**500**	**900**

Departmental Specific Elective - II, Semester- V

S. No.	Course Name Type	Course Code	Course Name
1	DSE-II	BCA 522	Linux Administration
		BCA 514	Distributed Operating System
		BCA 510	Multimedia And Animation
		BCA 518	Digital Forensics and Investigation
		BCA 524	Gamification

Lab based on Departmental Specific Elective - II (P), Semester- V

S. No.	Course Name Type	Course Code	Course Name
1	DSE-II (P)	BCA 559	Linux Administration Lab
		BCA 560	Distributed Operating System Lab
		BCA 561	Multimedia And Animation Lab
		BCA 562	Digital Forensics and Investigation Lab
		BCA 563	Gamification Lab

Semester-VI

S. No.	Subject Type	Course Code	Subject	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-13	BCA 609	Programming with C#	2	1	0	3	40	60	100
2	SEC-3	BCA 610	Android Programming	3	1	0	4	40	60	100
3	SEC-4	BCA 614	Python Programming	2	1	0	3	40	60	100
4	LC-12	BCA 660	In-house Project	0	0	12	6	50	50	100
5	LC-13	BCA 657	Programming with C# Lab	0	0	4	2	50	50	100
6	LC-14	BCA 658	Android Programming Lab	0	0	4	2	50	50	100
7	LC-15	BCA 659	Python Programming Lab	0	0	4	2	50	50	100
			Total	**7**	**03**	**24**	**22**	**320**	**380**	**700**

Course Code: BCA 107	BCA- Semester-I Core Course (CC-1) **FUNDAMENTAL OF COMPUTER'S AND MS-OFFICE**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the peripheral devices and computer generations.	
CO2.	Understanding the basic Concept of operating systems and programming languages.	
CO3.	Understanding the basic functions of Microsoft word and excel.	
CO4.	Understanding the basic functions of Microsoft Power-Point & creating the presentation.	
CO5.	Understanding the categories of programs, system software and applications.	
CO6.	Understanding the concepts of Internet, Web resources & networks.	
Course Content:		
Unit-1:	**Computer Basics**: Introduction and definition of computer, Computer Generations, Characteristics of Computer, Advantages and Limitations of computer, Classification of computers, Functional components of a computer system (Input, CPU, Storage and Output Unit), Types of memory (Primary and Secondary), **Computer Hardware**: Input Devices- Mouse, Bar Code Reader, Keyboard, Scanner, Joystick, Output Devices-VDU, Printer, Plotters, Types of Computer Software.	**7 Hours**
Unit-2:	**Computer Languages**: Introduction to languages, Compiler, Interpreter and Assembler, High Level Language to Machine Language Conversion , Evolution of programming language, Classification of Programming Languages, Features of a good Programming Language, Example of High Level Languages, Characteristics of a good language. **Number system:** Binary number system, Octal & Hexa-decimal number system, conversion, r and r-1 compliment, addition and subtraction using r and r-1 compliment method, weighted and non weighted code.	**7 Hours**
Unit-3:	Algorithm, flowcharts: flowcharts symbols, sample flowcharts. **MS-DOS**: Operating System, Basic Concepts of Operating System, Introduction of MS-DOS, Internal Commands-VOL,VER, DATE, TIME, CLS, DIR, CD, MD, PROMPT, TYPE, COPY, COPYCON , External Commands-MOVE, MORE, FIND, ATTRIB, TREE, DELTREE, EDIT, FORMAT **MS-WORD**: Starting MS WORD, Creating and formatting a	**8 Hours**

	document, Changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Creating Shapes and Charts, Inserting objects, Page setup and margins, Page Preview, Printing a document, Macros, Mail Merge.	
Unit-4:	**MS-EXCEL**: Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping , Sorting data, Auto Sum, Use of functions, Cell Referencing form, Generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page setup and margins, Print Preview, Printing Worksheets. **MS-ACCESS**: Maintaining Database by creating Tables, Queries, Reports and Forms.	**7 Hours**
Unit-5:	**MS-POWERPOINT:** Starting MS–Power Point,, Creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience handouts, printing presentation documents **Introduction of Internet:** History of internet, Web Browsers, Searching and Surfing, Creating an E-Mail account, sending and receiving E-Mails.	**7 Hours**
Text Books:	1. Sinha P.K., Computer Fundamentals, BPB Publishing.	
Reference Books:	1. Leon A. & Leon M., Introductions to Computers, Vikas Publication. 2. Norton Peter, Introductions to Computers, TMH Publication. 3. Price Michael, Office in Easy Steps ,TMH Publication. 4. O'Leary Timothy, O'Leary Linda , Microsoft Office ,TMH Publication. 5. Kanitkar Yashwant, Let Us C, BPB Publishing. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://learnengineering.in/computer-fundamentals-by-p-k-sinha-free-download/ 2. http://www.mcqsquestions.com/2015/01/fundamentals-of-computer-mcq-questions-set-10.html	

Course Code: BCA 110	BCA- Semester-I Core Course (CC-2) **DIGITAL LOGIC AND BASICS OF COMPUTER ORGANIZATION**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the operations of logic gates, boolean algebra and karnaugh map.	
CO2.	Understanding the working of combinational and sequential circuits.	
CO3.	Understanding the working of register organization and stack organization.	
CO4.	Understanding the concept of Input-Output Organization.	
CO5.	Understanding the layout of memory organization.	
Course Content:		
Unit-1:	**Logic Gates:** Basic Gates, Universal Gates and realization of other gates using universal gates. **Boolean Algebra:** Rules and laws of Boolean algebra, Demorgan's Theorems, Boolean Expressions and Truth Tables, Standard SOP and POS forms; Minterm and Maxterms, Canaonical representation of Boolean expressions, Minimization Techniques for Boolean Expressions using Karnaugh Map (three, four and five variable)	**7 Hours**
Unit-2:	**Combinational Circuits**- Introduction to combinational Circuits, Adders-Half-Adder and Full-Adder, Subtractors- Half and Full Subtractor, BCD adder, BCDSubtractor,Multiplexer, Demultiplexer, Encoder, Priority Encoder, Decoder,BCD to Seven segment Display Decoder, Comparators.	**7 Hours**
Unit-3:	**Sequential Circuits:** Introduction to Sequential Circuits, Flip-Flops, Types of Flip Flops: R-S, T, D, J-K, Race around condition, Master-Salve JK flip flop, Realization of flip flops. **Shift Registers:** Introduction to shift registers,4 bit shift register	**8 Hours**
Unit-4:	**Processor Organization:** General register organization, Stack organization, Reverse Polish Notation, Instruction Format, Addressing mode, Instruction type.	**7 Hours**
Unit-5:	**Input-Output Organization:** Peripheral Devices, Strobe control, HandShaking, DMA, Interrupts & Interrupt handling, Direct Memory access: DMA Controller and DMA Transfer.	**7 Hours**

	Memory Organization: Memory Hierarchy, Main Memory: RAM & ROM chips.	
Text Books:	1. Mano M., Computer System Architecture, Prentice Hall of India.	
Reference Books:	1. Vravice, Zaky&Hamacher, Computer Organization, Tata Mc Graw Hill 2. Tannenbaum, Structured Computer Organization, Prentice Hall of India. 3. Hayes John P., Computer Organization, McGraw Hill. 4. Mano Morris, Digital Logic, Prentice Hall of India. 5. Stallings, Computer Organization, Prentice Hall of India. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials 2. https://examupdates.in/digital-logic-design-books/	

Course Code: BCA 111	BCA- Semester-I Ability Enhancement Compulsory Course (AECC-1) **HUMAN VALUES & PROFESSIONAL ETHICS**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concepts of morals, values, ethics and value education.	
CO2.	Understanding the concept of work ethics and the differences between profession, ethics and happiness.	
CO3.	Analyzing the concepts of trust, spiritualism, and problems related to stress.	
CO4.	Understanding the concept and meaning of Intellectual Property Rights, Cybercrime, Plagiarism and misconduct.	
CO5.	Developing an understanding about e-waste and creating a balance between computer ethics and corporate social responsibility.	
Course Content:		
Unit-1:	**Introduction to Value Education:** Understanding of Morals, Values and Ethics; Need, Content and Process for Value Education. Attributes of A Good Character- Integrity, Work Ethic, Respect For Others, Living Peacefully, Cooperation, Commitment, Empathy etc. **Spirituality:** Introduction to Yoga and Meditation for Professional Excellence and Stress Management. Understanding Harmony in the Family and Society.	**7 Hours**
Unit-2:	**Ethics & Technology:** Impact of Technological Growth on Society and Value System; Reports of Club of Rome, Appropriate Technology Movement of Schumacher, Problems of Technology Transfer, Technology Assessment Impact Analysis, Human Operator in Engineering Projects & Industries, Problems of Man-Machine Interaction, Human Centered Technology, Safety and Risk Analysis.	**7 Hours**
Unit-3:	**Ethics of Profession:** Ethical Issues in Engineering Practice, Conflicts of Interest: Conflicts between Business Demands and Professional Ethics. Social and Ethical Responsibilities of Technologists. **Ethical Issues at Workplace:** Discrimination,Cybercrime, Plagiarism, Sexual Misconduct, Fraudulent Use of Institutional Resources. Intellectual Property Rights and its uses.Whistle blowing and beyond, Case studies.	**8 Hours**
Unit-4:	**Profession and Human Values:** Values Crisis in Contemporary Society; Value Spectrum of Good Life; Integrated Personality. Modern Search for a Good Society: Justice, Democracy, Secularism, Rule of Law, Values in Indian Constitution. **Canons of ethics:**	**7 Hours**

	Ethics of Virtue; Ethics of Duty; Ethics of Responsibility.	
Unit-5:	**Global Issues & Professional Ethics:** MNCs & Morality; Case Study: Bhopal Gas Tragedy. **Environmental Ethics:** Disposal of Plastic Waste, e-Waste, Industrial. **Computer Ethics:** Problems in Computer Ethics. Weapons Development: Impact on Society & Humanity.Moral Leadership; Corporate Social Responsibility.Engineering Council of India.	**7 Hours**
Text Books:	1. RS Naagarazan, A Text Book on Professional Ethics & Human Values, New Age International Publishers	
Reference Books:	1. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 2. Sathya Sai Education in Human Values, UK Newsletter, 2/2003 www.sathyasaiehv.org.uk 3. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley &Sons, New York 4. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://www.academia.edu/8844628/Professional_ 2. https://lecturenotes.in/subject/576/professional-ethics-and-human-values	

Course Code: TMU 101	BCA- Semester-I Ability Enhancement Compulsory Course (AECC-2) **ENVIRONMENTAL STUDIES**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding environmental problems arising due to constructional and developmental activities.	
CO2.	Understanding the natural resources and suitable methods for conservation of resources for sustainable development.	
CO3.	Understanding the importance of ecosystem and biodiversity and conserving it for maintaining ecological balance.	
CO4.	Understanding the types and adverse effects of various environmental pollutants and their abatement devices.	
CO5.	Understanding green house effect, various environmental laws, movements, different disasters and their management.	
Course Content:		
Unit-1:	***Definition and Scope*** of environmental studies, multidisciplinary nature of environmental studies, concept of sustainability & sustainable development. ***Ecology and Environment:*** Concept of an Ecosystem- its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, Ecological Pyramid & Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.	**7 Hours**
Unit-2:	***Natural Resources:*** Renewable & Non-Renewable resources; Land resources and landuse change; Land degradation, Soil erosion & desertification. Deforestation: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. Energy Resources: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies. Biodiversity: Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Biogeographical Classification of India.	**7 Hours**
Unit-3:	***Environmental Pollutions:*** Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies.	**8 Hours**
Unit-4:	***Environmental policies & practices:*** Climate change & Global Warming (Greenhouse Effect), Ozone Layer - Its Depletion and Control Measures, Photochemical Smog, Acid Rain Environmental laws: Environment	**7 Hours**

	protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context.	
Unit-5:	***Human Communities & Environment:*** Human population growth; impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case study: **Field Work:** 1. Visit to an area to document environmental assets; river/forest/flora-fauna etc. 2. Visit to a local polluted site: urban/ rural/industrial/agricultural. 3. Study of common plants, insects, birds & basic principles of identification. 4. Study of simple ecosystem; pond, river etc.	**7 Hours**
Text Books:	1. "Environmental Chemistry", De, A. K., New Age Publishers Pvt. Ltd.	
Reference Books:	1. "Biodiversity and Conservation", Bryant, P. J., Hypertext Book. 2. "Textbook of Environment Studies", Tewari, Khulbe & Tewari, I.K. Publication. 3. "Introduction to Environmental Engineering and Science", Masters, G. M., Prentice Hall India Pvt. Ltd. 4. "Fundamentals of Ecology", Odem, E. P., W. B. Sannders Co. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://www.tutorialspoint.com/environmental_studies/index.htm 2. http://www.schoolchalao.com/basic-education/environmental-education	

Course Code: TMUGE 101	BCA- Semester-I Ability Enhancement Compulsory Course (AECC-3) **ENGLISH COMMUNICATION – I**	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Remembering and understanding the basics of English grammar and building vocabulary for English communication.	
CO2.	Understanding the basic process of communication.	
CO3.	Applying correct vocabulary and tenses in sentence construction for effective communication.	
CO4.	Analyzing self, body-language and social etiquette to build self confidence.	
CO5.	Drafting applications in correct format on common issues.	
Course Content:		
Unit-1:	**Introductory Sessions** • Self-Introduction • Building Self Confidence: Identifying strengths and weakness, reasons of Fear of Failure, strategies to overcome Fear of Failure • Importance of English Language in present scenario (*Practice: Self-introduction session)*	**7 Hours**
Unit-2:	**Basics of Grammar** • Parts of Speech • Tense • Course and Predicate • Vocabulary: Synonym and Antonym *(Practice: Conversation Practice)*	**7 Hours**
Unit-3:	**Basics of Communication** • Communication : Process, Types, 7Cs of Communication, Importance & Barrier • Language as a tool of communication • Non-verbal communication: Body Language • Etiquette & Manners • Basic Problem Sounds *(Practice : Pronunciation drill and building positive body language)*	**8 Hours**
Unit-4:	**Application writing** • Format & Style of Application Writing. • Practice of Application writing on common issues.	**7 Hours**

Unit-5:	**Value based text reading:** Short Story (Non- detailed study) • Gift of Magi – O. Henry	**7 Hours**
Text Books:	1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
Reference Books:	1. Kumar, Sanjay. &Pushp Lata. "Communication Skills" New Delhi: Oxford University Press. 2. Carnegie Dale. "How to win Friends and Influence People" New York: Simon & Schuster. 3. Harris, Thomas. A. "I am ok, You are ok" New York: Harper and Row. 4. Goleman, Daniel. "Emotional Intelligence" Bantam Book. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference:	1. https://nptel.ac.in/courses/109/106/109106129/ 2. https://www.youtube.com/watch?v=0AM35Nu5McY	
Methodology:	**1.** Language Lab software. **2.** The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion. **3.** Conversational Practice will be effectively carried out by Face to Face & Via Media (Telephone, Audio-Video Clips) **4.** Modern Teaching tools (PPT Presentation, Tongue-Twisters & Motivational videos with sub-titles) will be utilized. **Note 1:** • Class (above 30 students) will be divided in to two groups for effective teaching. • For effective conversation practice, groups will be changed weekly. **Note 2**: *External Viva will be conducted by 2-member committee comprising* ***a)*** *One Faculty teaching the class* ***b)*** *One examiner nominated by University Examination cell.* *Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.*	

Evaluation Scheme

Internal Evaluation			External Evaluation		Total Marks
40 Marks			60 Marks		100
20 Marks (Best 2 out of Three CTs) ***(From Unit- II, IV & V)***	10 Marks (Oral Assignments) ***(From Unit I & III)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit II, IV & V)***	20 Marks (External Viva)* ***(From Unit -1 & III)***	

*Parameters of External Viva

Content	Body Language	Confidence	Question Responsiveness	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note: External Viva will be conducted by 2-member committee comprising

a) One Faculty teaching the class

b) One examiner nominated by University Examination cell.

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: BCA 151	BCA- Semester-I Laboratory Course (LC-1) **MS-OFFICE AND INTERNET LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying the usage of system settings and window's features**.**	
CO2.	Applying the Microsoft office word to create professional and academic documentation.	
CO3.	Applying the basic function of MS-excel to prepare the worksheet.	
CO4.	Applying the MS-Office power point to create the Power Point presentation.	
CO5.	Creating and editing database using MS-access.	
Course Content:		
Unit-1:	**Introduction to Windows:** Windows features including Control Panel and it's Components, Graphical features, Desktop setting with screensaver and wallpaper, Color, Background, Cut, Copy, Paste, Creating folder.	**7 Hours**
Unit-2:	**MS-WORD** **Creating, Editing, Formatting**: Font name, size, color, alignment, changing paragraph settings, Using Word Art ,Hyperlink, change case, spell checker, Mail Marge, Creating Tables, editing tables, alignment settings in tables.	**7 Hours**
Unit-3:	**MS-EXCEL** **Creating, Editing, Formatting:** Font name, size, color, alignment, entering data, sorting data, Inserting, renaming and deleting Sheet, Inserting row, column, cell, picture, background, graph, symbol, applying formula in a cell, Call by Value, Call by Reference, hyperlink, object, diagram, Macro.	**8 Hours**
Unit-4:	**MS-POWERPOINT** **Creating, Editing, Formatting:** Font name, size, color, alignment, changing, Inserting table, picture, background, graph, symbol, hyperlink, object, and diagram, Slide Layout, Slide Design, Slide Show, Slide Sorter View, Slide Transition, Custom Animation, Inserting Sound and Movies in a Slide.	**7 Hours**
Unit-5:	**MS-ACCESS** Creating and editing Database using Table, Query, Report and Form. **Introduction to Internet** Web Browser, Search Engine, Creating E-Mail account, Attaching documents, Sending and Receiving E-Mails.	**7 Hours**

Text Books:	1. O'Leary Timothy, O'Leary Linda , Microsoft Office ,TMH Publication	
Reference Books:	1. Norton Peter, Introductions to Computers, TMH Publication. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference:	1. https://www.proprofs.com/quiz-school/story.php?title=computer-info_3	

Course Code: BCA 153	**BCA- Semester-I** Laboratory Course (LC-2) **DIGITAL ELECTRONICS LAB**	**L-0 T-0 P-4 C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying concepts of logic gate and boolean algebra to design combinational circuits.	
CO2.	Applying the working of basic gates and sequential circuits.	
CO3.	Apply the design procedures to design basic sequential circuits.	
CO4.	Applying the concepts of sequential circuits to design flipflops and registers.	
CO5.	Understanding the basic digital circuits and to verify their operation.	
Course Content:		
	Students will be able to contrast and compare digital representation of information with the analog representation. 1. Design proper logic circuits to verify the truth table of basic gates 2. Implement the following Boolean expression using basic 3. Design proper logic circuits to prove that NAND gate is a universal gate. 4. Design proper logic circuits to prove that NOR is gate a universal gate. 5. Design an X-OR gate using NAND gate only. 6. Design half subtractor using NOR gate 7. Design Half Adder using NAND gate 8. Design Full Adder using Basic logic gates 9. Design Full Subtractor using Basic logic gates 10. Design a 4*1 multiplexer using basic logic gates and create IC. 11. Design a 8*1 multiplexer using basic logic gates and cerate IC. 12. Realize the following Boolean function using suitable MUX:- f(A,B,C)=Π(0,1,3, 5) 13. Design a half adder using suitable MUX 14. Design a full adder using suitable MUX. 15. Design a half subtractor using suitable MUX. 16. Design a full subtractor using suitable MUX. 17. To implement 1*4 de-multiplexer using basic logic gates and create IC. 18. Design a 1*8 demultiplexer using two 1*4 demultiplexer and create IC. 19. Design a circuit for a 2-line to 4 line de-multiplexer using basic logic gates. 20. Design a 3 to 8 Decoder and create IC.	

	21. Design a BCD to Excess-3 Code converter using NAND gates 22. Design a 3-bit gray code to binary code converter 23. Design a 4-bit binary Adder. 24. Design a logic circuit to check whether two 2-bit binary numbers are equal or not. 25. To study R-S flip-flop using NAND gate. 26. To study R-S flip-flop using NOR gate. 27. To study D-type flip-flop using NAND gate. 28. To study J-K flip-flop using NOR gate. 29. To study T flip-flop using NAND gate. 30. Design a 4-bit Shift Register.	
Text Books:	1. Mano M., Computer System Architecture, Prentice Hall of India.	
Reference Books:	1. Tannenbaum, Structured Computer Organization, Prentice Hall of India. 2. Stallings, Computer Organization, Prentice Hall of India. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference:	https://www.tutorialspoint.com/computer_logical_organization/index.htm	

Course Code: TMUGA-101	**Value Added Audit Course** **BCA- Semester-I** **Foundation in Quantitative Aptitude**	**L-2** **T-1** **P-0** **C-0**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Solving complex problems using Criss cross method, base method and square techniques.	
CO2.	Applying the arithmetical concepts of Average, Mixture and Allegation.	
CO3.	Evaluating the different possibilities of various reasoning based problems in series, Blood relation and Direction.	
CO4.	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation.	
Course Content:		
Unit-1:	**Speed calculations** Squares till 1000,square root, multiplications: base 100, 200 300 etc., 11-19, crisscross method for 2X2, 3X3, 4X4, 2X3, 2X4 etc., cubes, cube root	**3 Hours**
Unit-2:	**Percentages** Basic calculation, ratio equivalent, base, change of base, multiplying factor, percentage change, increment, decrement, successive percentages, word problems	**5 Hours**
Unit-3:	**Profit Loss Discount** Basic definition, formula, concept of mark up, discount, relation with successive change, faulty weights	**5 Hours**
Unit-4:	**SI and CI** Simple Interest, finding time and rate, Compound Interest, difference between SI and CI, Installments	**4 Hours**
Unit-5:	**Averages** Basic Averages, Concept of Distribution, Weighted Average, equations	**3 Hours**
Unit-6:	**Mixtures and allegations** Mixtures of 2 components, mixtures of 3 components, Replacements	**5 Hours**
Unit-7:	**Blood relations** Indicating type, operator type, family tree type	**3 Hours**
Unit-8:	**Direction sense** Simple statements, shadow type	**2 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in,	

	handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Course Code: BCA 202	BCA- Semester-II Core Course (CC-3) **PROGRAMMING IN C**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basics of C programming language, concept of functions and storage classes.	
CO2.	Understanding the concept of arrays, pointers, structure, union and strings along with dynamic memory allocation.	
CO3.	Analyzing concepts of file handling along with C processors.	
CO4.	Understanding a functional hierarchical code organization.	
CO5.	Understanding a defensive programming concept. Ability to handle possible errors during program execution.	
Course Content:		
Unit-1:	**C Basics:** History of C, Characteristics of C, C Program Structure, data types, Enumerated types, Variables, Defining Global Variables, Printing Out and Inputting Variables, Constants, Arithmetic Operations, Comparison Operators, Logical Operators, Order of Precedence, Escape sequence characters, Conditionals (The if statement, The switch statement) Looping and Iteration (The for statement, The while statement, The do-while statement, break ,continue, goto statements)	**7 Hours**
Unit-2:	**Functions**: (Function Prototyping, passing parameters (Actual and formal arguments), returning values, recursion, Scope of variable (local/global), Storage classes: auto, extern, static, register, Library Functions.	**7 Hours**
Unit-3:	**Arrays and Strings** (Single and Multi-dimensional Arrays, Strings) **Pointers:** Pointer declaration, Pointers arithmetic, **Dynamic Memory Allocation and Dynamic Structures:** malloc, calloc and realloc; sizeof.	**8 Hours**
Unit-4:	**Structure and Union:** Definition, Programs using Structure and Union, Difference between Structure and Union, User defined data types (typedef), Self-referential structures. **The C Preprocessor:** Macros, File inclusion, Other Preprocessor Commands.	**7 Hours**
Unit-5:	**File Handling:** Opening and Closing data files, Read and Write Functions, different modes of Files, Library functions for file handling, Command Line Argument.	**7 Hours**

Text Books:	1. Balaguruswamy E., *Programming in ANSI C,* TMH.	
Reference Books:	1. Yashwant Kanetkar, "Pointers in C", BPB Publications. 2. Paul Deitel and Harvey Dietel, "How to Program", PHI, 6th Ed. 3. Behrouz A. Forouzan and Richard F. Gilberg, "Computer Science A Structured Programming Approach Using C", PHI, 3rd Ed. 4. Jeri R. Hanly and Elliot B. Koffman, "Problem Solving and Programming in C", Pearson. 5. Kanitkar Yashwant, *Let Us C*, BPB. 6. Kanitkar Yashwant, *Working With C*, BPB. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/ 2. https://www.tutorialspoint.com/cprogramming/index.htm	

Course Code: BCA 212	**BCA- Semester-II** Skill Enhancement Course (SEC-1) **WEB TECHNOLOGIES**	**L-2** **T-1** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concepts of web technologies, HTML, & Cascading Style Sheet (CSS).	
CO2.	Understanding the concepts of dynamic web pages using Java script, Extensible Markup Language (XML), XSL & XSLT in XML documents.	
CO3.	Understanding & Analyzing various concepts in designing web pages.	
CO4.	Creating the modern web pages using the HTML and CSS features with different layouts as per need of applications.	
CO5.	Creating the modern Web applications using the client and server side technologies and the web design fundamentals.	
Course Content:		
Unit-1:	**Web Essentials:** Clients, Servers, and Communication. The Internet Protocols, HTTP, HTTPS, Markup Languages: An Introduction to HTML, History-Versions.	**7 Hours**
Unit-2:	**HTML:** Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML.	**7 Hours**
Unit-3:	**CSS:** Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3.	**8 Hours**
Unit-4:	**Java Script:** Introduction to Documents, forms, Statements, functions, objects in JavaScript, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas.	**7 Hours**
Unit-5:	**XML:** Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT.	**7 Hours**
Text Books:	1. Burdman, Collaborative Web Development, Addison Wesley.	
Reference Books:	1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education.	

	3. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 4. Bates, "Developing Web Applications", Wiley. 5. Bayross Ivan, Web Technologies Part II, BPB Publications. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/web_development_tutorials.htm	

Course Code: BCA 215	**BCA- Semester-II** Core Course (CC-4) **MATHEMATICS – I**	**L-2 T-1 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concepts of matrix.	
CO2.	Evaluating common applications of Set.	
CO3.	Formulate differentiation of functions.	
CO4.	Familiarity with determinant and matrices.	
CO5.	Evaluating arithmetic and geometric series.	
Course Content:		
Unit-1:	Definition and types of matrices such as square, row, Column, diagonal, identity, symmetric, singular, non-singular Matrices. Operation of matrices such as addition, subtraction, multiplication of matrices.	**7 Hours**
Unit-2:	Determinants and Adjoint of a matrix, Inverse of matrix, Solution of simultaneous linear equations by Matrix Method & Cramer's rule.	**7 Hours**
Unit-3:	Set & subset, Finite and Infinite set, Equal set, Null set, Proper subset, universal set, Singleton set. Union, Intersection, complement of set. Common applications of set.	**8 Hours**
Unit-4:	Differentiation of functions, derivatives of some common functions, polynomials, exponential, logarithmic & trigonometric functions.	**7 Hours**
Unit-5:	Mathematical Series- Arithmetic, Geometric & Harmonic Series.	**7 Hours**
Text Books:	1. O P Malhotra, S K gupta,"ICSE Mathematics" S Chand.	
Reference Books:	1. Seth M.Ray, Elements of Matrix and Determinants. 2. Shanti Narayan, Differential Calculus, S.Chand. 3. Vasistha A. R., Matrices, Krishna Publications. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/122/107/122107037/	

Course Code: BCA 213	**BCA- Semester-II** Ability Enhancement Compulsory Course (AECC-4) **MANAGEMENT CONCEPT AND ORGANIZATION BEHAVIORS**	**L-2** **T-1** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concept of management and planning.	
CO2.	Understanding the importance of organizing with functions of management.	
CO3.	Analyzing the concept of organizational behavior and understanding the importance of perception and understand the various theories of personality.	
CO4.	Understanding the concept of leadership and motivation.	
CO5.	Understanding organizational change and its applicability.	
Course Content:		
Unit-1:	**Introduction to Management:** Meaning, nature and importance of management; Management functions; Managerial Skills. Planning: Introduction, Importance of Planning, Types of Plans, Planning & Decision Making Process.	**7 Hours**
Unit-2:	**Organizing and Staffing:** Meaning, Importance & Process of Organizing, Organisational Structure & its types, Delegation of Authority, Staffing: Meaning& importance. Directing: Importance & Functions, Controlling: Importance and Process, Measures for Effective Control & Control Techniques.	**7 Hours**
Unit-3:	**Organizational Behaviour (OB):** Concept, Characteristics, Key Elements of OB, Models of OB. Perception: Concept, Process & Importance. Attitudes & Job Satisfaction. Personality: Concept, Types & Theories, Learning: Concept & Theories of Learning.	**8 Hours**
Unit-4:	**Motivation:** Concepts, Principles, Theories. **Leadership:** Concept, Function &Style. Group Dynamics: Definition, Stages of Group Development, Types & Group Decision Making. Power and Politics: Concept, Sources, Approaches to Power, Political Implications of Power.	**7 Hours**
Unit-5:	**Organizational Change:** Concept, Resistance to change & its Management, Implementation of Change. Conflict: Concept, Sources, Types and Resolution of Conflict, Stress: Meaning, Causes,	**7 Hours**

	Consequences& Managing Stress. **Culture:** Concept, Characteristics, Elements of Culture.	
Text Books:	1. Prasad L.M., Principles and Practice of Management, Sultan Chand.	
Reference Books:	1. Robbins Stephen P., Organizational Behavior Pearson Education 2. Koontz, Harold, Cyril 'O' Donnell, And Heinz Weihrich, Essentials of Management, Fourth Edition, McGraw-Hill, Singapore 3. Srivastava & Chunawalla, Management Principles and Practices, Macmillan 4. Koontz, Principles of Management, Tata McGraw Hill. 5. Murugan and Shaktivel, Management Principles and Practices, New Age. 6. W. Newstrom John, Organizational Behavior: Human Behavior at Work, Tata McGraw Hill. 7. Fred, Luthans, Organizational Behaviour, Tata McGraw Hill. 8. Shane L Mc. Steven, Glinow Mary Ann Von & Sharma Radha R., "Organizational Behavior" Tata McGraw Hill. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/organizational_behavior/organizational_behavior_tutorial.pdf	

Course Code: TMUGE 201	**BCA- Semester-II** Ability Enhancement Compulsory Course (AECC-5) **ENGLISH COMMUNICATION – II**	**L-2** **T-0** **P-2** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Remembering and understanding of the basics of English grammar and vocabulary.	
CO2.	Understanding the basic of listening, speaking and writing.	
CO3.	Applying correct vocabulary and tenses in sentence construction while writing, speaking & delivering presentation.	
CO4.	Analyzing different types of listening.	
CO5.	Understanding concepts of drafting official letters, email, paragraph.	
Course Content:		
Unit-1:	**Functional Grammar** • Prefix, suffix and One words substitution • Modals • Concord	**7 Hours**
Unit-2:	**Listening Skills** • Difference between listening & hearing, Process and Types of Listening • Importance and Barriers to listening	**7 Hours**
Unit-3:	**Writing Skills** • Official letter and email writing • Essentials of a paragraph, • Developing a paragraph: Structure and methods • Paragraph writing (100-120 words)	**8 Hours**
Unit-4:	**Strategies & Structure of Oral Presentation** • Purpose, Organizing content, Audience & Locale, Audio-visual aids, Body language. • Voice dynamics: Five P's - Pace, Power, Pronunciation, Pause, and Pitch. • Modes of speech delivery and 5 W's of presentation.	**7 Hours**
Unit-5:	**Value based text reading:** Short Essay (Non- detailed study) • How should one Read a book? – Virginia Woolf	**7 Hours**
Text Books:	**1.** Singh R.P., An Anthology of English Essay, O.U.P. New Delhi.	
Reference Books:	**1.** Nesfield J.C. "*English Grammar Composition & Usage*" Macmillan Publishers. **2.** Sood Madan "*The Business letters"* Goodwill Publishing House,	

	New Delhi. **3.** Kumar Sanjay & Pushplata "*Communication Skills*" Oxford University Press, New Delhi. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference:	1. https://nptel.ac.in/courses/109/106/109106129/ 2. https://www.youtube.com/watch?v=0AM35Nu5McY	
Methodology:	**1.** Words and exercises, usage in sentences. **2.** Language Lab software. **3.** Sentence construction on daily activities and conversations. **4.** Format and layout to be taught with the help of samples and preparing letters on different Course s. **5.** JAM sessions and Picture presentation. **6.** Tongue twisters, Newspaper reading and short movies. **7.** Modern Teaching tools (PPT Presentation, Tongue-Twisters & Motivational videos with sub-titles) will be utilized. **8.** Text reading: discussion in detail, critical appreciation by reading the text to develop students' reading habits with voice modulation. **Note 1:** • Class (above 30 students) will be divided in to two groups for effective teaching. • For effective conversation practice, groups will be changed weekly. **Note 2**: *External Viva will be conducted by 2-member committee comprising* *a) One Faculty teaching the class* *b) One examiner nominated by University Examination cell.* *Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.*	

Evaluation Scheme

Internal Evaluation			External Evaluation		Total Marks
40 Marks			60 Marks		
20 Marks (Best 2 out of Three CTs) ***(From Unit-I, III & V)***	10 Marks (Oral Assignments) ***(From Unit-II &IV)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit-1, III & V)***	20 Marks (External Viva)* ***(From Unit- II & IV)***	**100**

*Parameters of External Viva

Content	Body Language	Communication skills	Confidence	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note*: External Viva will be conducted by 2-member committee comprising*

a) *One Faculty teaching the class*

b) *One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: BCA 251	BCA- Semester-II Laboratory Course (LC-3) **C LANGUAGE LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying programming concepts of functions and arrays to write compile and debug programs in C language.	
CO2.	Applying programming concepts of pointers and strings to write compile and debug programs in C language.	
CO3.	Applying programming concepts of structure and union to write compile and debug programs in C language.	
CO4.	Understanding a concept of object thinking within the framework of functional model	
CO5.	Understanding a concept of functional hierarchical code organization.	
Course Content:		
	Basics of C Programs: **1)** Given the values of the variables x, y and z, write a program to rotate their values such that x has the value of y, y has the value of z, and z has the value of x. **2)** Write a program that reads a floating point number and then displays the right-most digit of the integral part of the number. **3)** The distance between two cities (in Km) is input through the keyboard. Write a C program to convert and print this distance in meter, feet, inches and centimeter. **4)** If a five-digit number is input through the keyboard, write a C program to calculate the sum of its digits without using loop. **5)** If a four-digit number is input through the keyboard, write a C program to obtain the sum of the first and last digit of this number. **6)** Program to find largest and smallest number from four given number. **7)** Program to find whether a year is leap or not. **8)** Program to find out the grade of a student when the marks of 5 Course s are given. The method of assigning grade is as— Per >= 85 Division=First grade=A+ Per< 85 and Per>= 70 Division=First grade=A Per< 70 and Per>= 60 Division=Firs grade=B+ Per< 60 and Per>= 50 Division=Second grade=B Per< 50 and Per>= 40 Division=Third grade=C	

Per < 40 Division=Fail grade= Fail

9) A library charges a fine for every book returned late. For first 5 days the fine is 50 paise, for 6-10daysfineisonerupeeandabove10 daysfineis5 rupees.If you return the book after 30 days your membership will be cancelled. Write a program to access the number of days the member is late to return the book and display the fine or the appropriate message.

10) Write a C program in which enter any number by the user and perform the operation of product of digits of entered number.

11) Write a C program in which enter any number by the user and perform the operation of Sum of digits of entered number.

12) Write a C Program to convert Decimal number to Binary number.

13) Find the sum of this series upto n terms
1+2+4+7+11+16+……..

14) Program to print Armstrong's numbers from 1 to 10000.

15) Program to find the sum of digits of a number until the sum is reduced to 1 digit.
For example: 538769→ 38→11→2

16) Write a program to convert years into
1. Minute
2. Hours
3. Days
4. Months
5. Seconds

Using switch () statements.

17) Write a C menu driven program that will perform the following operation.
1. Generate Fibonacci series as per given range which is entered by the user.
2. Print all the prime number between 1 to 300.
3. Exit

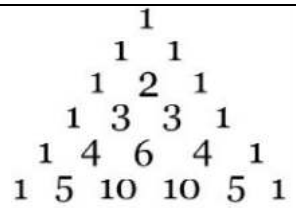
18) Write a C Program that will perform the logic of Perfect number.

19) Write a program to generate the following pattern –

i.

```
A B C D C B A
A B C   C B A
A B       B A
A           A
```

ii.

	 **20)** Write a currency program, which tells you how much numbers of 100, 50,20,10,5,2 and 1 Rs notes will be needed for a given amount of money. For example if the total amount is Rs. 545then five 100 Rs. notes, two 20 Rs. Notes and one 5 Rs. Note will be needed.	
	Programs related to Function: **1)** Write a C program to perform the factorial of given number. **2)** Write a C program that input numbers and display one of the following as per the desire of the user: a. Sum of the numbers b. Difference of the numbers c. Product of the numbers d. Division of the numbers e. Exit Provide separate functions for performing various tasks as Calculating. **3)** Write a C program to find the sum of the following series using function. X – X3/3! + X5/5! – X7/7! ……. **4)** Write a C program in which a function prime that returns 1 if its argument is a prime and return zero otherwise. **5)** Write a C program to perform the operation of $^{n}P_{r}$ and operation of $^{n}C_{r}$ using separate function. **6)** A positive integer is entered through the keyboard. Write a function to obtain the prime factors of this number. **7)** Write a C program using function that find out the 4th bit of given number is on or off.	
	Program related to Recursion: **1)** Write a C program to calculate factorial of a number using recursion. Number being entered by user. **2)** Write a C program to generate Fibonacci series using recursion. The user enters the limit of series. **3)** Write a C Program to print the reverse of an integer number entered by user.	
	Program related to Array: 1) Write a C program to count the number of positive, negative and zero number in the given list of numbers. 2) Write a C program for swapping of two arrays as per indexes	

	accordingly both array have the same size. 3) Write a C program in which enter 10 elements by the user and perform the operation of sorting in ascending order. 4) WAP to enter an integer array of size 10 and perform following operations on it. a. Display the Elements. b. Calculate the Sum and Average of Array. c. Find largest element. d. Find second largest element. e. Find the Smallest element. f. Display the Array in Reverse order. g. Exit 5) Write a C program to perform following operation on it. a. Generate n * n Matrix. b. Display n * n Matrix. c. Perform operation of Addition in two n * n Matrix. d. Perform operation of Subtraction in two n * n Matrix. e. Perform operation of Multiplication in two n * n Matrix. f. Exit Form perform every option generate a separate function. 6) Write a C program to perform following operation on it. a. Generate n * n Matrix. b. Display n * n Matrix. c. Perform operation of transpose of an n * n Matrix. d. Perform operation of sum of diagonal element of an n * n Matrix. e. Exit Form perform every option generate a separate function. 7) Write a program to search a given element in an Array using function if the element foundthen returns its position.	
	Programs related to String and Pointer: 1) Write a program to read a name through the keyboard. Determine the length of the string and find its equivalent ASCII codes. 2) Write a program to remove the Occurrences of "The" word from entered text. 3) Write a program to delete all the occurrences of the vowels in a given text. Assume that the text length will be of one line. 4) Write a program to copy the content of one string into another string using pointer and function. 5) Write a program to find that two strings are identical or not using pointer and function.	

	Programs related to Structure and Union: 1) Suppose you need to generate a result table which consists of student id, student name, marks of three Course and total marks. Write a program which takes input for ten students and displays result table. Also display student information separately who got the highest total. USE STRUCTURES. 2) Suppose you need to store information of 10 persons. Information includes name and age. But criteria is: for the child age should be in form of full birth date, for an adult the age should be in years only, while for aged person store age indicating the status 'O'. Use union for memory efficiency. **3)** Write a program to maintain the library record for 100 books with book name, author's name, and edition, year of publishing and price of the book.	
Text Books:	1. Balaguruswamy E., *Programming in ANSI C,* TMH.	
Reference Books:	1. Yashwant Kanetkar, "Pointers in C", BPB Publications. 2. Paul Deitel and Harvey Dietel, "How to Program", PHI, 6th Ed. 3. Kanitkar Yashwant, *Let Us C*, BPB. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/cprogramming/index.htm	

Course Code: BCA 255	**BCA- Semester-II** Laboratory Course (LC-4) **WEB TECHNOLOGIES LAB**	**L-0 T-0 P-4 C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying which concepts to create simple web pages using various HTML tags and attributes.	
CO2.	Applying concepts of CSS to design the layout of web pages.	
CO3.	Applying concepts of Java script to design dynamic web pages at client side.	
CO4.	Applying various web technologies in creating customized websites.	
CO5.	Understanding the CSS with its types and use them to provide the styles to the web pages at various levels.	
Course Content:		
	Basics Programs: 1. Create a simple HTML document about yourself or a topic of your choice using the basic tags learned in the first lesson. 2. Add bold and italic words to your document, save and view. 3. Add a header to your document, save and view. 4. Add paragraph and break tags to your document, save and view. 5. Add a horizontal rule where appropriate, save and view. 6. Add an unordered list to your document, save and view. 7. Add an ordered list to your document, save and view. 8. Add a definition list to your document, save and view. 9. Create a new file called *yournamefile2.htm* (it can be very basic). 10. Create a link to Yahoo (*http://www.yahoo.com*). 11. Create a link from *yournamefile2.htm* to *yournamefile1.htm*. 12. Create a page that shows the different types of heading available and show each in the same page. 13. Open one of your HTML files in your editor. 14. Add an image to your document using the tag, <IMG SRC="image.gif"> (Note**: image.gif** is a generic name. Your image may be **horse.gif** or **scenery.gif**. *Also, the image must be placed in the same directory or folder as your HTML file*. Although the image *can* be in another directory, the way to reference that image in your image tag isn't a part of this exercise). Save and view. 15. Align a short description to the bottom of your image, save and view. 16. Align the description to the top of the image, save and view.	

	17. Add a simple table to *yournamefile1.htm* without borders. Make the table with 2 rows and columns, save and view. 18. Add border value of 1, save and view. 19. Add a border value of 5, save and view. 20. Make the top row a table header, save and view. 21. Align all data elements to the middle of their cells, save and view. 22. Center one of your headers in *yournamefile1.htm*, save and view. 23. Center your image, save and view. 24. Align the image to the right, save and view. 25. Put a border around the image with a value of 1; save and view each. 26. Add a horizontal rule that is aligned to the left, is 50% of the width of the page and has a size value of 5, save and view. 27. Give some text (non-header) a font size value of +3, save and view. 28. Put a background color and text color on your page. In order to do this you must obtain the hexadecimal value for the color you want to use. The hex values are at the top of each color swatch (a 6 digit alpha-numeric number). Just plug the value in at the appropriate place in your **Body** tag. 29. Add title and footer to each page you have created till now. 30. Draw a home page of the 'Teerthankar Mahaveer University' (with tables). 31. Design a website that displays the information about the total courses offered by the university. The website should show the information about each Course in a well formatted manner. Use proper images and colors in the website. 32. Create the gallery page of the "Teerthankar Mahaveer University". In this page the different thumbnails of the pictures should be there and on the click the big picture should be seen in a new window. 33. Create a contact page of the university. The different types of controls should be seen there.	
	Program related to CSS 1. Create a page that will show the inline style of css. 2. Create a page that will show the embedding style of css. 3. Create a page that will show the different types of selectors 4. Create a page that will be done by the file style of CSS. 5. Create a page that will show the different types of property in CSS.	

	6. Create a page that will display the user information. The formatting will be done by the inline cascading style sheet. 7. Create a web page that will display the different style on a single page using the single style sheet with the help of DIV Tag. 8. Create a web page that will display the different ten properties of style sheet like margin, align, float etc.	
	Program related to JavaScript **1.** Write a JavaScript program which contain a Textbox and a submit button. To perform the operation of calculate the sum of its digits as per click on the submit button. **2.** If a five digit number input through the keyboard in the textbox, to perform logic of reverse the number as per click on submit button. **3.** If a five digit number is input through the keyboard, write a JavaScript program to print a new number by adding one of each of its digit which will be input in the Textbox. For example if the number that is input 12391 then the output should be displayed as 23402 as per click on submit button. **4.** According to the Gregorian calendar, it was Monday on the date 01/01/1990. If any year is input through the keyboard write a JavaScript program to find out what is the day on 1st January of this year. **5.** A library charges a fine for every book returned late. For first 5 day the fine is 50 paise, for 6-10 days fine is one rupee and above 10 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled. Write a JavaScript program to accept the number of days the member is late to return the book and display the fine or the appropriate message as per click on the submit button. **6.** If the three sides of a triangle are entered through the keyboard in three textbox, write a program to check whether the triangle is isosceles, equilateral, scalene or right—angled triangle as per click on the submit button. **7.** Write a JavaScript program that performs the logic of prime number finding between 1 to 300. But condition is that it will print all the number in reversing order. **8.** Write a JavaScript program that performs the logic of Fibonacci series as per given range. But condition is that it will reverse order. **9.** Write a menu driven program which has following option: a. Factorial of a number b. Armstrong or not c. Odd or even	

d. Magic number or not
e. Perfect number or not

10. Write a javascript general—purpose function to convert any given year into the textbox. The following table shows the roman equivalents of decimal numbers:

Decimal	Roman	Decimal	Roman
1	i	100	c
5	v	500	d
10	x	1000	m
50	L		

Example:
Roman equivalent of 1988 is mdcccclxxxviii
Roman equivalent of 1525 is mdxxv

11. A positive number entered through the keyboard. Write a JavaScript function to obtain the prime factors of this number. For example, prime factors of 24 are 2,2,2 and 3, whereas prime factor of 35 are 5 and 7.

12. Write a JavaScript program in which 25 numbers are entered from the keyboard into an array. Write a program to find out how many of them are positive, how many are negative, how many are even and how many are odd.

13. Implement the selection sort, bubble sort and insertion sort algorithm on a set of 25 number using JavaScript.

14. Write a JavaScript program to interchange the odd and even components of an array.

15. Create a JavaScript Program which count how many character are placed in the text area. This application contain two Button one for Total Count and another for showing the content and counting character.

16. Write a JavaScript program in which contain 3 Textbox which contain day, month, year from user and a button, on click on that button you will find the days of week.

17. Write a JavaScript program in which browser contains a textbox and a button. Perform sum the digit from 1 to range of digit which u have enter in the textbox and show the sum of the digit as per given range in the alert massage with word conversion.

18. Write a JavaScript Stopwatch program in which browser contains two Textbox and a button: one Textbox contain predetermine time and another Textbox contain Times as per decreasing order according to First Textbox when clicking on button when the time is 00:00:00 then you will get a alert massage.

19. Write a JavaScript program in which browser contains a textbox and a button. Perform the following validation when hit on the Button

a. The textbox field would not be Blank
b. Check the length of the input string in to the Textbox it would not be less than 3 and greater than 10. If the range is less than 3 and greater than 10, than perform a alert massage with the range of string.

20. Write a JavaScript Stopwatch program in which browser contains two Textbox and a button: one Textbox contain predetermine time and another Textbox contain Times as per increasing order start from 00:00 the clock will raise an alert message when the time will same as the time on first Textbox.

21. Write a JavaScript Program that will find out how many days left in this month.

22. Write a JavaScript Program that will contain a input box that will show the visitor how long they have been on your page. Time is running in increment operation.

23. When someone visits your web page, JavaScript will start the clock. When the leave that page, they will be alerted with the time they have been viewing the page.

24. Perform the Checkbox Validation using JavaScript.

25. Perform Phone Number Validation using JavaScript.

26. Perform Date Validation sing JavaScript.

27. Perform Email address Validation using JavaScript.

28. Write a JavaScript Program that will validate credit card entry.

29. Write a JavaScript program in which browser contains three textbox and a button. Perform the following operation and validation as per First textbox contain FirstName and Second Textbox contain Lastname in Proper Case. The Third Textbox contains UserId as per this rule when u hit on the Submit Button. The rule is userId contain 6 Character from the starting of Last Name and 1 cheracter of the firstname from starting after concatenate show this string as a userId in the third Textbox. If the Last Name has not 6 Character than collect all the character from the Last name and swap remaining blank from – and concatenate first character of First Name.

Example:-

First Name	Ram
Last Name	Laxman
UserID	LaxmanR

But If

First Name	Ram
Last Name	Laxm
UserID	Laxm—R

- Only Characters are Allowed in text Box
- Blank Text Box Not Allowed
- Locked UserID Text Box Mean no one can Change the

	Content.	
Text Books:	1. Burdman, Collaborative Web Development, Addison Wesley.	
Reference Books:	1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education. 3. Bayross Ivan, Web Technologies Part II, BPB Publications. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/web_development_tutorials.htm	

Course Code: TMUGA-201	Value Added Audit Course BCA- Semester-II **Analytical Reasoning**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Applying the arithmetical concepts in Ratio Proportion Variation.	
CO2.	Employing the techniques of Percentage; Ratios and Average in inter related concepts of Time and Work, Time Speed and Distance.	
CO3.	Identifying different possibilities of reasoning based problems of Syllogisms and Venn diagram.	
CO4.	Examining the optimized approach to solve logs and Surds.	
Course Content:		
Unit-1:	**Ratio, proportions and variations** Concept of ratios, proportions, variations, properties and their applications	**5 Hours**
Unit-2:	**Time and Work** Same efficiency, different efficiency, alternate work, application in Pipes and Cisterns	**6 Hours**
Unit-3:	**Time Speed Distance** Average speed, proportionalities in Time, Distance, trains, boats, races, circular tracks	**6 Hours**
Unit-4:	**Logs and Surds** Concept and properties of logs, surds and indices	**4 Hours**
Unit-5:	**Coding and decoding** Sequential coding, reverse coding, abstract coding	**3 Hours**
Unit-6:	**Syllogisms** Two statements, three statements	**4 Hours**
Unit-7:	**Venn diagram** Basic concept and applications	**2 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Course Code: BCA 306	**BCA- Semester-III** Core Course (CC-5) **OPERATING SYSTEM**	**L-2 T-1 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding to describe the functionality of operating system.	
CO2.	Understanding to understand process, its management and synchronization.	
CO3.	Understanding concept of deadlock, how it is detected and prevented.	
CO4.	Understanding concept of memory and its management and various processes to manage it.	
CO5.	Understanding concept of file management and its various techniques.	
Course Content:		
Unit-1:	Introduction to the Operating System (OS), Types of Operating System: Batch System, Time Sharing System, Real Time System. Multi Programming, Distributed System, Functions and Services of OS.	**7 Hours**
Unit-2:	**Process Management:** Process Concept, Process State, Process Control Block, Process Scheduling, CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Preemptive & Non Preemptive Scheduling.	**7 Hours**
Unit-3:	**Deadlocks:** System model, Characterization, Deadlock Prevention, Deadlock Avoidance and Detection, Recovery from deadlock.	**8 Hours**
Unit-4:	**Memory Management:** Logical Address, Physical Address, External and Internal Fragmentation. Concept of paging, Page table structure - Hierarchical Paging, Hashed Page Tables, Inverted Page Table.	**7 Hours**
Unit-5:	**Information Management:** File Concept, Access Methods, Directory Structure. Device Management: Disk Structure, Disk Scheduling Algorithms.	**7 Hours**
Text Books:	1. Silbershatz and Galvin," Operating System Concept", Addition Wesley.	
Reference Books:	1. Flynn, Mchoes, "Understanding Operating System", Thomson Press, Third Edition. 2. Tannenbaum,"Operating System Concept", Addition Weseley. 3. Joshi, R. C. and Tapaswi, S., “Operating Systems”, Wiley Dreamtech. 4. Nutt, G., “Operating Systems”, Addison-Wesley.	

	5. Godbole Ahyut, "Operating System", PHI. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/105/106105214/ https://www.youtube.com/playlist?list=PLsylUObW5M3CAGT6OdubyH6FztKfJCcFB	

Course Code: BCA 309	**BCA- Semester-III** Core Course (CC-6) **COMPUTER NETWORK**	**L-2 T-1 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basics of computer network, topology, data communication system and availability of information.	
CO2.	Understanding the layers of the OSI model and TCP/IP and explain the function of each layer.	
CO3.	Analyzing the different types of networking protocol and their functionality.	
CO4.	Analyzing the services and features of the various layers such as Application, Transport of data networks.	
CO5.	Applying the various protocols studied at different layers in real life application.	
Course Content:		
Unit-1:	**Introductory Concepts:** Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology, Physical Layer- transmission, switching methods, Integrated services digital networks.	**7 Hours**
Unit-2:	**Medium access sub layer:** Channel allocations, LAN protocols, ALOHA Protocols- Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, Ethernet, Error correction & detection algorithms, elementary data link layer protocols, sliding window protocols, error handling, High Level Data Link Control.	**7 Hours**
Unit-3:	**Network Layer:** Point-to Point networks, concept of virtual circuit and LAN, routing algorithms, congestion control algorithms, internetworking, TCP/IP protocol, UDP, SCTP, IP addresses, IPv6 Packet Format, Subneting.	**8 Hours**
Unit-4:	**Transport Layer**: Design issues, connection management, Internet Transport Protocol (UDP), Ethernet transport Protocol, Transmission Control Protocol (TCP).	**7 Hours**
Unit-5:	**Application Layer:** Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Introduction to Cryptography and Network Security Communication Security (IPSec, Firewalls). Implement a program for encryption a text with network security algorithm.	**7 Hours**

Text Books:	1. Computer Networks by A. S Tanenbaum", Pearson education.	
Reference Books:	1. Computer Networks with Internet Protocols by W Stallings, Pearson Education. 2. Local and Metropolitan Area Networks by W Stallings, Pearson Education. 3. Data and Computer Communication by W. Stallings, Macmillan Press. 4. Computer Networks & Internet with Internet Applications by Comer Pearson Education. 5. Internetworking with TCP/IP by PHI. 6. Data Communication and Networking by Forouzan TMH. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://www.university.youth4work.com/study-material/computer-networking-lecture 2. https://www.geeksforgeeks.org/computer-network-tutorials/	

Course Code: BCA 313	**BCA- Semester-III** Core Course (CC-7) **DATA STRUCTURE USING C++**	**L-2 T-1 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding and remembering the basic terminologies, compute the time complexities and analyze the usage of array.	
CO2.	Analyzing the concept of Data Structures through ADT like stack, queue and linked list, also understand the basic usage and operations to be performed on them.	
CO3.	Understanding, analyzing and applying the learnt concept to solve problems related to various sorting and searching algorithm, later performing a comparative analysis of each one of them.	
CO4.	Understanding various representations of trees and graphs and analyzing different methods to solve various problems related with them.	
CO5.	Applying algorithm for solving problems like sorting, searching, insertion and deletion of data.	
Course Content:		
Unit-1:	**Introduction**: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm, Complexity and Time-Space trade-off. **Arrays:** Array Definition, Representation and analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C++, Character string operation.	**7 Hours**
Unit-2:	**Stack**: Array Representation and Implementation of stack, Operations on Stack: Push & Pop, Linked Representation of Stack and Operations Associated with Stack, Applications of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using Stack. **Queue:** Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, and Circular queue.	**7 Hours**
Unit-3:	**Linked list:** Representation and Implementation of Singly Linked List, Traversing and Searching of linked List, Overflow and Underflow, Insertion and deletion to/from Linked List, Insertion and deletion algorithms, Doubly linked list, Circular List, Linked List v/s Array.	**8 Hours**
Unit-4:	**Sorting:** Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, and Heap Sort. Comparative Analysis of above Sorting algorithms. **Searching:** Sequential search, Binary Search.	**7 Hours**

Unit-5:	**Trees:** Basic terminology, Binary Trees, Binary tree representation, algebaric Expressions, Complete Binary Tree, Array and Linked Representation of Binary trees, Traversing Binary tree, Binary Search Tree. **Graph:** Basic terminology, Graph representation using adjacency matrix, Graph representation using adjacency list.	**7 Hours**
Text Books:	1. Lipschutz, Data Structure, Tata McGraw Hill.	
Reference Books:	1. Horowitz and Sahani, Fundamentals of Data Structures, Galgotia. 2. Kruse et.al R., Data Structures and Program Design in C, Pearson Education. 3. Cormen T. H., Introduction to Algorithms, Prentice Hall of India. 4. Loudon K., Mastering Algorithms with C, Shroff Publisher & Distributors. 5. Bruno R Preiss, Data Structures and Algorithms with Object Oriented Design Pattern in C++, John Wiley & Sons Inc. 6. Adam Drozdek, Data Structures and Algorithms in C++, Thomson Asia. 7. Tenenbaumet. al A.M., Data Structures Using C & C++, Prentice Hall of India. 8. KanitkarYashwant, Data Structure Using C, BPB. 9. Salaria R.S., Data Structure Using C, Khanna Publishers. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://www.geeksforgeeks.org/data-structures/ 2. https://www.studytonight.com/data-structures/	

Course Code: BCA 314	**BCA- Semester-III** Core Course (CC-8) **OOPs & C++**	**L-2 T-1 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concept and underlying principles of Object-Oriented Programming.	
CO2.	Understanding how object-oriented concepts are incorporated using C++ programming language.	
CO3.	Developing problem-solving and programming skills using OOP concept.	
CO4.	Understanding the benefits of a well structured program.	
CO5.	Developing the ability to solve real-world problems through software development in high-level programming language like C++ with file handling concept.	
Course Content:		
Unit-1:	**Introduction:** Introducing Object-Oriented Approach, Relating to other paradigms (functional, data decomposition). Basic terms and ideas: Abstraction, Encapsulation, Inheritance, Polymorphism, Basic programming of C++.	**7 Hours**
Unit-2:	**Classes and Objects:** Encapsulation, abstract data types, Object & classes, attributes, methods, C++ class declaration, State identity and behavior of an object, Constructors and destructors, object types, Meta class, abstract classes.	**7 Hours**
Unit-3:	**Inheritance:** Access specifiers, Types of inheritance, Ambiguity resolution in Multiple Inheritance, Constructor calling (Implicit and Explicit Constructor call) to base class, Containership and inheritance, Virtual Base Class.	**8 Hours**
Unit-4:	**Friend:** Friend Function, Friend Member Function and Friend Class. **Polymorphism:** Function Overloading, Operator overloading, operator overloading using Friend. Virtual function & Pure Virtual function.	**7 Hours**
Unit-5:	**File Handling:** Stream Classes Hierarchy, Opening and closing FILE, Read and write in file. File pointers and Manipulations, Error Handling in File Operation, Command line Argument.	**7 Hours**
Text Books:	1. Lafore R., Object Oriented Programming using C++, Galgotia.	

Reference Books:	1. Parasons D., Object Oriented Programming with C++, BPB Publication. 2. Steven C. Lawlor, The Art of Programming Computer Science with C++, Vikas Publication. 3. Schildt Herbert, C++: The Complete Reference, Tata McGraw Hill. 4. Tony Gaddis, Watters, Muganda, Object-Oriented Programming in C++, Dreamtech. 5. Venugopal A.R. & Rajkumar, T. Ravishanker,Mastering C++, Tata McGraw Hill. 6. Lippman S. B. &Lajoie J., C++ Primer, Addison Wesley. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.w3schools.com/cpp/cpp_oop.asp https://www3.ntu.edu.sg/home/ehchua/programming/cpp/cp3_OOP.html	

Course Code: BCA 308	**BCA- Semester-III** **General Elective Course (GEC) - I** **SYSTEM ANALYSIS AND DESIGN**	**L-2** **T-1** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding what systems are and how they are developed.	
CO2.	Understanding to describe the role and responsibilities of the systems analyst in the development and management of systems.	
CO3.	Understanding to identify and describe the phases of the systems development life cycle.	
CO4.	Understanding to analysis portion of the systems development life cycle in a disciplined manner.	
CO5.	Understanding to use CASE tools and techniques for process and data modeling.	
CO6.	Understanding to develop and deliver a requirements definition proposal for a new system in a well-structured business proposal.	
Course Content:		
Unit-1:	**System Definition and concepts:** General Theory system, Manual and automated system, Real life Business Sub-Systems. System Environments and Boundaries, Real-time and distributed system, Basic principles of successful system, Approach to system development: Structured System Analysis and Design, Prototype, Joint Application Development, Role and Need of System Analyst.	**7 Hours**
Unit-2:	**Introduction to System Development Life Cycle** (SDLC), Various phases of SDLC: System Analysis, Design, Development, Implementation, Maintenance; Documentation: Principles of System Documentation, Types of documentation and their importance.	**7 Hours**
Unit-3:	**Data and fact gathering techniques:** Interviews, Group Communication -Questionnaires; Assessing Project Feasibility: Technical, Operational, Economic and Cost Benefits Analysis. Modern Methods for determining system requirements: Joint Application Development Program, Prototyping, Business Process Re-engineering. System Selection Plan and Proposal.	**8 Hours**
Unit-4:	**Module specifications**: Top-down and bottom-up design, Module coupling and cohesion, Structure Charts. Process Modeling, Logical and physical design, Conceptual Data Modeling: Entity /Relationship Analysis, Entity-Relationship Modeling, ERDs and DFDs. Process Description: Structured English, Decision Tree, Decision Table, Data Dictionary.	**7 Hours**

Unit-5:	**Classification of forms**: Input/output forms design, User-interface design, Graphical interfaces. Standards and guidelines for GUI design, Designing Physical Files and Databases: Designing Fields, Designing Physical Records, Designing Physical Files, Designing Databases, System planning considerations, Conversion methods, procedures and controls, Testing and Validation, Preparing User Manual, Maintenance Activities and Issues.	**7 Hours**
Text Books:	1. E M Awad, 'Systems Analysis and design', Galgotia(P) Ltd.	
Reference Books:	1. A Hoffer, F George, S Valaciah, **'**Modern System Analysis & Design' Low Priced Edition,Pearson Education. 2. V K Jain, 'Systems Analysis and design', Dreamtech Press. 3. Whitten J. L, Bentley L. D, 'Systems Analysis and Design Methods', Tata McGraw-Hill. 4. A. Dennis and B. H. Wixom, 'Systems Analysis and Design', John Wiley & Sons, Inc. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/system_analysis_and_design/system_analysis_and_design_overview.htm	

Course Code: BCA 315	BCA- Semester-III General Elective Course (GEC) - I **MANAGEMENT INFORMATION SYSTEM**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the role of information technology and information systems in business.	
CO2.	Understanding the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making.	
CO3.	Analyzing and synthesize business information and systems to facilitate evaluation of strategic alternatives.	
CO4.	Effectively communicate strategic alternatives to facilitate decision making.	
CO5.	Understanding security and control issues in information system.	
Course Content:		
Unit-1:	**Foundation of Information Systems in Business:** Information system in business, The Components of an Information system, Types of information systems.	**7 Hours**
Unit-2:	Concept of MIS, Structure of MIS, MIS & Decision Support Systems, End user and Enterprise Computing Application software and System software.	**7 Hours**
Unit-3:	**Managerial Overview:** Database Management: Managing Data Resources, Technical foundation of database management Resources. Fundamentals of strategic advantage, Using Information for strategic advantage.	**8 Hours**
Unit-4:	**Business Applications of Information Technology:** Internet & Business, Intranet, Extranet & Enterprise Solutions, Information System for Managerial Decision Support.	**7 Hours**
Unit-5:	**Managing Information Technology:** Managing Information Resources and technologies, Global information technology, Security and control Issues in Information system, ethical and societal challenges of IT.	**7 Hours**
Text Books:	1. Brian O., *Management Information System*, Tata McGraw Hill.	
Reference Books:	1. Murdick, *Information System for Modern Management*, PHI. 2. Jawadekar, *Management Information System*, Tata McGraw	

	Hill. 3. Jain Sarika, *Information System*, PPM. 4. Davis, *Information System*, Palgrave Macmillan. 5. Gordon B., Davis &Margrethe H. Olson, *Management Information System*, Tata McGraw Hill. 6. Brian O., *Introduction to Information System*, McGraw Hill. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.geeksforgeeks.org/management-information-system-mis/	

Course Code: TMUGE 301	BCA- Semester-I Ability Enhancement Compulsory Course (AECC-6) **ENGLISH COMMUNICATION – III**	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Remembering and understanding the English grammar and vocabulary.	
CO2.	Understanding the art of public speaking and strategies of reading comprehension.	
CO3.	Applying correct vocabulary and sentence construction during public speaking or professional writing.	
CO4.	Analyzing different types of sentences like simple, compound and complex.	
CO5.	Drafting notice, agenda and minutes of the meeting.	
CO6.	Demonstrating speaking skills during common conversation and power point presentation.	
Course Content:		
Unit-1:	**English Grammar & Vocabulary** • Correction of Common Errors (with recap of English Grammar with its usage in practical context.) • Synthesis: Simple, complex and compound sentence • Commonly used Idioms & phrases (Progressive learning whole semester)	**7 Hours**
Unit-2:	**Speaking Skills** • Art of public speaking • Common conversation • Extempore • Power Point Presentation (PPT) Skills**:** Nuances of presenting PPTs	**7 Hours**
Unit-3:	**Comprehension Skills** • Strategies of Reading comprehension: Four S's • How to solve a Comprehension (Short unseen passage: 150-200 words)	**8 Hours**
Unit-4:	**Professional Writing** Preparing Notice, Agenda & Minutes of the Meeting	**7 Hours**
Unit-5:	**Value based text reading:** Short story The Barber's Trade Union – Mulk Raj Anand	**7 Hours**

Text Books:	**1.** Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
Reference Books:	**1.** Allen, W. "Living English Structure" Pearson Education, New Delhi. **2.** Joseph, Dr C.J. & Myall E.G. "A Comprehensive Grammar of Current English" Inter University Press, Delhi **3.** Wren & Martin "High School English Grammar and Composition" S.Chand & Co.Ltd., New Delhi. **4.** Norman Lewis "Word Power Made Easy" Goyal Publications & Distributers, New Delhi. **5.** Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi. **6.** Kumar Sanjay &Pushplata "Communication Skills" Oxford University Press, New Delhi. **7.** Agrawal, Malti "Professional Communication" KrishanaPrakashan Media (P) Ltd. Meerut. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://nptel.ac.in/courses/109/106/109106129/ 2. https://www.youtube.com/watch?v=0AM35Nu5McY	
Methodology:	**1.** Idiom & Phrases and exercises, usage in sentences. **2.** Language Lab software. **3.** Power Point presentation. **4.** Newspaper reading, short articles from newspaper to comprehend and short movies. **5.** Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized. **6.** Text reading: discussion in detail, Critical appreciation by reading the text to develop students' reading habits with voice modulation. **Note 1:** • Class (above 30 students) will be divided in to two groups for effective teaching. • For effective conversation practice, groups will be changed weekly. **Note 2**: *External Viva will be conducted by 2-member committee comprising* *a) One Faculty teaching the class* *b) One examiner nominated by University Examination cell.* *Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.*	

Evaluation Scheme

Internal Evaluation			External Evaluation		Total Marks
40 Marks			60 Marks		
20 Marks (Best 2 out of Three CTs) ***(From Unit- I, III,IV & V)***	10 Marks (Oral Assignments) ***(Unit –II)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit- I, III,IV & V)***	20 Marks (External Viva)* ***(Unit –II)***	**100**

*Parameters of External Viva

Content	Body Language	Communication skills	Confidence	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note*:External Viva will be conducted by 2-member committee comprising*

a) *One Faculty teaching the class*
b) *One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: BCA 355	BCA- Semester-III Laboratory Course (LC-5) **DATA STRUCTURE USING C++ LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying the learnt concept for evaluating the operations on arrays, stack, queue and linked list.	
CO2.	Analyzing and applying the techniques for solving problems related to searching and sorting.	
CO3.	Understanding the use of array representation.	
CO4.	Understanding the use of Binary Search Tree and applying the concept to evaluate the operations to be performed on it.	
CO5.	Understanding and evaluating the time complexities of various algorithms and data structure implemented for solving the problems.	
Course Content:		
	Array: Insertion of element in an array, deletion of element from an array.	
	Sorting: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Two Way Merge Sort and Heap Sort.	
	Searching: Sequential search, binary search.	
	Stack: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Conversion of Infix to Prefix and Postfix Expressions.	
	Queue: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Circular queue.	
	Linked list: Representation and Implementation of Singly Linked List, Traversing and Searching, Inserting and Deleting of Linked List. Same operation in Doubly Linked List, Circular Linked List.	
	Binary Search Tree: Creation, searching and traversal.	
Text Books:	1. Lipschutz, Data Structure, Tata McGraw Hill.	
Reference Books:	1. Kruse et.al R., Data Structures and Program Design in C, Pearson Education. 2. Tenenbaumet. al A.M., Data Structures Using C & C++, Prentice Hall of India. *** Latest editions of all the suggested books are recommended.**	

Additional Electronic Reference Material:	1. https://www.geeksforgeeks.org/data-structures/ 2. https://www.studytonight.com/data-structures/	

Course Code: BCA 356	**BCA- Semester-III** Laboratory Course (LC-6) **OOPs & C++ LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Developing the ability to study the basic concepts of Object oriented Programming. Students will be able to write programs in C++.	
CO2.	Becoming familiar with the fundamentals and acquire programming skills in the C++ language.	
CO3.	Developing efficient program for operator and function overloading concept	
CO4.	Developing efficient program for friend function and virtual function.	
CO5.	Demonstrate the use of various OOPs concepts with the help of programs.	
Course Content:		
	1) Program illustrating basic input/output operations using CIN, COUT. **2)** Implementing class and objects. **3)** Implementing function overloading. **4)** Implementing various constructors and destructor **5)** Program illustrating overloading of various operators. **6)** Program illustrating use of Friend, Inline, Static Member functions, default arguments. **7)** Program illustrating various forms of Inheritance **8)** Program illustrating use of virtual functions, virtual Base Class. **9)** Program illustrating use of file handling	
Text Books:	1. Lafore R., Object Oriented Programming using C++, Galgotia.	
Reference Books:	1. Schildt Herbert, C++: The Complete Reference, Tata McGraw Hill. 2. Tony Gaddis, Watters, Muganda, Object-Oriented Programming in C++, Dreamtech. 3. Venugopal A.R. &Rajkumar, T. Ravishanker,Mastering C++, Tata McGraw Hill. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.w3schools.com/cpp/cpp_oop.asp https://www3.ntu.edu.sg/home/ehchua/programming/cpp/cp3_OOP.html	

Course Code: TMUGA-302	BCA- Semester-III Value Added Course (VAC-3) **Modern Algebra and Data Management**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.	
CO2.	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.	
CO3.	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data.	
CO4.	Correlating the various arithmetic concepts to check sufficiency of data	
Course Content:		
Unit-1:	**Number theory** Classification of Numbers, Divisibility Rules, HCF and LCM, Factors, Cyclicity(Unit Digit and Last Two digit), Remainder Theorem, Highest Power of a Number in a Factorial, Number of trailing zeroes	**8 Hours**
Unit-2:	**Data interpretation** Data Interpretation Basics, Bar Chart, Line Chart, Tabular Chart, Pie Chart, DI tables with missing values	**7 Hours**
Unit-3:	**Data Sufficiency** Introduction of Data Sufficiency, different topics based DS	**5 Hours**
Unit-4:	**Permutations and combinations** Fundamental counting, and or, arrangements of digits, letters, people in row, identical objects, rank, geometrical arrangements, combination: - basic, handshakes, committee, selection of any number of objects, identical and distinct, grouping and distribution, de-arrangements	**6 Hours**
Unit-5:	**Probability** Introduction, Probability based on Dice and Coins, Conditional Probability, Bayes Theorem	**4 Hours**
Reference Books:	R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude R2:-Quantitative Aptitude by R.S. Agrawal R3:-M Tyra: Quicker Maths R4:-Nishith K Sinha:- Quantitative Aptitude for CAT R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com R6:-Logical Reasoning by Nishith K Sinha R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Course Code: **TMUGS-301**	**BCA- Semester-III** **Value Added Course (VAC-4)** **Managing Self**	**L-2** **T-1** **P-0** **C-0**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
CO2.	Understanding and analyzing self and devising a strategy for self growth and development.	
CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
CO4.	Utilizing time in the most effective manner and avoiding procrastination.	
CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
Course Content:		
Unit-1:	**Personal Development:** Personal growth and improvement in personality Perception Positive attitude Values and Morals High self motivation and confidence Grooming	**10 Hours**
Unit-2:	**Professional Development:** Goal setting and action planning Effective and assertive communication Decision making Time management Presentation Skills Happiness, risk taking and facing unknown	**8 Hours**
Unit-3:	**Career Development:** Resume Building Occupational Research Group discussion (GD) and Personal Interviews	**12 Hours**
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education	

2. Tracy, Brian, Time Management (2018), Manjul Publishing House
3. Hill, Napolean, Think and grow rich (2014), Amazing Reads
4. Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub
5. https://www.hloom.com/resumes/creative-templates/
6. https://www.mbauniverse.com/group-discussion/topic.php
7. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan
8. Burne, Eric, Games People Play (2010), Penguin UK
9. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression

*** Latest editions of all the suggested books are recommended.**

Course Code: BCA 402	BCA- Semester-IV Core Course (CC-9) **SOFTWARE ENGINEERING**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying the concepts of life cycle models to choose the appropriate model.	
CO2.	Analyzing the requirements and design the software.	
CO3.	Creating or implementing the software based on the industry standards	
CO4.	Designing and developing test cases.	
CO5.	Designing software by applying the software engineering principles.	
Course Content:		
Unit-1:	**Introduction:** Software Engineering approach, Need of engineering aspect for Software Design, SDLC, Software Crisis, Software Process, Process models (Classical Waterfall Model, Build-nFix Model, Iterative Waterfall Model, Prototyping Model, Evolutionary Model and Spiral Model)	**7 Hours**
Unit-2:	**Software Requirement Analysis and Specifications:** Software Requirement Specifications, Need of SRS, Steps for constructing good SRS, Behavioral and Non-Behavioral requirements, Analysis Model.	**7 Hours**
Unit-3:	**Software Design:** Design Concepts & Principle, problem partitioning, abstraction, and top down and bottom up-design, Cohesion & Coupling, How to measure degree of Cohesion and Coupling, Function Oriented Design, DFDs, Structure Chart, Object Oriented Design. Coding: Top-Down and Bottom–Up programming, Structured programming, Programming style, Do's and Don'ts for Coding.	**8 Hours**
Unit-4:	**Coding**: Programming languages and development tools, Selecting languages and tools, Good programming practices Coding Standards.	**7 Hours**
Unit-5:	**Software Maintenance:** Software Maintenance Process and its types, Introduction to Reverse Engineering. Software Reliability & Quality Assurance: Software Reliability issues, Software quality, Overview of Quality Standards like ISO 9001, SEI-CMM and its comparison with ISO, Introduction, scope and architecture of CASE.	**7 Hours**

Text Books:	1. Rajib Mall, "Software Engineering ", PHI.	
Reference Books:	1. Ian Sommerville, Software Engineering, Pearson Education (Addison Wesley). 2. P. Jalote, "An Integrated approach to Software Engineering", Narosa. 3. Waman S. Jawadekar,"Software Engineering: Principles and Practice", McGraw Hill. 4. K.K.Agrawal&Yogesh Singh, "Software Engineering", New Age Publication. 5. R. S. Pressman, "Software Engineering – A practitioner's approach", McGraw Hill Int.Ed. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf 2. https://www.tutorialspoint.com/software_engineering/index.htm	

Course Code: BCA 407	**BCA- Semester-IV** **Core Course (CC-10)** **COMPUTER GRAPHICS**	**L-2** **T-1** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basics of computer graphics and animation, different graphics systems, and applications of computer graphics.	
CO2.	Understanding various algorithms for line drawing, circle drawing, and filling of bounded objects.	
CO3.	Understanding the geometric transformations on graphics objects and their applications in composite form.	
CO4.	Understanding different clipping methods and its transformation to graphics display device.	
CO5.	Analyzing different line, polygon, and text clipping methods.	
Course Content:		
Unit-1:	**Introduction of Computer Graphics:** Application areas of Computer Graphics, Overview of graphics systems. **Graphics primitives:** video-display devices, and raster-scan systems, random scan systems, Plasma displays, LCD, input devices.	**7 Hours**
Unit-2:	**Output Primitives**: Points and lines, Line drawing algorithms: DDA, Bresenham's algorithm, Circle drawing algorithms: Mid-point algorithm, Bresenham's algorithm, Filled area primitives: Scan line polygon fill algorithm, Boundary-fill and Flood-fill algorithms.	**7 Hours**
Unit-3:	**2-D Geometrical Transforms:** Translation, rotation, scaling, reflection and shear transformations, homogeneous coordinate system, composite transforms, transformations between coordinate systems, Introduction of 3-D Transformation.	**8 Hours**
Unit-4:	**2-D Viewing:** The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland – Hodgeman polygon clipping algorithm, Curve clipping, Text clipping.	**7 Hours**
Unit-5:	**Computer Animation:** Design of animation sequence, General computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.	**7 Hours**
Text Books:	1. Donald Hearn &M.Pauline Baker, Computer Graphics C Version, Pearson Education.	
Reference	1. Donald Hearn &M.Pauline Baker, Computer Graphics, Prentice Hall of	

Books:	India. 2. Zhigand Xiang, Roy Plastock, Schaum's Outlines, Computer Graphics, TataMc-Graw Hill. 3. David F Rogers, Procedural Elements for Computer Graphics, Tata McGraw Hill. 4. GovilShalin, Principles of Computer Graphics, PAI, Springer. 5. Steven Harrington, Computer Graphics, Tata McGraw Hill. 6. Amrendra N Sinha and Arun D Udai," Computer Graphics", TMH. 7. VanDam, Feiner& Hughes, Computer Graphics Principles &Practice, Pearson Education. 8. Steven Harrington, Computer Graphics, Tata McGraw Hill. 9. Schaum's Outline Computer Graphics,McGraw-Hill. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/computer_graphics/computer_graphics_tutorial.pdf	

Course Code: BCA 416	BCA- Semester-IV Core Course (CC-11) **DATABASE MANAGEMENT SYSTEM**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basics of database concepts including design of data models, database architecture and database languages.	
CO2.	Analyzing the performance of data models using entity relationship model and relational model with the help of E-R diagram, extended E-R diagram, key concepts and integrity constraints.	
CO3.	Applying the relational database concepts on relational tables with DDL, DML and DCL queries and operations like subqueries, join, union, intersection using SQL.	
CO4.	Understanding and applying the concept of functional dependency and normalization upto 3NF and BCNF on relational tables with transaction processing, serializability and recovery.	
CO5.	Understanding and analyzing the concept of concurrency control protocols and locking on database transactions with recovery techniques and database security.	
Course Content:		
Unit-1:	**Introduction:** An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and data base language and their interfaces, Data definition language, DML, Overall Database Structure.	**7 Hours**
Unit-2:	**Data modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagram to tables, extended ER model. **Relational data Model and Language:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra.	**7 Hours**
Unit-3:	**SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Insert, update and delete operations, sub queries, Aggregate functions, Joins, Unions, Intersection, Minus operations. Roles and Privileges.	**8 Hours**
Unit-4:	**Data Normalization:** Functional dependencies, Normal form up to 3rd normal form & BCNF **Transaction Processing Concepts:** Transaction system, testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability,	**7 Hours**

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

Course Code: BCA 411	BCA- Semester-IV Departmental Specific Elective (DSE) - I **ETHICAL HACKING FUNDAMENTAL**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding basic terminology and the fundamentals associated with Hacking in good or bad perspective.	
CO2.	Remembering with different ways and methodology of Hacking.	
CO3.	Understanding the nature, class, and platforms to tackle for web and network-based Hacking.	
CO4.	Understanding to plan tracking and a vulnerability assessment for web-based applications.	
CO5.	Applying to express the basic understanding of ethical hacking laws and tests.	
CO6.	Identifying and report on the strengths and vulnerabilities of the tested network.	
Course Content:		
Unit-1:	**Introduction to Ethical Hacking:** Hacking Methodology, Process of Malicious Hacking, Foot printing and Scanning: Foot printing, Scanning. Enumeration: Enumeration. System Hacking and Trojans: System Hacking, Trojans and Black Box Vs White Box Techniques.	**7 Hours**
Unit-2:	**Hacking Methodology:** Denial of Service, Sniffers, Session Hijacking and Hacking Web Servers: Session Hijacking, Hacking Web Servers. Web Application Vulnerabilities and Web Techniques Based Password Cracking: Web Application Vulnerabilities, Web Based Password Cracking Techniques.	**7 Hours**
Unit-3:	**Web and Network Hacking :** SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security. Linux Hacking: Linux Hacking. Evading IDS and Firewalls: Evading IDS and Firewalls.	**8 Hours**
Unit-4:	**Report writing & Mitigation:** Introduction to Report Writing & Mitigation, requirements for low level reporting & high level reporting of Penetration testing results, Demonstration of vulnerabilities and Mitigation of issues identified including tracking.	**7 Hours**
Unit-5:	**Ethical Hacking Laws and Tests :** An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking, ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking – Social Engineering, Host Reconnaissance.	**7 Hours**

Text Books:	1. Michael T. Simpson, Kent Backman, James E. "Corley, Hands-On Ethical Hacking and Nework Defense", Second Edition, Cengage Course.	
Reference Books:	1. Steven DeFino, Barry Kaufman, Nick Valenteen, "Official Certified Ethical Hacker Review Guide", CENGAGE Course. 2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress Basics Series – Elsevier. 3. Whitaker & Newman, "Penetration Testing and Network Defense", Cisco Press, Indianapolis. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/ethical_hacking/index.htm	

Course Code: BCA 412	BCA- Semester-IV Departmental Specific Elective (DSE) - I **MOBILE DEVICE AND NETWORK ARCHITECTURE**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basics of computer network, Communication Channels, data communication system and OSI Data Models.	
CO2.	Understanding the working of cellular Network, Mobile Network Architecture, Base station subsystem, SMS network Architecture.	
CO3.	Analyzing the basic SMS protocols and creates some basic applications.	
CO4.	Understanding the 2G Network Architecture, GPRS Architecture, GPRS Protocols, UMTS Spectrum and 3GPP2 Network Architecture.	
CO5.	Understanding the Wireless Network, Working of Bluetooth wireless networks, leant about handset manufacturing.	
CO6.	Understanding and analyzing the handset characteristic; analyzing the different handset models.	
Course Content:		
Unit-1:	**Communication Principles**: Wireless Communication Principles, Radio Communication, Analog and Digital Communication, Benefits of Digital Signals, Computer Network, OSI Model, Mobile Network OSI layer functions, Mobile Network Protocol Layers. Introduction to Basic Telephony, POTS (Plain Old Telephone Service), Telephony Networks, PSTN (Public Switched Telephone Network), Telephone Network Hierarchy, Telecommunication Networks, Fixed Networks, Mobile Networks.	**7 Hours**
Unit-2:	**Mobile Cellular Networks**: Cellular Network Concepts, Cells and Base Stations, Frequency and Interface in Cells, Access Channels, Mobile Network Architecture, Mobile Network, Mobile Network Subsystems, Mobile Station, Base Station Subsystems, Network Switching Subsystems, Mobile Network Protocol Stacks, Core Networks, PLMN (Public Land Mobile Network), Mobile Network Fundamentals, Mobile Network Features, Mobility, Registration, Handoff, Roaming, Mobile Network Fundamentals (SMS), SMS (Short Message Service), SMS Network Architecture, SMS Network Elements, SMS Protocols, SMS Applications & Short Codes.	**7 Hours**
Unit-3:	**GSM and CDMA Networks:** GSM History, GSM RF Channels, 2G Network Architecture, GSM Protocol Stack, GPRS Standards,	**8 Hours**

	CS and PS Domains, GPRS Architecture, GPRS Network Architecture, GPRS Protocols, CDMA Evolution, 2G CDMAOne, CDMA 2G Standards, 3GPP2 Network Architecture, Mobile IP, UMTS Spectrum, UMTS Radio Access Network, UMTS Protocol Stacks, SIP Network, UMTS Multiple Access Network Architecture, 4G.	
Unit-4:	**Handset Evolution, Handset Characteristics and Features** : Mobile Phone and Network Evolution, Cellular Networks, Cell Phones, Mobile Phones, Mobile Handset Characteristics, Wireless Cellular, Bluetooth , Display, Keypad, Camera, Mobile Handset Categories, Low end Phones, Feature Phones, Smart phones, Handset Components, Handset Design, Handset Manufacture, Handset Bill of Materials, assembling handsets.	**7 Hours**
Unit-5:	**Hardware Architecture and Subsystems** : Handset hardware architecture, Primary Hardware Subsystems, Element inside a Mobile Handset, Hardware Architecture Evolution, Processing Subsystem architecture, Hardware architectural trends, CPU and Memory, Memory, Internal storage, Hardware evolution, Introduction to the Radio subsystems, Function of the RF Subsystems**,** Handset Power Requirements, Power Management, Power reduction techniques, Power Subsystem components, Introduction and Definition to the SIM, Smartcards in general and concept of Mobile Identity , Functions and usage of the SIM , Phones without SIMs.	**7 Hours**
Text Books:	1. Wireless and Mobile Network Architectures by Yi-Bang Lin and Imrich Chlamtac, Wiley-India.	
Reference Books:	1. Mobile Computing – Technology, Application & Service Creation by Asoke. K Talukder, Roopa R. Yavagal, Asoke K. Talukder, Tata McGraw-Hill. 2. GSM - Architecture, Protocols and Services by JörgEberspächer, Hans-JoergVögel, Christian Bettstetter, Christian Hartmann John Wiley & Sons. 3. Mobile Networks Architecture by Andre Perez, Wiley. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://en.wikipedia.org/wiki/Mobile_architecture https://www.tutorialspoint.com/lte/lte_network_architecture.htm	

Course Code: BCA 417	BCA- Semester-IV Departmental Specific Elective (DSE) - I **DISCRETE MATHEMATICS**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Expressing a logic sentence in terms of predicates, quantifiers, and logical connectives and also will be able to apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.	
CO2.	Evaluating Boolean functions and simplify expressions using the properties of Boolean algebra.	
CO3.	Understanding the concepts of sets, relations and functions to find out the solution of a given problem.	
CO4.	Understanding the concepts of recurrence relations and generating functions in combinatorics and applying the various counting principles to find out the solution of a given problem.	
CO5.	Understanding the concepts of graph and tree in discrete structures related to the real life applications with the help of graphs and trees.	
Course Content:		
Unit-1:	**Propositional Calculus:** Propositions, Truth tables, Logical Equivalence, Logical implications, Algebra of propositions, Conditional propositions, Bi-conditional statements, Negation of Compound statements, Tautologies and Contradiction, Normal Form, Arguments, Fallacies.	**7 Hours**
Unit-2:	**Boolean algebra and Circuits:** Boolean Expression, Logic Gates, Logic Circuits, Boolean Functions, Sum of Product and Product of Sum Forms, Canonical Forms, Simplification of functions using K-Map.	**7 Hours**
Unit-3:	**Set Theory:** Basic concepts of Set theory, some operations on sets, Venn diagram, Basic Set identities, Cartesian product. **Relation:** Definition, Types of relation, Pictorial representation of relation, Composition of Relation, Equivalence relation. **Function:** Definition, Classification of function, Types of function (one to one, many to one, into, onto, objective), Composition of function, Inverse function, Identity function.	**8 Hours**
Unit-4:	**Combinatorics:** Fundamental principles, Permutation and Combination, Recurrence Relation.	**7 Hours**

Unit-5:	**Graphs and Trees:** Introduction to graphs, Graph terminology, Application of Graphs, Finite and Infinite graphs, Incidence and Degree, Isolated vertex, Pendent Vertex, and Null graph.	**7 Hours**
Text Books:	1. Sarkar Swapan Kumar, Discrete Mathematics, S Chand.	
Reference Books:	1. Liu C.L., Elements of Discrete Mathematics, TMH. 2. Neville Dean, Essence of Discrete Mathematics, Prentice Hall. 3. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw Hill. 4. Richard Johnsonbaugh, Discrete Mathematics, Macmillan. 5. NarsinghDeo, Graph Theory with Applications to Engineering and Comp. Science, Prentice Hall of India. 6. Seymour Lipschutz & Marc Lipson, Discrete Mathematics, Tata McGraw Hill. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://www.tutorialspoint.com/discrete_mathematics/index.htm 2. https://www.javatpoint.com/discrete-mathematics-tutorial	

Course Code: BCA 418	BCA- Semester-IV Departmental Specific Elective (DSE) - I **ENTERPRISE RESOURCE PLANNING**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Undersatnding use of Enterprise software, and its role in integrating business functions.	
CO2.	Analyzing the strategic options for ERP identification and adoption.	
CO3.	Designing the ERP implementation strategies.	
CO4.	Creating reengineered business processes for successful ERP implementation.	
CO5.	Understanding future and scope of Enterprise Integration Application.	
Course Content:		
Unit-1:	**ERP: An Overview:** Concept of ERP, Reasons for Growth Of ERP**,** Problem areas in ERP implementations, The future of ERP Characteristics and features of ERP**,** Benefits of ERP.	**7 Hours**
Unit-2:	**Enterprise Modeling and Integration for ERP:** Enterprise: An overview, Integrated Management Information, The role of enterprise, Business modeling, Integrated Data Model Scope of Enterprise system, Generic Model of ERP System, Client/Server Architecture Characteristics of client/Server Architecture, Different Components of ERP Client/Server Architecture.	**7 Hours**
Unit-3:	**ERP and related Technologies:** BPR(Business Process reengineering), BPR –The different phases, BPR and IT, Data Warehousing, Data Warehouse Components, Structure and Uses of Data Warehouse, Data Mining, Data Mining Process, Advantages and Technologies Used In Data Mining, OLAP, Supply Chain Management, ERP Vs SCM, CRM.	**8 Hours**
Unit-4:	**ERP Implementation:** .Evolution of ERP, Evolution of Packaged Software Solutions, The Obstacles in ERP implementation, ERP Implementation Lifecycle (Different Phases), Implementation Methodology, ERP Implementation, The Hidden Costs, In-house Implementation-Pros and Cons, Vendors and role of vendors for ERP, Consultants and role of consultants for ERP.	**7 Hours**
Unit-5:	**ERP Present and Future:** Limitations of ERP, EIA (Enterprise Integration Application), EIA Products, ERP And E-Commerce, ERP and Internet, Future Directions in ERP.	**7 Hours**

Text Books:	1. Alexis Leon, "ERP Demystified", Tata McGraw Hill.	
Reference Books:	1. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI. 2. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology. 3. Mary Summer, "Enterprise Resource Planning"-Pearson Education. 4. Ellen Mon, Bret Wagner "Concepts in ERP", Second Edition of Cengage Learning. 5. Rahul V. Altekar "Enterprisewide Resource Planning", Tata McGraw Hill. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/management_concepts /enterprise_resource_planning.htm	

Course Code: BCA 408	**BCA- Semester-IV** **General Elective Course (GEC) - II** **FUNDAMENTALS OF ACCOUNTING**	**L-2** **T-1** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding meaning and concepts of accounting.	
CO2.	Understanding and prepare different type of accounts and accounting books.	
CO3.	Analyzing the effect of business transactions on an organization's financial records.	
CO4.	Analyzing and compare inter-organizational and intra-organizational financial records to make appropriate decisions.	
CO5.	Creating the capacity to understand and convey accounting information to different stakeholders of the organization.	
CO6.	Use accounting information to solve a variety of business problems.	
Course Content:		
Unit-1:	**Accounting:** Meaning and Concepts, Difference between accounting and book keeping, Importance and Limitations of Accounting, Users of Accounting information, Accounting Principles, Conventions and Concepts.	**7 Hours**
Unit-2:	**Subsidiary Books:** Purchase book, sales book, purchase return book, sales return book, debit note, credit note Types of accounts, golden rules of accounting, Preparation of Journal, Ledger and Trial balance.	**7 Hours**
Unit-3:	**Preparation of Final Accounts:** Manufacturing Account, Trading Account, Profit and Loss Account, Balance Sheet (without adjustments).	**8 Hours**
Unit-4:	**Common Size Statements:** Comparative Financial Statements, Balance Sheet, Profit and Loss Account.	**7 Hours**
Unit-5:	Preparation of Bank Reconciliation Statement.	**7 Hours**
Text Books:	1. Maheswari S.N. & Maheswari S. K., Introduction to Financial Accountancy, Vikas Publications.	
Reference Books:	1. Jawahar Lal, Financial Accounting, Wheeler Publishing. 2. Gupta R.L. & Radhaswamy-Fundamentals of Accounting. 3. Chawla & Jain-Financial Accounting. 4. Grewal. T.S., Fundamentals of Accounting, Sultan chand &	

	Sons Pvt Ltd New Delhi. 5. Goel D.K. , Introduction to Accounting. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.coursera.org/specializations/accounting-fundamentals	

Course Code: BCA 414	BCA- Semester-IV General Elective Course (GEC) - II **RETAIL MANAGEMENT**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concepts of effective retailing.	
CO2.	Know the recent trends in retailing in India.	
CO3.	Possess the knowledge of various retail formats and will be understand the retail customer.	
CO4.	Understanding the functionality of merchandise management.	
CO5.	Understanding the relationship marketing strategies.	
Course Content:		
Unit-1:	**Introduction to Retailing:** Concept of retailing, Functions of retailing, Terms & Definition, Retail formats and types, Retailing Channels, Retail Industry in India, Importance of retailing, changing trends in retailing.	**7 Hours**
Unit-2:	**Understanding the Retail Consumer:** Retail consumer behavior, Factors influencing the Retail consumer, Customer decision making process, Types of decision making, Market research for understanding retail consume .	**7 Hours**
Unit-3:	**Retail Market Segmentation and Strategies:** Market Segmentation and its benefits, Kinds of markets, Definition of Retail strategy, Strategy for effective market segmentation, Strategies for penetration of new markets, Growth strategies, Retail value chain.	**8 Hours**
Unit-4:	**Merchandise Management:** Meaning of Merchandising, Factors influencing Merchandising, Functions of Merchandising Manager, Merchandise planning, Merchandise buying, Analyzing Merchandise performance.	**7 Hours**
Unit-5:	**Retail Space Management and Marketing**: Definition of Space Management, Store layout and Design, Visual Merchandising, Promotions Strategy, Relationship Marketing Strategies, CRM, Retail Marketing Mix, Retail Communication Mix, POP Displays.	**7 Hours**
Text Books:	1. David Gilbert, "Retail Marketing Management" by Pearson.	
Reference Books:	2. "Retailing Management: Text and Cases" – Swapna Pradhan, Macgraw Hill Education. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/retail_management/retail_management_tutorial.pdf	

Course Code: BCA 415	BCA- Semester-IV General Elective Course (GEC) - II **DIGITAL MARKETING**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding digital marketing knowledge to business solutions in local and global environment.	
CO2.	Identify and applying research digital marketing issues in business situations.	
CO3.	Analyzing the issues, draw appropriate and well justified solutions, and develop and evaluate an effective digital marketing plan.	
CO4.	Effectively communicate digital marketing knowledge in oral and written contexts.	
CO5.	Critically review digital marketing decisions on the basis of social, environmental and cultural considerations.	
Course Content:		
Unit-1:	**Introduction to Digital Marketing:** Definition, Key concept of Digital Marketing, Traditional vs. Digital Marketing, Benefits of using Digital media, Opportunity of Digital Marketing, Inbound and Outbound Marketing, Components of Online Marketing – Email, Forum, Social Network, Banner, BLOG, Newsletter Understanding Traffic & Leads.	**7 Hours**
Unit-2:	**Search Marketing:** Introduction to Search Engine Optimization (SEO), Need of an SEO friendly website, Benefits of Search Positioning, Role of Keywords in SEO, Meta Tags and Meta Description, On-page & Off-page optimization, Internal & External Links, Organic vs. non-organic SEO.	**7 Hours**
Unit-3:	**Email Marketing:** Introduction to Email Marketing, Elements of Email, Email List Generation, Email Structure, Email Delivery, Online Data Capture, Off Line data Capture. **Digital Display Advertising:** Concepts, Benefits, Challenges.	**8 Hours**
Unit-4:	**Social Media Marketing:** Key Concepts, Different Social Media Channels – Facebook, YouTube, Twitter, Instagram, Business Page-Setup and Profile, About Content Marketing, About Online Advertising, Basic concepts – CPC, PPC, CPM, CTR, CR, Overview of Google AdWords.	**7 Hours**
Unit-5:	**Mobile Marketing:** Key Concepts, Different kind of Mobile Marketing, Opportunities and Risks, SMS Content, SMS Strategy, Mobile Advertising.	**7 Hours**

	Web Analytics: About Web Analytics, Types of Web Analytics (On-site, Off-site), Importance of Web Analytics, Reporting.	
Text Books:	1. Ian Dobson "The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns", Wiley.	
Reference Books:	1. Vandana Ahuja, "Digital Marketing", Oxford Universty Press. 2. Pearson, Puneet Singh Bhatia "Fundamentals of Digital Marketing". *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.edureka.co/blog/digital-marketing-tutorial/ https://www.guru99.com/free-digital-marketing-tutorial.html	

Course Code: BCA 419	**BCA- Semester-IV** **General Elective Course (GEC) - II** **SALES AND PRODUCTION MANAGEMENT**	**L-2** **T-1** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the sales and sales area for effective production, material and quality.	
CO2.	Understanding the psychology of buyers, recruitment and selection of sales force, also to understand the importance of six sigma and quality assurance.	
CO3.	Applying the process of training, Total Quality Management (TQM), inventory management and apply different sampling techniques.	
CO4.	Analyzing the process of TQM, quality assurance, six sigma, sales and production outcome.	
CO5.	Evaluating the sales performance, aggregate planning and work measurement.	
CO6.	Creating a mechanism of sales oriented, motivated, trained sales force.	
Course Content:		
Unit-1:	**Introduction to Sales Management:** Evolution of Sales management, Scope and Importance: Skills of a Sales Personnel, Types of Sales Managers; Personal Selling- Theories, Psychology in Selling, Buying Situations, Sales Process; Sales Forecasting; Sales Territory Design.	**7 Hours**
Unit-2:	**Sales Force Management**: Sales Organization Structure; Sales Force Size; Recruitment& Selection of Sales Force; Training , motivation and compensation of Sales Force; Sales Quotas and Contests; Evalution of Sales Performance.	**7 Hours**
Unit-3:	**Introduction to Production:** Meaning, Nature, Scope and Major decision areas of production management, production system, Facilities location, Facility layout, Line balancing, Capacity Planning, Aggregate Planning.	**8 Hours**
Unit-4:	**Method Study & Work Measurement:** Work Study, Time Study, Method Study - Objectives, Pre-requisites and procedures, Productivity measures.	**7 Hours**
Unit-5:	**Materials Management and Quality Assurance: Materials** Management: Materials Handling, Material Requirement Planning Meaning, Importance, purchases management, Store management	**7 Hours**

	and Inventory Management. Acceptance Sampling, Statistical Quality Control, Maintenance Management, Total Quality Management, Concept of JIT, Six- Sigma.	
Text Books:	1. Adam Jr., Everett E. R J, Production and Operations Management, Prentice-Hall, 2000.	
Reference Books:	1. McGregor D, Operations Management, McGraw-Hill, 1960. 2. Morton, Production and Operations Management, Vikas Publications. 3. Haleem A, Production and Operations Management, Galgotia Books, 2004. 4. Panda, T.K. and Sahadev, S., Sales and Production Management, Oxford University Press, New Delhi, (2nd Ed., 2012). 5. Chary, Production and Operations Management, Tata McGraw-Hill. 6. Still.K.R, Cundiff.E.W & Govoni.N.A.P (6th Ed.,2014). Sales Management, Pearson Education, New Delhi. 7. Tanner Jr.,J.F., Honeycutt Jr., E.D. and Erffmeyer, R.C. (1st Ed.,2015), Sales Management, Pearson Education ,New Delhi. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://theinvestorsbook.com/sales-management.html https://www.univie.ac.at/prolog/teaching/LVAs/KFK-PM/SS08/pm_ch7.pdf	

Course Code: TMUGE 401	BCA- Semester-IV Ability Enhancement Compulsory Course (AECC-7) ENGLISH COMMUNICATION – IV	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Remembering and understanding the English grammar and vocabulary.	
CO2.	Understanding the essentials of effective listening and speaking.	
CO3.	Understanding the corporate expectations and professional ethics.	
CO4.	Applying correct vocabulary and sentence construction during professional writing or job interviews.	
CO5.	Analyzing different types of interviews.	
CO6.	Drafting resume, C.V. or cover letter.	
Course Content:		
Unit-1:	**Vocabulary & Grammar** • Homophones and Homonyms • Correction of Common Errors (with recap of English Grammar with its usage in practical context.) • Transformation of sentences	7 Hours
Unit-2:	**Essence of Effective listening & speaking** • Listening short conversation/ recording (TED talks / Speeches by eminent personalities) *Critical Review of these abovementioned* • Impromptu	7 Hours
Unit-3:	**Professional Writing** a)Proposal: Significance, Types, Structure & AIDA b) Report Writing: Significance ,Types, Structure& Steps towards Report writing	8 Hours
Unit-4:	**Job Oriented Skills** Cover Letter o Preparing Rèsumè and Curriculum-Vitae o Interview: Types of Interview, Tips for preparing for Interview and Mock Interview o Corporate Expectation & Professional ethics: Skills expected in corporate world	7 Hours
Unit-5:	**Value based text reading:** Short story a) A Bookish Topic – R.K. Narayan	7 Hours

Text Books:	1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
Reference Books:	1. Raman Meenakshi & Sharma Sangeeta, "Technical Communication-Principles & Practice" Oxford University Press, New Delhi. 2. Mohan K. & Sharma R.C., "Business Correspondence of Report Writing",TMH, New Delhi. 3. Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi. 4. Kumar Sanjay & Pushplata "Communication Skills" Oxford University Press, New Delhi. 5. Agrawal, Malti "Professional Communication" Krishana Prakashan Media (P) Ltd. Meerut. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://nptel.ac.in/courses/109/106/109106067/ 2. https://www.youtube.com/watch?v=lPldr57hpPg	
Methodology:	**1.** The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion. **2.** Language Lab software. **3.** Sentence transformation on daily activities and conversations. **4.** Conversational Practice will be effectively carried out by Face to Face & Via Media (Audio-Video Clips). **5.** Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized. **Note 1:** • Class (above 30 students) will be divided in to two groups for effective teaching. • For effective conversation practice, groups will be changed weekly. **Note 2**: *External Viva will be conducted by 2-member committee comprising* *a) One Faculty teaching the class* *b) One examiner nominated by University Examination cell.* *Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.*	

Evaluation Scheme

Internal Evaluation			External Evaluation		Total Marks
40 Marks			60 Marks		
20 Marks (Best 2 out of Three CTs) ***(Unit –I, III,IV & V)***	10 Marks (Oral Assignments) ***(Unit –II& IV)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(Unit –I, III,IV & V)***	20 Marks (External Viva)* ***(Unit –II& IV)***	**100**

*Parameters of External Viva

Content	Body Language	Communication skills	Confidence	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note*:External Viva will be conducted by 2-member committee comprising*

a) *One Faculty teaching the class*
b) *One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: BCA 454	**BCA- Semester-IV** **Laboratory Course (LC-7)** **DATABASE SYSTEMS LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding and applying DDL queries like Create, Alter, Drop, Truncate and Rename on relational database tables.	
CO2.	Applying DML queries like Select, Insert, Update and Delete on relational database tables.	
CO3.	Understanding DCL queries like Grant and Revoke on relational database tables.	
CO4.	Applying aggregate functions with Group By and Having Clauses.	
CO5.	Applying and analyzing queries for different types of joins and set operations with the creation of nested subqueries and views.	
Course Content:		
	1) Create Table, insert data into tables, Deletion, Updation **2)** Retrieval of data using SQL statement with all possible clauses. **3)** Using aggregate function **4)** Using group by and having clause **5)** Write query for Join, set operation, and nested queries. **6)** Creating View	
Text Books:	1. Silberschatz Abraham, Korth Henry &Sudarshan S., Database Systems Concepts, McGrawHill. 2.	
Reference Books:	1. Melton Jim& Simon Alan, Understanding the New SQL: A Complete Guide, Morgan Kaufmann Publishers. 2. Majumdar A. K. &Battacharya P., Data Base Management Systems, Tata McGraw Hill. 3. Elmarsi R. & Navathe S.B., Fundamentals of Database Systems, Addison Wesley. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/106/106106093/ https://www.youtube.com/watch?v=1057YmExS-I&list=PLEbnTDJUr_Ic_9b4PcKmlae41cyxEefot	

Course Code: BCA 453	**BCA- Semester-IV** **Laboratory Course (LC-8)** **COMPUTER GRAPHICS LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying the line / circle drawing algorithms to draw the line/ circle graphics object by writing C programs.	
CO2.	Applying the region filling algorithms to fill the bounded region by writing C programs.	
CO3.	Applying the line clipping algorithms to clip the line against the various clip windows by writing C programs.	
CO4.	Applying the polygon/ text clipping algorithms to clip the polygon / text against the rectangular clip windows by writing C programs.	
CO5.	Extracting scene with different clipping methods and its transformation to graphics display device.	
Course Content:		
	1) Programs for designing objects in graphics by using Library functions. **2)** Programs to draw the line, circle by using algorithms. **3)** Programs to fill polygons by using algorithms. **4)** Programs to implement line clipping. **5)** Programs to implement 2-D transformation on objects. **6)** Programs to do basic animation by using graphics.	
Text Books:	1. Donald Hearn &M.Pauline Baker, Computer Graphics C Version, Pearson Education.	
Reference Books:	1. Donald Hearn &M.Pauline Baker, Computer Graphics, Prentice Hall of India. 2. Zhigand Xiang, Roy Plastock, Schaum's Outlines, Computer Graphics, TataMc-Graw Hill. 2. VanDam, Feiner& Hughes, Computer Graphics Principles &Practice, Pearson Education. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://www.geektonight.com/computer-graphics-notes/ 2. https://www.tutorialspoint.com/computer_graphics/index.htm	

Course Code: TMUGA-402	BCA- Semester-IV Value Added Course (VAC-5) **Advance Algebra and Geometry**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Recognizing the rules of Crypt-arithmetic and relate them to find out the solutions.	
CO2.	Illustrating the different concepts of Height and Distance and Functions.	
CO3.	Employing the concept of higher level reasoning in Clocks, Calendars and Puzzle Problems.	
CO4.	Correlating the various arithmetic and reasoning concepts in checking sufficiency of data.	
Course Content:		
Unit-1:	**Clocks and calendars** Introduction , Angle based , faulty Clock, Interchange of hands, Introduction of Calendars, Leap Year , Ordinary Year	**5 Hours**
Unit-2:	**Set theory** Introduction , Venn Diagrams basics, Venn Diagram – 3 sets, 4-Group Venn Diagrams	**4 Hours**
Unit-3:	**Heights and Distance** Basic concept, Word problems	**3 Hours**
Unit-4:	**Functions** Introduction to Functions, Even and Odd Functions, Recursive	**3 Hours**
Unit-5:	**Problem Solving** Introduction, Puzzle based on 3 variable, Puzzle based on 4 variable	**6 Hours**
Unit-6:	**Data Sufficiency** Introduction, Blood relation based, direction based, ranking based	**5 Hours**
Unit-7:	**Crypt Arithmetic** Introduction of Crypt Arithmetic, Mathematical operations using Crypt Arithmetic, Company Specific Pattern	**4 Hours**
Reference Books:	R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude R2:-Quantitative Aptitude by R.S. Agrawal R3:-M Tyra: Quicker Maths R4:-Nishith K Sinha:- Quantitative Aptitude for CAT R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com R6:-Logical Reasoning by Nishith K Sinha R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Course Code: TMUGS-401	BCA- Semester-IV Value Added Course (VAC-6) **Managing Work and Others**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Communicating effectively in a variety of public and interpersonal settings.	
CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.	
CO5.	Handling difficult situations with grace, style, and professionalism.	
Course Content:		
Unit-1:	**Intrapersonal Skills:** Creativity and Innovation Understanding self and others (Johari window) Stress Management Managing Change for competitive success Handling feedback and criticism	**8 Hours**
Unit-2:	**Interpersonal Skills:** Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organisations Manners, etiquette and net etiquette	**12 Hours**
Unit-3:	**Interview Techniques:** Job Seeking Group discussion (GD) Personal Interview	**10 Hours**
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Burne, Eric, Games People Play (2010), Penguin UK	

	3. Carnegie, Dale, How to win friends and influence people (2004), RHUK 4. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 5. Steinburg, Scott, Nettiquette Essentials (2013), Lulu.com 6. https://www.hloom.com/resumes/creative-templates/ 7. https://www.mbauniverse.com/group-discussion/topic.php 8. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression *** Latest editions of all the suggested books are recommended.**	

Course Code: BCA 512	BCA- Semester-V Core Course (CC-12) **CORE JAVA PROGRAMMING**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the detail concept of java in real life.	
CO2.	Learning how the java is different and easy from other programming languages.	
CO3.	Analyze the relationship between java and data analysis.	
CO4.	Understanding java with some modules.	
CO5.	Understanding how the data is predicted in java.	
Course Content:		
Unit-1:	**An Introduction to Java**: Java Platform, Buzzwords, Short History on Java, Installing JDK, Setting the PATH. **Fundamental Programming Structures:** A Simple Java program, Data Types, Variables, Operators, Control Flow, Arrays, Big Numbers. **Objects and Classes:** Introduction to Object Oriented Programming, Defining Your Own class, Introducing Methods, Method Overloading, Constructors, The this Keyword, Garbage Collection, Object Destruction and Finalize, Argument Passing Mechanism, Using Object as Parameter, Returning Object, Recursion, Introducing Final, Understanding static, Introducing Nested and Inner Classes, Using Command Line Argument, Variable Length Arguments, and Ambiguity.	**7 Hours**
Unit-2:	**Inheritance:** Base class, Super class and Sub class, The Object class, Using Super keyword, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final keyword with Inheritance. **Packages:** Finding Package and CLASSPATH, Access Protection, Importing Package **Interfaces**: Implementing Interfaces, Applying Interfaces, Variable in Interfaces, Interfaces can be extended. **Exception Handling**: Exception Type, Using try and catch, multiple catch Clauses, Nested try Statements, Using throw keyword, Using throws keyword, Using Finally, Chained Exception. **Input / Output**: I/O Basic, The Stream Classes, Reading Console Input, Writing Console Output, The Print Writer Class, The Closeable and Flushable Interface, The Byte Stream Classes, The Character Streams Classes, Using a Stream Tokenizer, Serialization.	**7 Hours**
Unit-3:	**Graphics Programming:** Applet Fundamentals, Applet Architecture, An Applet Skeleton, Overriding update(), Applet	**8 Hours**

	Display Method, Requesting Repainting, The HTML APPLET Tag, getDocumentBase() and getCodeBase() Method. **Introducing AWT:** AWT Classes, Window Fundamentals (Component, Container, Panel, Window, Frame, Canvas), Working with Frame. Working with Graphics, Working with Shapes, Working with Colors, Working with Fonts, Displaying Image. **Event Handling:** Basics of Event Handling, Delegation Event Model, Event Classes, Event Listener Interfaces, Handling Mouse Events. **AWT Controls:** Button, Label, Checkbox, CheckboxGroup, Choice, List, Scrollbar, TextField, TextArea, Menu Bar and Menu, Dialog Boxes. **Introduction to Layout Management:** Flow Layout, Border Layout, Grid Layout, GridBag Layout.	
Unit-4:	**Swings:** Swings Overview, Creating a Swing Applet and Application. **Swing Components:** Icon, JLabel, JTextField, JTextArea, JPasswordField, JButton, JCheckBox, JRadioButton, JComboBox, JList, JProgressBar, JMenubar, JMenu, JToolBar, JScrollPane, JPanel, JTable, JSlider, JInternalFrame, Dialog Boxes.	**7 Hours**
Unit-5:	**Multithreading:** Threads, Interrupting Threads, Thread States, Thread Priorities, Synchronization, Suspending, Resuming and Stopping Threads, Using Threads and Swings. **JDBC:** Introduction to JDBC, Types of JDBC Drivers, JDBC-ODBC Bridge, Connecting to a database, Inserting and Retrieving Data from the Database. **Utilities:** Using JAR and JAVADOC utilities.	**7 Hours**
Text Books:	1. Patrick Naughton & Herbert Schildt, The Complete Reference JAVA2, Tata McGraw Hill.	
Reference Books:	1. Balagurusamy E., Programming in JAVA, Tata McGraw Hill. 2. Steven Holzner, Java2 Black Book, Dreamtech. 3. Mark Wutica, "Java Enterprise Edition", QUE. 4. Cay S. Horstmann & Gary Cornell, Core Java 2 Volume I – Fundamentals, PHI. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/java/index.htm https://www.javatpoint.com/java-tutorial https://www.w3schools.com/java/	

Course Code: BCA 519	BCA- Semester-V Skill Enhancement Course (SEC-2) **PHP & MySql**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the Web-Technology & Development with essential constructs of HTML.	
CO2.	Understanding the fundamental & differentiation of local and remote host/web-servers.	
CO3.	Understanding & deep dive towards server-side scripting with PHP essentials & basic constructs.	
CO4.	Understanding the concept of Client & Server Side Scripting methodologies in view of JavaScript & PHP usage.	
CO5.	Understanding the concept of dynamic web-development with the usage of MySql RDBMS to create, store and query data from the remote server.	
CO6.	Understanding the synchronous data exchange from a web server with the usage of AJAX technique.	
Course Content:		
Unit-1:	**Throwback of Web Elements and Web Servers: HTML:** Tags, images, tables and forms; **CSS**: Types, background, color, text, padding, spacing, margin. **JavaScript:** Data Types, Operators, Events, Validation and Functions.	**7 Hours**
Unit-2:	**Introduction to web servers:** WAMP, LAMP and XAMPP; Scripting: Server side scripts, client side scripts and their role in web development. **PHP** -Introduction to PHP, History, Difference of PHP with other server side languages. Syntax, Operators, Variables, Constants, Control Structure, Language construct.	**7 Hours**
Unit-3:	**Function** – Syntax, Arguments, Variables, References, Returns and Variable Scope; File Inclusion: include() and Require(); **Arrays and its types**; Date and Time functions-basics; **Basics of OOP's** – Instantiation, Modifiers, Inheritance, Interfaces; String functions; Web Features- Sessions, Forms, GET and POST data, Cookies.	**8 Hours**
Unit-4:	**Introduction to MySQL**: Introduction to MySQL, Datatypes and Constraints, Select, Orderby, Limit, Joins, Groupby, Having, Subquery, Indexing, Database connectivity in PHP with mysql_connect and PDO and using insertion, Deletion, updating and retrieval of data from database using PHP.	**7 Hours**

Unit-5:	Exceptions in PHP, Static Methods and Properties; **Introduction to AJAX**, AJAX and its applications, working of AJAX; Introduction to web services, advantages of web services, web services platform elements, Using XML in PHP. Understanding the WordPress and Jquery in PHP.	**7 Hours**
Text Books:	1. Ivan Bayross, HTML, DHTML, JavaScript, CSS, PHP, BPB Publications.	
Reference Books:	1. Professional PHP Programming, Jesus Castagnetto, Harish Rawat, Sascha Schumann, Chris Scollo, DeepakVeliath - Wrox Publications. 2. Beginning PHP and MySQL 5, W. Jason Gilmore,Apress Publication. 3. PHP 5 Advanced, Larry Ullman, Peachpit Press. 4. Ivan Bayross, PHP 5, BPB Publications. 5. Andrew Curioso, Ronald Bradford, Patrick Galbraith, Expert PHP and Mysql, Wiley Publishing. 6. Steven Holzner, The Complete Reference PHP, McGraw Hill Education. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/php/php_and_mysql.htm https://www.w3schools.com/php/php_mysql_intro.asp	

Course Code: BCA 515	BCA- Semester-V Ability Enhancement Compulsory Course (AECC-8) **ENTREPRENEURSHIP**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the meaning and concepts of entrepreneurship.	
CO2.	Understanding and apply the concepts and theories of motivation.	
CO3.	Understanding and analysing different facet and forms of business.	
CO4.	Understanding, applying and evaluating different financing options.	
CO5.	Understanding the government support policies and its applications.	
CO6.	Understanding and applying remedies to sick businesses.	
Course Content:		
Unit-1:	**Entrepreneurship:** Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.	**7 Hours**
Unit-2:	**Motivation:** Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.	**7 Hours**
Unit-3:	**Business:** Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.	**8 Hours**
Unit-4:	**Financing and Accounting:** Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.	**7 Hours**
Unit-5:	**Support to Entrepreneurs:** Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators –	**7 Hours**

	Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.	
Text Books:	1. Khanka. S.S., "Entrepreneurial Development" S. Chand & Co. Ltd., Ram Nagar, New Delhi.	
Reference Books:	1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill. 2. Mathew J Manimala, "Entrepreneurship theory at cross roads: paradigms and praxis" 2nd Edition Dream tech. 3. Rajeev Roy, 'Entrepreneurship', Oxford University Press. 4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad. 5. Donald F Kuratko, "Entrepreneurship – Theory, Process and Practice", Cengage Learning. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1.https://www.tutorialspoint.com/entrepreneurship_development/entrepreneurshipdevelopment_tutorial.pdf 2. http://www.crectirupati.com/sites/default/files/lecture_notes/Entreprenuer%20ship.pdf	

Course Code: BCA 522	BCA- Semester-V Departmental Specific Elective (DSE) - II **LINUX ADMINISTRATION**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basic features of Linux, How to install Linux system and architecture of Linux operating system.	
CO2.	Understanding the existing Files and Directories of Linux system. Understanding the uses of path and types of path implementation using command line operations.	
CO3.	Understanding the uses of different command with different parameters. Understand shell meta characters of Linux.	
CO4.	Understanding the shell programming and the concept of script writing. Understanding the use of different Loops, Decisions, Arithmetic operation, use of commands in Linux.	
CO5.	Understanding the role and responsibilities of system administrator. Understanding how the user will be created and managed. Understanding the system management like performance monitoring, managing permissions, becoming super user, creating Disk partition, Backup and Restoring the system, installing and removing packages.	
Course Content:		
Unit-1:	**Linux Introduction and File System**: Basic Features, Advantages of Linux, Disadvantages of Linux Installing requirement, Installing the Linux system, Basic Architecture of Unix/Linux system, Kernel, Shell. Linux File system-Boot block, super block, Inode table, data blocks, How Linux access files, storage files, Linux standard directories.	**7 Hours**
Unit-2:	**Files and directories:** Files and Directories, Examples of Absolute Paths, Current Directory, Making and Deleting Directories, Relative Paths, Special Dot Directories, Using Dot Directories in Paths, Hidden Files, Paths to Home Directories, Looking for Files in the System, Specifying Multiple Files, Specifying Files with Wildcards, Chaining Programs Together.	**7 Hours**
Unit-3:	**Linux Commands:** pwd, cd, ls, who, who am i, which, cp, mv, rm, mkdir, touch, hostname, cat, cal, mount, umount, login, logout, echo, wget, wc, grep, dd, test, chmod, date, du, head, tail, id, kill , ln, more, less, find. Shell Meta Characters: Filename Substitution Meta characters, Redirection Meta characters, Process Execution Metacharacters, Conditional Execution Using && and ‖, Quoting Meta characters, Positional Parameters and Special Parameters.	**8 Hours**
Unit-4:	**Shell Programming-** Shell Variables, Shell Keywords, Another way of Assigning Values to Variables, Unix-defined or System	**7 Hours**

	Variables, Unchanging Variables, Positional parameters, Passing Command Line Arguments, Setting Values of Positional Parameters, Displaying Date in Desired Format, Using Shift on Positional Parameters, Arithmetic in Shell Script, tput Command Control Instructions in Shell, Taking Decisions, if Statement, test Command, File Tests, String Tests, Use of Logical Operators, Hierarchy of Logical Operators, Case Control Structure, Loop while Loop, until loop, for Loop, Using for with Command Line Arguments, Nesting of Loops, break Statement, continue Statement.	
Unit-5:	**User Management:** Common administrative tasks, identifying administrative files configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, User management tools, Command line user management, Changing permissions and ownerships Creating and managing groups, creating groups with useradd, Modifying group attributes with groupmod, Modifying user attributes with usermod, Temporary disabling of users accounts, deleting groups and users, Creating and mounting file system. **System Management:** Checking and monitoring system performance - file security & Permissions, Becoming super user using su. Getting system information with uname, host name, Disk partitions & sizes, users, kernel, Installing and removing packages, Backup and restore, command line tools, Compress utilities - tar, cpio, dump, rsync and restore utilities, Miscellaneous Backup solutions.	**7 Hours**
Text Books:	1. Unix Shell Programming, Yashwant Kanetkar, BPB Publications.	
Reference Books:	1. Red hat Linux Administration By Michael Turner and Steve Shah-McGraw-Hill Companies, Inc Publisher. 2. RHCSA/RHCE Red Hat Linux Certification Study Guide (Exams EX200 & EX300). (Certification Press) [Paperback], Michael Jang, McGraw-Hill Osborne Media. 3. Using Linux By Jack Tackett, David Gunter, Phi, Eee Edition. 4. Red Hat Linux Bible –Cristopher Negus, Idg Books India Ltd. 5. Redhat Fedora linux for Dummies By Naba Barkakati-Wiley Publishing, Inc. 6. Unix, Sumitaba Das. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/linux_admin/index.htm https://www.geeksforgeeks.org/what-is-linux-system-administration/	

Course Code: BCA 514	BCA- Semester-V Departmental Specific Elective (DSE) - II **DISTRIBUTED OPERATING SYSTEM**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding and remembering the basic architecture, goals and design issues along with communication in distributed operating system.	
CO2.	Analyzing and evaluate election algorithms for leader node selection and also to understand the concepts related to deadlock in distributed environment.	
CO3.	Understanding and evaluate the process, processors and scheduling in distributed system.	
CO4.	Evaluating the design and implementation of file system and understand the concepts of distributed shared memory.	
CO5.	Understanding the concepts of distributed shared memory.	
Course Content:		
Unit-1:	**Introduction:** Introduction to Distributed System, Goals of Distributed system, Hardware and Software concepts, Design issues. Communication in distributed system: Layered protocols, Client-Server model, Remote Procedure Calls and Group Communication. Middleware and Distributed Operating Systems.	**7 Hours**
Unit-2:	**Synchronization in Distributed System:** Clock synchronization, Mutual Exclusion, Election algorithm, the Bully algorithm, and a Ring algorithm, Atomic Transactions, Deadlock in Distributed Systems, Distributed Deadlock Prevention, and Distributed Deadlock Detection.	**7 Hours**
Unit-3:	**Processes and Processors in distributed systems:** Threads, System models, Processors Allocation, Scheduling in Distributed System, Real Time Distributed Systems.	**8 Hours**
Unit-4:	**Distributed file systems:** Distributed file system Design, Distributed file system Implementation, Trends in Distributed file systems.	**7 Hours**
Unit-5:	**Distributed Shared Memory:** What is shared memory, Consistency models, Page based distributed shared memory, and Shared variables distributed shared memory.	**7 Hours**

Text Books:	1. Andrew S. Tanenbaum and Maarten van Steen "Distributed Systems: Principles and Paradigms", Prentice Hall.	
Reference Books:	1. Abraham Silberschatz, Peter B. Galvin, G Gagne, "Operating System Concepts", AddisonWesley. 2. Randy Chow and Theodore Johnson. "Distributed Operating Systems & Algorithms", Addison-Wesley. 3. Mukesh Singhal and N.G. Shivaratri, "Advanced Concepts in Operating systems" Tata McGraw – Hill. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/Distributed-Systems	

Course Code: BCA 510	BCA- Semester-V Departmental Specific Elective (DSE) - II **MULTIMEDIA AND ANIMATION**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding basics of animation software.	
CO2.	Examining multimedia applications in several areas.	
CO3.	Classifying multimedia software based on its function.	
CO4.	Examining basic principles behind animation and techniques.	
CO5.	Creating a storyboard for the animation project.	
Course Content:		
Unit-1:	**Multimedia Basics:** Evolution of Multimedia and its objects, Uses of Multimedia in different fields of specification, Multimedia hardware, Multimedia Software, Different stages to Design and Produce a multimedia application, Memory and Storage Devices, Communication Devices, Presentation and Object Generation Tools.	**7 Hours**
Unit-2:	**Multimedia Components: Text**-Character sets and general guidelines. **Graphics:** Vector Drawing, Digital Image and its Characteristics. Image File Formats: BMP,JPEG, GIF, TIFF, PNG, Image Capturing. **Audio:** Analog Sound, Digital Audio, Digital Audio Concepts, Sampling Variables, MIDI Sound, MIDI under Windows Environment, Audio File Formats, Audio Capturing. **Video:** Analog and Digital Video, Characteristics of Digital Video, Video Capturing.	**7 Hours**
Unit-3:	**Data and Image Compression:** Lossless Compression Algorithm: Run Length Coding, Variable Length Coding-Arithmetic Coding, Huffman Coding, Shannon-Fano Algorithm, Dictionary Based Coding (LZW), JPEG Standards, Lossy Compression Algorithms-Lossy Transform Codes, Lossy Predictive codecs, JPEG Compression, Quantization.	**8 Hours**
Unit-4:	**Audio and Video Compression:** Lossy and Lossless Compression of Audio, Multimedia Monitor Bitmaps, Color Models, Video Representation, Video Compression Techniques, Video Compression based on motion Compensation, JPEG Standards.	**7 Hours**
Unit-5:	**Basics of Animation:** Keyframes, In-between Frames, Timeline, Motion Tweening, Reverse Frames, Types of Animation, Drawing Techniques, **Basic Animation Software:** Macromedia and Adobe Products, Layer Concepts, Scene sequence and its formation using multi-layers.	**7 Hours**

Text Books:	1. Tay Vaughan, Multimedia-Making it Work, TMH Publication.	
Reference Books:	1. Ranjan Parekh, Principles of Multimedia, TMGH, New Delhi. 2. Paul Wells, The Fundamentals of Animation, AVA Publishing House. 3. Kogent Course Solutions, Photoshop CS6 in simple steps, Dreamtech Press. 4. ZeNian Li and Mark S. Drew, Fundamentals of Multimedia, PHI/Pearson Education. 5. Sujata Pandey, Manoj Pandey, Multimedia (System, Technology and Communication), S.K.Kataria & Sons. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.geeksforgeeks.org/difference-between-multimedia-and-animation/ https://www.slideshare.net/azira96/chapter-1-introduction-to-multimedia	

Course Code: BCA 518	BCA- Semester-V Departmental Specific Elective (DSE) - II **DIGITAL FORENSICS AND INVESTIGATION**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the concepts of Computer Forensics and its investigation procedures.	
CO2.	Understanding the working of various storage devices and different methods of data recovery.	
CO3.	Understanding the concepts of various forensic techniques like Windows, Linux and mobile.	
CO4.	Understanding the various application password cracking techniques.	
CO5.	Applying various computer forensic tools to collect digital evidences.	
CO6.	Understanding the various cyber laws under IT act 2008.	
Course Content:		
Unit-1:	**Computer Forensics:** Introduction to Computer Forensics, Forms of Cyber Crime, First Responder Procedure- Non-technical staff, Technical Staff, Forensics Expert and Computer Investigation procedure.	**7 Hours**
Unit-2:	**Storage Devices & Data Recover Methods:** Storage Devices-Magnetic Medium, Non-magnetic medium and Optical Medium. Working of Storage devices-Platter, Head assembly, spindle motor. Data Acquisition, Data deletion and data recovery method and techniques.	**7 Hours**
Unit-3:	**Forensics Techniques:** Windows forensic, Linux Forensics, Mobile Forensics, Steganography, Application Password cracking-Brute force, Dictionary attack, Rainbow attack. Email Tacking – Header option of SMTP, POP3, IMAP.	**8 Hours**
Unit-4:	**Cyber Law:** Corporate espionage, Evidence handling procedure, Chain of custody, Main features of Indian IT Act 2008 (Amendment).	**7 Hours**
Unit-5:	**Current Computer Forensic tools:** evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-	**7 Hours**

	mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools. **Cell phone and mobile device forensics**: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.	
Text Books:	1. Guide to Computer Forensics and Investigations, B. Nelson, et al, Cengage.	
Reference Books:	1. Hacking Exposed Computer Forensics, Aaron Philipp, David Cowen, Chris Davis, Pub: McGraw Hill. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.geeksforgeeks.org/digital-forensics-in-information-security/ https://www.guru99.com/digital-forensics.html	

Course Code: BCA 524	BCA- Semester-V Departmental Specific Elective (DSE) - II **GAMIFICATION**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the fundamentals of game programming, its architecture, state controls and ACTOR management.	
CO2.	Understanding the role of 3D Graphics, Coordinate Systems, Rasterization, Illumination and Texturing in developing animated games.	
CO3.	Understanding the game design principles such as character development and core mechanics used for designing and developing of 3D animated game.	
CO4.	Applying the techniques of rendering, controlling, sorting and collision detection in designing game engine.	
CO5.	Understanding the importance of various frameworks and platforms such as Adventure Game Studio in designing games.	
CO6.	Understanding the basic principles, importance of tools like OpenGL and DirectX in game development.	
Course Content:		
Unit-1:	Fundamental of Game Programming: Input, Applying Game Logic, Game Loops, Game Timings, Core Architecture Using State Controls , ACTOR Management , Collision Detection , Artificial Intelligence, 2D Graphics Programming: Rendering ,Render Loop, Handling Window Events.	**7 Hours**
Unit-2:	3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Physics based Simulation, Scene Graphs. 3D Graphics Foundations: 3D Graphics in Computer Animation and Real Time, 3D Hardware Acceleration,3D Game History, 3D Graphics Condensed Soup , Creating Game Audio Using : Overview of Audio Components, Basics, OpenAL Basics, Tinkering with Source and Listener Properties, Sound Rendering Contexts.	**7 Hours**
Unit-3:	Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.	**8 Hours**
Unit-4:	Gaming platform and frame work: Flash, Direct X, open GL, Java, python, Mobile gaming for android, Game engines :Adventure game studio, Dx studio, Unity.	**7 Hours**

Unit-5:	Developing 2D and 3D interactive games using DirectX or Python Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.	**7 Hours**
Text Books:	1. Mike McShaffrfy and David Graham, "Game Coding Complete", Fourth Edition, Cengage Learning, PTR, 2012.	
Reference Books:	1. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", 2ndEditionPrenticeHall / New Riders, 2009. 2. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", 3rd Edition, Course Technology PTR, 2011. 3. Jesse Schell, The Art of Game Design: A book of lenses, 1stEdition, CRC Press, 2008. 4. Jason Gregory"Game Engine Architecture",CRC Press / A K Peters, 2009. 5. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" 2ndEditions, Morgan Kaufmann, 2006. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.learning-theories.com/gamification-in-education.html	

Course Code: BCA 551	BCA- Semester-V Laboratory Course (LC-9) **MINI PROJECT (INDUSTRIAL TRAINING)**	L-0 T-0 P-12 C-6
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the phases of SDLC and performing initial investigation about project.	
CO2.	Understanding to design ER-Diagram and DFD of the project.	
CO3.	Applying the designing procedures to design database.	
CO4.	Creating SRS Document for the project.	
CO5.	Creating Forms and Front end of the Project.	
Course Content:		
	Evaluation Process Project Guide/Supervisor of the project will be nominated by Head of Department and the internal evaluation shall be done by three faculty members committee nominated by the Director of the college. The external evaluation will be done by the external examiner arranged by examination branch of the university.	

Course Code: BCA 555	**BCA- Semester-V** **Laboratory Course (LC-10)** **CORE JAVA PROGRAMMING LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the execution of java in real life.	
CO2.	Implementing the different modules to predict data.	
CO3.	Executing different functions to search pattern in the files.	
CO4.	Analyzing the data from different datasets with different modules.	
CO5.	Creating event handling on various components.	
Course Content:		
	1) Developing simple console application in Java. **2)** Programs based on loops, arrays, operators and big numbers. **3)** Programs based on Classes and Objects. **4)** Programs based on Method Overloading, Constructors. **5)** Simple application based on static keyword. **6)** Programs based on Inheritance. **7)** Programs based on Method Overriding, Dynamic Method Dispatch, Abstract Classes. **8)** Programs based on String Handling. **9)** Simple application to demonstrate the working of Packages. **10)** Developing a Simple Applet. **11)** An applet to demonstrate the working of Mouse Events. **12)** Programs based on the usage of all AWT controls. **13)** A simple application to demonstrate the working of Frames. **14)** A simple swing application. **15)** Programs to demonstrate event handling on various swing components. **16)** Programs based on applets and multithreading. **17)** A simple application to retrieve and insert records in MS-Access database. **18)** A simple application to retrieve and insert records in My-SQL database. **19)** Use of JAR and JAVADOC utilities.	
Text Books:	1. Patrick Naughton & Herbert Schildt, The Complete Reference JAVA2, Tata McGraw Hill.	
Reference Books:	1. Balagurusamy E., Programming in JAVA, Tata McGraw Hill. 2. Steven Holzner, Java2 Black Book, Dreamtech. 3. Cay S. Horstmann & Gary Cornell, Core Java 2 Volume I – Fundamentals, PHI. *** Latest editions of all the suggested books are recommended.**	

Course Code: BCA 558	BCA- Semester-V Laboratory Course (LC-11) **PHP & MySql LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Implementing the Web-Scripts with essential constructs of HTML.	
CO2.	Implementing server-side scripting by hands-on practice of basic PHP development.	
CO3.	Implementing web-scripts in PHP for file handling operations.	
CO4.	Creating a web-script with database like MySql for creating, storing and querying data live.	
CO5.	Applying live CRUD operations with PHP-MySql for developing Create, Read, Update and Delete operations over web server on the database.	
CO6.	Implementing asynchronous data exchange between web-application and database server with AJAX technique.	
Course Content:		
	1. Basic program related to looping, control statement and functions. 2. Program related to array. 3. Program related to string. 4. Program related to Global Variables.	
	5. Form Validation in PHP a. Write a HTML file to create a simple form with 5 input fieldsviz: Name, Password, b. Email, Pincode, Phone No. and a Submit button. c. Write a PHP program to demonstrate required field validations to validate that allinput fields are required. d. Write a PHP program to validate Name, Email and Password. e. Write a PHP program to display error messages if the above validations do not hold. f. Create a form for your college library entering student details for each student in the college. Validate the form using PHP validators and display error messages.	
	6. File Handling in PHP a. Create a PHP program to demonstrate opening and closing a file. b. Create a PHP program to demonstrate reading a file. c. Create a PHP program to demonstrate writing in a file.	

	d. Create a PHP program to read the following text from a file tmu.txt "Teerthanker Mahaveer University, Moradabad (or TMU Moradabad), is a public engineering university located in Moradabad and write to another file Coursephp.txt. e. Write a program in PHP to print the count of word the as an independent word in text file STORY.TXT. For example, if the content of the file STORY.TXT is "There was a monkey in the zoo. The monkey was very naughty." Then the output of the program should be 2.	
	7. Database in PHP a. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Use PHP script for programs 1 and 2. b. Create a Cookie and add these four user ID"s and passwords to this Cookie. c. Read the User id and Passwords entered in the Login form and authenticate with the values (UserId and Passwords) available in the cookies. If he is a valid user (i.e., UserName and Password match) you should welcome him by name (UserName) else you should display "You are not an authenticated user". d. Write a PHP which does the following job: Insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the UserName and Password from the database (instead of cookies). e. Create tables in the database which contain the details of items (books in our case like Book name, Price, Quantity, Amount) of each category. Modify your catalogue page in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using PHP. **f.** Create and delete MYSQL database using PHP.	
	8. Session Tracking in PHP a. Write a PHP program to start a PHP Session. b. Write a PHP program to destroy a PHP Session. c. WAP to create a PHP Session without cookies. d. Write a PHP program to store current date-time in a COOKIE and display the "Last visited on date-time on the web page upon reopening of the same page. e. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page. 9. Program related to AJAX	

Text Books:	1. Ivan Bayross, HTML, DHTML, JavaScript, CSS, PHP, BPB Publications.	
Reference Books:	1. Professional PHP Programming, Jesus Castagnetto, Harish Rawat, Sascha Schumann, Chris Scollo, DeepakVeliath - Wrox Publications. 2. Beginning PHP and MySQL 5,W. Jason Gilmore, Apress Publication. 3. Andrew Curioso, Ronald Bradford, Patrick Galbraith, Expert PHP and Mysql, Wiley Publishing. *** Latest editions of all the suggested books are recommended.**	

Course Code: **BCA 559**	**BCA- Semester-V** **LAB based on Departmental Specific Elective (DSE) - II** **LINUX ADMINISTRATION LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Developing the ability to install Linux operating system (Ubentu).	
CO2.	Developing the ability to install Linux operating system (Ubentu).	
CO3.	Developing the ability to use different process controlling commands. Develop the ability to write find command with different parameters to search files.	
CO4.	Developing the ability to write shell programming to solve different problems.	
CO5.	Developing the ability to analyze system performance, to create and restore backup, to create and manage user and group.	
Course Content:		
	Installation of Linux operating system (Ubentu). Use of different commands CD, LS, CP, MD, RM, MKDIR, RMDIR, more, less, creating and viewing files, using CAT, file comparisons, View files, disk related commands, checking disk free spaces. Batch commands, kill, PS, who, sleep, Printing commands, grape, FGREP, find, sort, Cal, banner, touch, file, file related commands- WS, SAT, CUT, GREP, DD, etc. Mathematical commands- BC, EXPR Shell Programming conditional and looping statements, case statements, parameter passing and arguments, Shell variables, shell keywords, Creating Shell programs. Creating and Managing users, System Backup and restore, Monitor system performance.	
Text Books:	1. Unix Shell Programming, Yashwant Kanetkar, BPB Publications.	
Reference Books:	1. Red hat Linux Administration by Michael Turner and Steve Shah-McGraw-Hill Companies, Inc Publisher. 2. Redhat Fedora linux for Dummies By Naba Barkakati-Wiley Publishing, Inc. *** Latest editions of all the suggested books are recommended.**	

Course Code: BCA 560	BCA- Semester-V LAB based on Departmental Specific Elective (DSE) - II **DISTRIBUTED OPERATING SYSTEM LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Creating and analyzing distributed shared memory and Client Server based programs.	
CO2.	Applying the learnt concepts for implementing different algorithms for loader node selection.	
CO3.	Applying and evaluating the demonstration of centralized and distributed deadlock.	
CO4.	Creating distributed server mechanism and evaluate various RPC techniques.	
CO5.	Creating distributed application on case based study.	
Course Content:		
	1) Study Client Server based program using RPC and RMI 2) Implement the functioning of Lamport's Logical Clock. 3) Program to implement the Election algorithm. 4) Program to implement the Bully algorithm 5) Program to implement the Ring algorithm 6) Program to demonstrate concept of centralized and distributed deadlock. 7) Implement a Distributed Chat Server using TCP Sockets. 8) Implement RPC mechanism for a file transfer across a network. 9) Build distributed application to illustrate the concept of shared memory and fault tolerance.	
Text Books:	1. Andrew S. Tanenbaum and Maarten van Steen "Distributed Systems: Principles and Paradigms", Prentice Hall.	
Reference Books:	1. Abraham Silberschatz, Peter B. Galvin, G Gagne, "Operating System Concepts", AddisonWesley. 2. Randy Chow and Theodore Johnson. "Distributed Operating Systems & Algorithms", Addison-Wesley. 3. Mukesh Singhal and N.G. Shivaratri, "Advanced Concepts in Operating systems" Tata McGraw – Hill. *** Latest editions of all the suggested books are recommended.**	

Course Code: BCA 561	BCA- Semester-V LAB based on Departmental Specific Elective (DSE) - II **MULTIMEDIA AND ANIMATION LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding about multimedia authoring, paradigm and tools.	
CO2.	Developing audio digitization, audio file format and audio software.	
CO3.	Developing digital video standards, formats and technology.	
CO4.	Creating a photo gallery using transition effect.	
CO5.	Creating a picture transformation effect.	
Course Content:		
	• Make a collage using move, scaling, & Rotation of layers • Convert a color image into Grayscale. • Make a photo strip with the use of wrap tool. • Convert a B&W image into color. • Create a picture using a layer clipping mask • Create a text using a layer clipping mask • Create a button using a Layer filter effect • Prepare a cutout of some images using Photoshop. • Create a Digital Painting • Create a Digital Painting of a celebrity. • Open a document in Macromedia Flash and save as Template. • Change the default workspace layout of a flash file and save it as a new workspace. • Create an animation for text in which each character show one by one. • Create a graphic and export as .png image. • Every Drawing is merged mode, and make a graphics save in Library • Create a photo Gallery using transition effects. • Create a glowing text • Create a day night effect using special effects in flash • Eye Blinking animation by key frame animation • Create a flash Banner this to be used for a website. • Creating a picture transformation effect • Create a butterfly animation, animate it using motion guide • Create a animation for moving car. • When You Create a new document, You Save it as a templates.	

	• Change the default workspace layout of a flash file and save it as a new workspace. • All files save in flash formate. • You give a proper name save files. • Still Drawing are saved in PNG File Formate. • Create a web layout size of 1024. • Design a carton Face help of Drawimg tools. • Every Drawing is merged mode, and make a graphics save in Library. • Create a photo Gallery using transition effects. • Glowing Stars animation in sky. • Animated candle animation with shape tweening. • Create a bubble animation using symbol. • Create a day night effect using some speacial flash effect. • Eye Blinking animation with keyframe by keyframe animation. • Create a flash black and white flash Banner this banner can be used for any website. • Creating a picture transformation effect. • Glowing Text animation. • Create a butterfly animation, butter fly animation is using on motion guide. • Submitted your projectes file formate is shockwave file formate. • Water Drop animation with the help of movie clip. • Give a sound in any two animations. • You can import the sound only stage. • Create a movie casting animation using the filters.	
Text Books:	1. Tay Vaughan, Multimedia-Making it Work, TMH Publication.	
Reference Books:	1. Ranjan Parekh, Principles of Multimedia, TMGH, New Delhi. 2. Paul Wells, The Fundamentals of Animation, AVA Publishing House. 2. ZeNian Li and Mark S. Drew, Fundamentals of Multimedia, PHI/Pearson Education. *** Latest editions of all the suggested books are recommended.**	

Course Code: BCA 562	BCA- Semester-V LAB based on Departmental Specific Elective (DSE) - II **DIGITAL FORENSICS AND INVESTIGATION LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Applying computer forensic tools and techniques to identify, collect, secure and preserve digital evidences.	
CO2.	Applying basic and networking commands of Linux and windows operating system.	
CO3.	Applying various software's for password cracking.	
CO4.	Applying various data recovery tools on fixed disks, removable disks and mobile devices.	
CO5.	Analysing plain text using cryptography and steganography.	
CO6.	Applying disk manager or partition magic technique on hard disk for creating, deleting, rename and resize the disk partition.	
Course Content:		
	1. Perform the identification, seizure and search of digital media. 2. Perform the evidence collection from both secondary and primary memory. 3. Perform formatting on fixed and removable secondary disks graphically. 4. Perform formatting on all storage devices in CUI mode. 5. Perform the following using disk manager or partition magic- (i) Create and delete the partition (ii) Rename the disk partitions (iii) Resize the disk partitions. 6. Perform data recovery on fixed and removable disks using data recovery tools. 7. Perform backup operations on entire or selected disk partitions or files. 8. Perform restore operations from the backups taken earlier. 9. Execute the basic commands of Linux operating system. 10. Execute the basic commands of Disk operating system. 11. Execute the common networking commands with their options in both Windows and Linux. 12. Perform password cracking with the help of software. 13. Perform IP tracking operation. 14. Perform email investigation by email tracking and meta data analysis. 15. Perform the recovery of email message using eDiscovery. 16. Demonstration of cryptography procedure. 17. Demonstration of steganography procedures. 18. Perform recovery of data on mobile devices.	

	19. Perform management on firewalls. 20. Perform chain of custody procedure on FTK.	
Text Books:	1. Guide to Computer Forensics and Investigations, B. Nelson, et al, - Cengage.	
Reference Books:	1. Hacking Exposed Computer Forensics, Aaron Philipp, David Cowen, Chris Davis, Pub: McGraw Hill. *** Latest editions of all the suggested books are recommended.**	

Course Code: BCA 563	BCA- Semester-V LAB based on Departmental Specific Elective (DSE) - II **GAMIFICATION LAB**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the commonly available Frameworks and IDE's for game development and their hardware requirement.	
CO2.	Applying different game elements for designing the concept of game.	
CO3.	Identifying the proper framework and tools for designing specific type of games.	
CO4.	Applying the DirectX and python for developing 2D interactive games.	
CO5.	Applying the unity Game engine for developing a level in the game.	
Course Content:		
	1. Develop a concept and story for a game. 2. Create the game element using 3D or 2D graphics using 3D software and flash. 3. Create 2D interactive game using DirectX and python. 4. Create A puzzule Game using DirectX and python. 5. Create a level in unity Game engine.	
Text Books:	1. Mike McShaffrfy and David Graham, "Game Coding Complete", Fourth Edition, Cengage Learning, PTR, 2012.	
Reference Books:	1. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", 2ndEditionPrenticeHall / New Riders, 2009. 2. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", 3rd Edition, Course Technology PTR, 2011. 3. Jason Gregory"Game Engine Architecture",CRC Press / A K Peters, 2009. *** Latest editions of all the suggested books are recommended.**	

Course Code: BCA 609	BCA- Semester-VI Core Course (CC-13) **PROGRAMMING WITH C#**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basics of programming with C#.	
CO2.	Understanding the meaning and basic components of a programming with C#.	
CO3.	Applying hands-on use of programming with C# applications in Web, Window and Console Application.	
CO4.	Identifing categories of programs, Web, Window and Console Application. Organize and work with many projects.	
CO5.	Completion of the assignments will result programming with C# applications knowledge and skills.	
Course Content:		
Unit-1:	**Architecture of the .Net Framework Development Platform:** Compiling Source Code into Managed Code, Metadata, Intermediate Language (IL), Common Language Runtime Services, Common Type System, Common Language Specification The .Net Framework Class Library, Just-In-Time Compilation, Unified Classes, Boxing and Unboxing. **C# Basics:** Data Types, Literals and Variables, Operator, Program Control Statements, Class and Object, Arrays and Strings.	**7 Hours**
Unit-2:	**A Closer Look at Methods and Classes:** C# Access Modifiers, Use ref and out parameter, Variable number of Arguments, Concept of Return Object and Array. Method Overloading, Overloading Constructors, Optional Arguments, Named Arguments, Recursion, Understanding Static. Operator Overloading, Indexers and Properties. **Inheritance:** Member Access using Protected Access, Calling Base Class Constructor, Name Hiding, Virtual Methods and Overriding, Abstract Classes, Using sealed to Prevent Inheritance.	**7 Hours**
Unit-3:	Interfaces, Exception Handling. Using I/O, Delegates and Events, Namespaces and Assemblies, Reflection, Unsafe Code, Networking and Socket. **Multithreading:** Thread Class, Determining when a Thread Ends, Thread Priorities, Synchronization.	**8 Hours**
Unit-4:	**Windows Forms Controls:** Working with Textbox, Buttons, Labels, Checkbox, Radio Buttons, List box, Combo Box, Picture Box, Menu, Events: The Change Event, The Click Event, The Key Down Event, The Form Load Event (IDE Environment).	**7 Hours**

	Introduction to ADO.Net: Connected v/s. Disconnected Data Access. ADO.Net Architecture, Connection Object, SQL Command Object, Data Adapter Object, Data Reader Object, DataSet Object. Developing a Simple ADO.NET Based Application with Inserting, Deleting, Retrieving & Updating Data. Implementing Procedure.	
Unit-5:	**ASP.NET Web Form Controls:** Introduction to ASP.NET Web Forms, Implementation of ASP.NET controls: Dropdown List, Textbox, Button, Checkbox, Radio Button. Implementing Master Page, State Management, Validation Control. Developing a Simple ADO.NET Based Application. **Utilities:** Using JAR and JAVADOC utilities.	**7 Hours**
Text Books:	1. Wiley," Beginning Visual C#", Wrox.	
Reference Books:	1. C#.Net Developers Guide- Greg Hack, Jason Werry, SaurabhNandu, (SyngRess). 2. Wrox Press Professional C# – Simon Robinson, Jay Glynn. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/csharp/index.htm https://www.programiz.com/csharp-programming/guide	

Course Code: BCA 610	BCA- Semester-VI Skill Enhancement Course (SEC-3) **ANDROID PROGRAMMING**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the Android operating system, its features along with its architecture, Android Studio, Android Virtual Device makes student familiar with Android operating system and its SDK .	
CO2.	Becoming familiar with Activities, Intents, Fragments through which students will be able to code the behavior of basic Android Application.	
CO3.	Becoming familiar with Views like Button TextView, WebView, ImageView, Spinner etc. through which students will be able to design the user interface of Android Application.	
CO4.	Developing the ability to understand the different storage options like SQlite, SharedPreferences, available in Android Application development along with data sharing option like ContentProvider.	
CO5.	Developing the ability in students to understand the concept of Services, Location Based Services, JSON, and develop Android Applications like Music player using Services, Weather forecast using JSON, Location Tracker using Google Map.	
Course Content:		
Unit-1:	**Introduction** Android, Android Versions, Features of Android, Architecture of Android Obtaining the Required Tools, Android SDK , Installing the Android SDK Tools Configuring the Android SDK Manager - Eclipse, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs) , Creating Your First Android Application - Types of Android Application, Anatomy of an Android Application.	**7 Hours**
Unit-2:	**Activities, Fragments and Intents** Understanding Activities, Creating Activities, Linking Activities Using Intents, Resolving Intent Filter Collision, Returning Results from an Intent, Passing Data Using an Intent Object, Fragments, Adding Fragments Dynamically, Life Cycle of a Fragment, Interactions between Fragments, Calling Built-In Applications Using Intents, Understanding the Intent Object, Using Intent Filters - Adding Categories, Displaying Notifications.	**7 Hours**
Unit-3:	**Android User Interface** Understanding the Components of a Screen, Adapting to Display Orientation Managing Changes to Screen Orientation, Utilizing the Action Bar, Creating the User Interface Programmatically, Listening for UI Notifications,	**8 Hours**

	Designing Your User Interface With Views, Using Basic Views, Using Picker Views, Using List Views to Display Long Lists, Understanding Specialized Fragments - Displaying Pictures And Menus With Views, Using Image Views to Display Pictures - Using Menus with Views, Additional Views.	
Unit-4:	**Databases, Content Providers and Messaging** Saving and Loading User Preferences, Persisting Data to Files, Creating and Using Databases, Content Providers, Sharing Data in Android, Using a Content Provider, Creating Your Own Content Providers, Using the Content Provider - Messaging, SMS Messaging, Sending E-mail.	**7 Hours**
Unit-5:	**Location Based Services, Networking and Android Services** Location Based Services, Displaying Maps, Getting Location Data, Monitoring a Location, Project-Building a Location Tracker, Networking, Consuming Web Services Using HTTP, Consuming JSON Services, Sockets Programming Developing. Android Services, Creating Your Own Services, Establishing Communication between a Service and an Activity, Binding Activities to Services, Understanding Threading, Publishing Android Applications, Preparing for Publishing, Deploying APK Files.	**7 Hours**
Text Books:	1. Wei - Meng Lee, "Beginning Android 4 Application Development", John Wiley & Sons, Inc.	
Reference Books:	1. Zigurd Mednieks, Laird Dornin, Blake Meike G, and Masumi Nakamura, "**Programming Android**", O'Reilly. 2. Reto Meier, "Professional Android 4 Application Development", John Wiley & Sons, Inc. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.geeksforgeeks.org/introduction-to-android-development/ https://www.tutorialspoint.com/android/index.htm	

Course Code: BCA 614	BCA- Semester-VI Skill Enhancement Course (SEC-4) **PYTHON PROGRAMMING**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding and remembering programming skills in core Python.	
CO2.	Understanding Object Oriented Skills in Python.	
CO3.	Creating the skill of designing user defined functions in python.	
CO4.	Creating the ability to work on modules in python.	
CO5.	Understanding of important aspects related with string, lists and dictionary in python.	
Course Content:		
Unit-1:	Introduction History, Features, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator Conditional Statements If, If-else, Nested if-else, Looping For, While, Nested loops, Control Statements Break, Continue, Pass.	**7 Hours**
Unit-2:	String Manipulation Accessing Strings, Basic Operations, String slices, Function and Methods Lists Introduction, Accessing list, Operations, Working with lists, Function and Methods Tuple Introduction, Accessing tuples, Operations, Working, Functions and Methods.	**7 Hours**
Unit-3:	Dictionaries Introduction, Accessing values in dictionaries, Working with dictionaries, Properties, Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.	**8 Hours**
Unit-4:	Modules Importing module, Math module ,Random module, Packages, Composition Input Output Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files.	**7 Hours**
Unit-5:	Exception Handling Exception, Exception Handling, Except clause, Try, Finally clause, User Defined Exceptions OOPs concept Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding.	**7 Hours**
Text Books:	1. Learning Python by Mark Lutz, David Ascher Shop O'Reilly - O'Reilly Media.	
Reference Books:	1. Learn Python the Hard Way, Zed A. Shaw , Goodreads. 2. Python Essential Reference, David M. Beazley, Addison	

	Wesley. 2. Beginning Python, Magnus Lie Hetland , Goodreads. 3. Python Programming for the Absolute Beginner, third edition, Ross Dawson, Goodreads. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.geeksforgeeks.org/python-programming-examples/ https://www.tutorialspoint.com/python/index.htm	

Course Code: BCA 660	BCA- Semester-VI Laboratory Course (LC-12) **PROJECT**	L-0 T-0 P-12 C-6
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the process of Project development.	
CO2.	Understanding the flow of Processes in the project.	
CO3.	Applying the knowledge to develop applications based on SRS Document.	
CO4.	Applying the learning to develop applications on different platforms like Window, Web based or Mobile based applications to specific set of problem and their solutions.	
CO5.	Applying the test cases for testing of the project.	
CO6.	Analyzing the different roles required in project development.	
Course Content:		
	Evaluation Process Project Guide/Supervisor of the project will be nominated by Head of Department and the internal evaluation shall be done by three faculty members committee nominated by the Director of the college. The external evaluation will be done by the external examiner arranged by examination branch of the university.	

Course Code: BCA 657	**BCA- Semester-VI** **Laboratory Course (LC-13)** **PROGRAMMING WITH C# LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Recognizing when to use each of the programming with C# programs to create professional, academic, business and many software projects.	
CO2.	Understanding programming with C# programs to create personal, academic and business documents following current professional and/or industry standards.	
CO3.	Applying skills and concepts for basic use of computer hardware, software, networks and the internet in the workplace.	
CO4.	Applying coursework as identified by the internationally accepted Internet and Microsoft Core programming with C# standards.	
CO5.	Creating window based application.	
Course Content:		
	1. The use of sequence, conditional and iteration construct. 2. Various operators like logical, arithmetical, relational, etc. 3. Overloading of various operators. 4. Use of Static Member functions, optional arguments. 5. Use of destructor and various types of constructor. 6. Various forms of Inheritance. 7. Use of Interface in multiple inheritance, virtual and override concept, delegates. 8. File operation. 9. Create windows based application with connected and disconnected architecture. 10. Simple web application using ASP Net.	
Text Books:	**1.** "Black Book .Net Framework 4.5", DreamTech.	
Reference Books:	**1.** C#.Net Developers Guide- Greg Hack, Jason Werry, SaurabhNandu, (SyngRess). **2.** Wrox Press Professional C# – Simon Robinson, Jay Glynn. **3.** "C# 4.0 Complete Reference", by Herbert Schildt. **4.** "Professional ASP.NET 4.5 in C# and VB" by Bill Evjen, Scott Hanselman, Devin Rader, Wrox. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.tutorialspoint.com/csharp/index.htm https://www.programiz.com/csharp-programming/guide	

Course Code: **BCA 658**	**BCA- Semester-VI** **Laboratory Course (LC-14)** **ANDROID PROGRAMMING LAB**	**L-0** **T-0** **P-4** **C-2**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Developing the ability to understand the basic concepts of Android application development.	
CO2.	Becoming familiar with the fundamentals and acquire programming skills in Android.	
CO3.	Developing application of location Tracker using Google Map.	
CO4.	Developing efficient basic Android application like Calculator, Temperature Conversion etc.	
CO5.	Able to start writing own Android applications.	
Course Content:		
	1. Creating Applications with Multiple Activities and a Simple Menu using ListView 2. Creating Activities For Menu Items and Parsing XML Files 3. Writing Multi-Threaded Applications 4. Using WebView and Using the Network 5. Graphics Support in Android 6. Preferences and Content Providers 7. Location Services and Google Maps in Android	
Text Books:	1. Wei - Meng Lee, "Beginning Android 4 Application Development", John Wiley & Sons, Inc.	
Reference Books:	1. Zigurd Mednieks, Laird Dornin, Blake Meike G, and Masumi Nakamura, "Programming Android", O'Reilly. 2. Reto Meier, "Professional Android 4 Application Development", John Wiley & Sons, Inc. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.geeksforgeeks.org/introduction-to-android-development/ https://www.tutorialspoint.com/android/index.htm	

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