Faculty of Engineering & Technology

Syllabus

For

Bachelor of Computer Application (B.C.A.)

(Program Code: ET0142)

(2023-27)

Approved by the Academic Council vide resolution no …………………

INDEX

1. **INTRODUCTION**

The quality of technical education should be improved in such a manner that Technical graduates are able to compete globally in terms of their knowledge and skills and serve for the society and nation. And for this purpose Learning Outcome-based Curriculum Framework (LOCF) is developed.

Incorporation of Learning Outcome-based Curriculum Framework (LOCF) in the Graduate program like BCA makes it student-centric, interactive and outcome-oriented to achieve well-defined aims, objectives and goals. The learning outcomes are attained by students through development of skills acquired during the program of study by providing them practical exposure. Program learning outcomes will include subject-specific skills and generic skills, including transferable global skills and competencies. It would also focus on knowledge and skills that prepare students for further study, employment and society development. LOCF help ensure comparability of learning levels and academic standards across colleges/universities.

At present, the goal of technical education may be achieved using the following measures:

i. Curriculum reform based on learning outcome-based curriculum framework (LOCF).

ii. Improving learning environment and academic resources.

iii. Elevating the quality of teaching and research.

iv. Involving students in discussions, problem-solving and out of box thinking about various ideas and their applicability, which may lead to empowerment and enhancement of the social welfare.

v. Motivating the learners to understand various concepts of their educational program keeping in view the regional context.

vi. Enabling learners to create research atmosphere in their colleges/ institutes/ universities.

vii. Teach courses based on Choice Based Credit System (CBCS).

2. **LEARNING OUTCOME-BASED APPROACH TO CURRICULUM PLANNING**

The Bachelor of Computer Application (BCA) degree is awarded to the students on the basis of knowledge, understanding, skills, values and academic achievements. Hence, the learning outcomes of this program are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for knowledge.

The course for BCA is designed according to outcome based approach in the light of post graduate attributes, description of qualifications, courses and program learning outcomes. It may lead to all round development and delivery of complete curriculum planning. Hence, it provides specific guidelines to the learners to acquire sufficient knowledge during this program.

The program has been planned in such manner that there is scope of flexibility and innovation in

i. Modifications of prescribed syllabi.

ii. Teaching-learning methodology.

iii. -Assessment technique of students and knowledge levels.

iv. Learning outcomes of courses.

v. Addition of new elective courses subject to availability of experts in colleges/institutes/universities across the country.

2.1. Nature and Extent of Undergraduate Program

As a part of effort to enhance employability of BCA graduates the outcomes based curriculum are very essential in present day perspective. Therefore, higher education degrees must formulate Graduate Attributes (GAs), qualification descriptors, learning outcomes and course learning outcomes which will help in curriculum planning and development in the form of design and delivery of courses. The overall formulation of the degree program must equip learner to have competencies to provide deliverables to the industry.

2.2. Aims of undergraduateprogram(BCA)

The overall aims ofBCAprogram are to:

i. Demonstrate the ability to adapt to technological changes and innovations in the discipline.

ii. Analyze, design, implement and evaluate computerized solutions to real life problems, using appropriate computing methods.

iii. Proficiency in the basic mathematics employed in computer science.

iv. Differentiate among essential data structures used in computer programming, and explain how they work.

v. Gain knowledge of algorithms and their role in computer science.

vi. Identify, explain and apply fundamental structured programming techniques.

vii. Utilize important data structures and associated algorithms in the development of computer programs.

viii. Develop computer programs using functional programming and object-oriented programming paradigms.

ix. Apply techniques of software validation and reliability analysis to the development of computer programs.

x. Demonstrate the critical thinking and communication skills required in

xi. Acquire the knowledge, skills, experience and values to become lifelong learners able to obtain employment in a computer-related field or go on to graduate study.

2.3. Motive behind curriculum planning and development

The committee considered and discussed the following factors for LOCF for the graduates:

i. Framing of syllabi

ii. Learners attributes

iii. Qualification descriptors

iv. Program learning outcomes

v. Course learning outcomes

vi. Necessity of having elective courses

vii. Academic standards

3. PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

The program educational objectives are set in line with Institutional and Departmentalmission statements. The program educational objectives of Bachelor of Computers are toproduce Computer Graduate who takes the responsibility with following qualities:

PEO1. Apply basic knowledge of mathematics, principles of physics and chemistry fordesign and development.

PEO2. Demonstrate the application of exploration practices through development ofinnovative tools that are beneficial in production.

PEO3. Exhibit skills of design and construct machineries based on requirement andneed of Technology operations.

PEO4. Exhibit strong, independent learning, analytical and problem solving skills withspecial emphasis on design, communication, and ability to work in teams.

PEO5. To have successful career as computer professional through lifelong learning inthe field of Bachelor of Computer.

4. GRADUATION ATTRIBUTES (GAs)

The graduate attributes in BCA are the summation of the expected course learning outcomes mentioned in the end of each course. Some of them are stated below.

GA1: **Discipline-specific Knowledge:** Capability of demonstrating comprehensive knowledgeof BCA program and understanding of core branch so that it forms a foundation for a graduate program of study.

GA2: **Critical Thinking & Analytical Reasoning:** Ability to employ critical thinking in understanding the concepts relevant to the various branches of engineering. Ability to analyze the results and apply them in various problemsappearing in different streams.

GA3: **Research-related skills:**

To develop a sense of inquiry and capability for asking relevant and intelligent questions, problem identification, synthesizing and articulating; ability to recognize and establish cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.

GA4: **Problem Solving:** Capability to solve problems by using research-based knowledge and research methods including innovative thinking, design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

GA5: **Usage of Modern Tools (Information/digital literacy):**

To create, select, and apply appropriate techniques, resources, and modern science and IT tools including prediction and modeling to complex science activities with an understanding of the limitations.

GA6: **Multicultural Competence:**

Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

GA7: **Self-directed learning withEnvironment :**Ability to work independently and do in-depth study of variousproblems and requirements of society with natural available resources and sustainable development.

GA8. **Moral and ethical awareness/reasoning:**

Ability to identify unethical behavior such as falsification or misrepresentation of data and adopting objective, unbiased and truthful actions in all aspects of their program.

GA9. **Leadership Readiness/Qualities:**

Capability for mapping out the tasks in a team or an organization, self-motivating and inspiring team members to engage with the team objectives/vision; and using management skills to follow the mapped path to the destination in a smooth and efficient way.

GA10: **Communication skills:**

i. Ability to communicate various concepts of technical education effectively using practical approach and their geometrical visualizations.

ii. Ability to use courses as a precise language of communication in other branches of human knowledge.

iii. Ability to resolve unsolved problems and requirements of industries and societies

iv. Ability to show the importance of their technical knowledge as precursor to various scientific developments since the beginning of the civilization.

GA11: Project Management and Finance:

Ability to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

GA12: Lifelong learning:

Ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning.

5. QUALIFICATION DESCRIPTORS (QDs)

The qualification descriptor suggests the generic outcomes and attributes to be obtained while obtaining the degree of BCA.The qualification descriptors indicate the academic standards on the basis of following factors:

i. Level of knowledge

ii. Understanding

iii. Skills

iv. Competencies and attitudes

v. Values.

These parameters are expected to be attained and demonstrated by the learners after becoming graduates in this program. The learning experiences and assessment procedures should be so designed that every graduate may achieve the program learning outcomes with equal opportunity irrespective of the class, gender, community and regions. Each technical graduate should be able to:

i. Demonstrate fundamental systematic knowledge and its applications. It should also enhance the subject specific knowledge and help in creating jobs in various sectors.

ii. Demonstrate educational skills in areas of their program.

iii. Apply knowledge, understanding and skills to identify the difficult/unsolved problems in courses of their program and to collect the required information in possible range of sources and try to analyze and evaluate these problems using appropriate methodologies.

iv. Apply one's disciplinary knowledge and skills in newer domains and uncharted areas.

v. Identify challenging problems and obtain well-defined solutions.

vi. Exhibit subject-specific transferable knowledge relevant to job trends and employment opportunities.

6. PROGRAM LEARNING OUTCOMES (PLOs)

Studentsgraduating with the BCAdegree should be able to acquire.

PLO1. **Technical knowledge**: Apply the knowledge of mathematics and science fundamentals to the solution of complex technical problems.

PLO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex technical problems reaching substantiated conclusions using first principles of mathematics and sciences.

PLO3. **Design/development of solutions**: Design solutions for complex technical problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PLO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PLO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern technical and IT tools including prediction and modeling to complex technical activities with an understanding of the limitations.

PLO6. **The technocrat and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional technical practice.

PLO7. **Environment and sustainability**: Understand the impact of the professional technical solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PLO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the technical practice.

PLO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PLO10. **Communication**: Communicate effectively on complex technical activities with the technical community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PLO11. **Project management and finance**: Demonstrate knowledge and understanding of the technology and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PLO12. **Lifelong learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Mapping of Graduate Attributes (GAs) and Program Learning Outcomes (PLOs):

PLO/ GA	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
PLO1	■											
PLO2		■										
PLO3			■									
PLO4				■								
PLO5					■							
PLO6						■						
PLO7							■					
PLO8								■				
PLO9									■			
PLO10										■		
PLO11											■	
PLO12												■

7. **PROGRAM SPECIFIC OUTCOMES (PSO's) :**

PSO1: Professionally empowering the student as technical manpower in industry or anentrepreneur for production analytics and innovation.

PSO2: Able to excel in various technological challenges and contribute for self-reliant society.

8. **TYPES OF COURSES**

Courses in a program may be of four kinds: Core, Elective, Ability Enhancement and Skill Enhancement.

a) **Core Course:-**

There may be a Core Course in every semester. This is the course which is to be compulsorily studied by a student as a requirement to complete the program in a said discipline of study.

2. List of Course

Core Subjects and Core Electives:

- Computer Fundamentals   Core
- Programming with C   Core
- Mathematics   Core
- Management Information System   Core
- *C Programming Lab   core
- Computer Fundamental Lab   Core
- Computer organization & Architecture   Core
- Programming in C++   Core

- Operating System   Core
- C++ lab   Core
- Personality Development Lab   Core
- PC Maintenance Lab   Core
- Data Structure using C   Core
- Data Base Management System   Core
- Computer Network   Core
- Discrete Mathematics   Core
- Data Structure & Algorithms Lab   Core
- DBMS Lab   Core
- JAVA Programming   Core
- Internet Programming   Core
- Software Engineering   Core
- Linux Programming   Core
- Java Programming Lab   Core
- Software Engineering Lab   Core
- Adv. Internet Programming Lab   Core
- Industrial Training   Core
- Advance Java   Core
- Advance Internet Programming   Core
- Theory of Computation   Core Elective
- Data Mining & Data Warehousing   Core Elective
- Compiler Design   Core Elective
- Advance Java Lab   Core
- Advance Internet Programming Lab   Core
- Compiler Design Lab   Core
- Seminar   Core
- Python Programming   Core
- Advance Computer Networks   Core Elective
- Machine Learning   Core Elective
- Artificial Intelligence   Core Elective
- Major Project   Core
- Python Lab   Core
- Machine Learning Lab   Core
- Fundamental of PHP   Core
- Research Methodology   Core
- ISS   Core
- Cloud Computing   Core Elective
- E- Commerce   Core Elective
- Big Data Analytics   Core Elective
- PHP Lab   Core
- ISS Lab   Core
- Synopsis Writing & Seminar   Core
- PHP Lab   Core
- ISS Lab   Core
- Synopsis Writing & Seminar   Core
- Internet of Things Lab   Core

- Seminar — Core
- Dissertation — Core
- Fundamental of PHP — Core
- Computer Graphics — Core
- Cloud Computing — Core Elective
- E- Commerce — Core Elective
- Big Data Analytics — Core Elective
- ISS — Core
- PHP Lab — Core
- Computer Graphics Lab — Core
- ISS Lab — Core
- Industrial Training — Core
- Internet of Things — Core
- Cryptography and Network Security — Core
- Deep Learning — Core
- Cyber Ethics & Crime — Core Elective
- Mobile Computing — Core Elective
- Software Project Management — Core Elective
- Internet of Things Lab — Core
- Project — Core

AECC

- Communication Skills — AECC
- Principles of Management — AECC
- Universal Human Values — AECC
- Leadership Skills & Management — AECC
- Professional Skills — AECC
- Research Methodology — AECC

VAC

- Environmental Studies — VAC
- Stock Market Operations — VAC
- New Venture Development — VAC

Multi Disciplinary

- Constitutional Values — Multi Disciplinary
- Cyber Crime & Protection — Multi-Disciplinary
- Critical Thinking — Multi -Disciplinary

SEC

- Basics of Hardware & PC Maintenance — SEC
- Digital Design Essentials — SEC
- Digital Marketing — SEC

Computation of Workload:
Lecture (L) : 1 Credit = 1 Theory period of one hour duration
Tutorial (T) : 1 Credit = 1 Tutorial period of one hour duration
Practical (P) : 1 Credit = 1 Practical period of two hour duration

9. PROGRAM STRUCTURE

BCA COURSE STRUCTURE

Semester – I

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 101	Computer Fundamentals	Core	30	70	100	4
BCA 102	Programming with C	Core	30	70	100	4
BCA 103	Mathematics	Core	30	70	100	4
BCA 104	English	AECC	30	70	100	4
BCA 105	Principles of Management	AECC	30	70	100	4
BCA VAC 001	Environmental Studies	VAC	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 106	C Programming Lab	Practical	60	40	100	1
BCA 107	Computer Fundamental Lab	Practical	60	40	100	1
TOTAL			300	500	800	26

Semester – II

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 201	Computer organization & Architecture	Core	30	70	100	4
BCA 202	Programming in C++	Core	30	70	100	4
BCA 203	Operating System	Core	30	70	100	4
BCA 204	Management Information System	Core	30	70	100	4
BCA 205	**Constitutional Values**	**Multi Disciplinary**	**15**	**35**	**50**	**2**
BCA 206	Basics of Hardware & PC Maintenance	SEC	30	70	100	4
PRACTICALS/VIVA-VOCE		**Type**	**Internal Marks**	**External Marks**	**Total**	**Credits**
BCA 207	C++ lab	Practical	60	40	100	1
BCA 208	Personality Development Lab	Practical	60	40	100	1
BCA 209	PC Maintenance Lab	Practical	60	40	100	1
TOTAL			**345**	**505**	**850**	**25**

Semester – III

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 301	Data Structure using C	Core	30	70	100	4
BCA 302	Data Base Management System	Core	30	70	100	4
BCA 303	Computer Network	Core	30	70	100	4
BCA 304	Communication Skills	AECC	30	70	100	4
BCA 305	Discrete Mathematics	Core	30	70	100	4
BCA VAC 002	Stock Market Operations	VAC	15	35	50	2
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 306	Data Structure & Algorithms Lab	Practical	60	40	100	1
BCA 307	DBMS Lab	Practical	60	40	100	1
TOTAL			**285**	465	750	**24**

Semester – IV

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 401	JAVA Programming	Core	30	70	100	4
BCA 402	Internet Programming	Core	30	70	100	4
BCA 403	Software Engineering	Core	30	70	100	4
BCA 404	Universal Human Values	AECC	30	70	100	4
BCA 405	Cyber Crime & Protection	Multi-Disciplinary	15	35	50	2
BCA 406	Digital Design Essentials	SEC	30	70	100	4
BCA 407	Linux Programming	Core	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 408	Java Programming Lab	Practical	60	40	100	1
BCA 409	Software Engineering Lab	Practical	60	40	100	1
BCA 410	Adv. Internet Programming Lab	Practical	60	40	100	1
BCA 411	Industrial Training	Practical	60	40	100	1
TOTAL			**435**	**615**	**1050**	**30**

Semester – V

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 501	Advance Java	Core	30	70	100	4
BCA 502	Advance Internet Programming	Core	30	70	100	4
BCA 503 A	Theory of Computation	Core Elective	30	70	100	4
BCA 503 B	Data Mining & Data Warehousing	Core Elective	30	70	100	4
BCA 503 C	Compiler Design	Core Elective	30	70	100	4
BCA 504	Leadership Skills & Management	AECC	30	70	100	4
BCA VAC 003	New Venture Development	VAC	15	35	50	2
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 505	Advance Java Lab	Practical	60	40	100	1
BCA 506	Advance Internet Programming Lab	Practical	60	40	100	1
BCA 507	Compiler Design Lab	Practical	60	40	100	1
BCA 508	Seminar	Seminar	60	40	100	1
TOTAL			**435**	**615**	**1050**	**22**

Semester – VI

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 601	Python Programming	Core	30	70	100	4
BCA 602 A	Advance Computer Networks	Core Elective	30	70	100	4
BCA 602 B	Machine Learning	Core Elective	30	70	100	4
BCA 602 C	Artificial Intelligence	Core Elective	30	70	100	4
BCA 603	Professional Skills	AECC	30	70	100	4
BCA 604	Critical Thinking	Multi - Disciplinary	15	35	50	2
BCA 605	Digital Marketing	SEC	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 606	Major Project	Practical	100	100	200	6
BCA 607	Python Lab	Practical	60	40	100	1
BCA 608	Machine Learning Lab	Practical	60	40	100	1
TOTAL			**355**	**495**	**850**	**26**

(UG Degree (Hons.) with Research)

Semester – VII

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 701	Fundamental of PHP	Core	30	70	100	4
BCA 702	Research Methodology	Core	30	70	100	4
BCA 703	ISS	Core	30	70	100	4
BCA 704 A	Cloud Computing	Core Elective	30	70	100	4
BCA 704 B	E- Commerce	Core Elective	30	70	100	4
BCA 704 C	Big Data Analytics	Core Elective	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 705	PHP Lab	Practical	60	40	100	1
BCA 706	ISS Lab	Practical	60	40	100	1
BCA 707	Synopsis Writing & Seminar	Practical	100	100	200	6
TOTAL			**340**	**460**	**800**	**24**

Semester – VIII

(UG Degree (Hons.) with Research)

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 801	Internet of Things	Core	30	70	100	4
BCA 802	Deep Learning	Core	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 803	Internet of Things Lab	Practical	60	40	100	2
BCA 804	Seminar	Practical	60	40	100	2
BCA 805	Dissertation	Practical	150	150	300	12
TOTAL			**330**	**370**	**700**	**24**

(UG Degree (Hons.)
Semester – VII

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 701	Fundamental of PHP	Core	30	70	100	4
BCA 702	Computer Graphics	Core	30	70	100	4
BCA 703 A	Cloud Computing	Core Elective	30	70	100	4
BCA 703 B	E- Commerce	Core Elective	30	70	100	4
BCA 703 C	Big Data Analytics	Core Elective	30	70	100	4
BCA 704	Research Methodology	AECC	30	70	100	4
BCA 705	ISS	Core	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 706	PHP Lab	Practical	60	40	100	1
BCA 707	Computer Graphics Lab	Practical	60	40	100	1
BCA 708	ISS Lab	Practical	60	40	100	1
BCA 709	Industrial Training	Practical	60	40	100	1
TOTAL			**390**	**510**	**900**	**24**

Semester – VIII
(UG Degree (Hons.)

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 801	Internet of Things	Core	30	70	100	4
BCA 802	Cryptography and Network Security	Core	30	70	100	4
BCA 803	Deep Learning	Core	30	70	100	4
BCA 804 A	Cyber Ethics & Crime	Core Elective	30	70	100	4
BCA 804 B	Mobile Computing	Core Elective	30	70	100	4
BCA 804 C	Software Project Management	Core Elective	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 805	Internet of Things Lab	Practical	60	40	100	2
BCA 806	Project	Practical	100	100	200	6
TOTAL			**280**	**420**	**700**	**24**

Note for award of BCA:

- Total Credits (153)
- The student who secures 145 credits out of 153 credits, will be awarded a UG degree - BCA

Note for award of BCA (Hons.):

- Total Credits (201)
- The student who secures 193 credits out of 201 credits, will be awarded a UG degree - BCA (Hons.)

Note for award of BCA (Hons.) with Research:

- Total Credits (201)
- The student who secures 193 credits including 12 Credit Project out of 201 credits, will be awarded a UG degree BCA (Hons. with Research)

Note:

- A student is required to obtain min. 40% marks in individual paper to pass.
- The credit relaxation will be applicable only on the elective course from different semester (i.e. the student can opt out only elective subject).
- Out of the total credits, 20% of the credits may be earned by the student through MOOCs (SWAYAM, NPTEL, Coursera etc.). However, the choice of online courses to be approved in advance by Dean/ HoD and Coordinator SWAYAM keeping in view the latest guidelines of the UGC/ respective regulatory body guidelines.
- The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to the project should be delivered one after starting of semester .The progress will be monitored through seminars and progress reports.

10. COURSE-WISE LEARNING OBJECTIVES, STRUCTURES AND OUTCOMES (CLOSOs)

Semester – I

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 101	Computer Fundamentals	Core	30	70	100	4
BCA 102	Programming with C	Core	30	70	100	4
BCA 103	Mathematics	Core	30	70	100	4
BCA 104	English	AECC	30	70	100	4
BCA 105	Principles of Management	Core	30	70	100	4
BCA VAC 001	Environmental Studies	VAC	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 106	C Programming Lab	Practical	60	40	100	1
BCA 107	Computer Fundamental Lab	Practical	60	40	100	1
TOTAL			**300**	**500**	**800**	**26**

BCA-101 - Computer Fundamentals

Course Objective:

- To know the importance of information systems of computer
- To evaluate the role of the major types of memory in computer
- To assess the impact of the Internet and Internet technology and softwares.
- To learn communication and networking concept..

Course Contents:

Unit-I **Computer Basics**: What are computers? The evolution of computers, Generations of Computers, classification of Computers, **Interfacing with the Computer:** What is Data Processing, Data and Information, Block Diagram, Input-output devices, Description of Computer input- Output Units, Hardwares and softwares.

Number System: Representation of integers, Representation of Fractions, Octal and Hexadecimal representation of numbers, Decimal to Binary Conversion. Binary addition, subtraction of numbers, Two's Complement representation of numbers, Addition/ subtraction of numbers in 2's Complement rotation, Binary multiplication, Binary division, Floating Point representation of numbers.

Unit-II **Computer Memory:** Memory Cell, Memory Organization, Read Only Memory, Serial Access Memory, Physical Devices Used to construct Memories, Magnetic Hard disk, Floppy Disk Drives, Compact Disk Read Only Memory, Magnetic Tape Drives. **Languages:** Programming Language, Assembly language, Low level and high level languages, assemblers, compilers, interpreters, linkers, algorithms, flow charting, decision tables, pseudo code.

Unit–III **Software concepts:** System & application software packages. **Operating system:** Why do we need an Operating System? Batch operating system, Multiprogramming Operating system, Time sharing operating system, Personal Computer Operating System, Unix Operating System, On- line and Real time system.

Unit–IV **Data and Network Communication:** Types of Communication, Need for computer communication networks, Internet and World Wide Web, Characteristics of Communication Channels.Allocation of Channel, Physical communication media, Computer Network Topologies, Communication Protocols, Local Area Networks, ATM Networks, Interconnecting Networks

Unit–V **Introduction to MS-Word, MS-Excel, MS-Power point:** Introduction, Windows 2007 Interface, Customizing the Word Application, Document Views, Basic Formatting in MS Word 2007, Advanced Formatting, Navigating through a

Word Document, Performing a Mail Merge, A Quick Look at Macros, Printing Documents, Print Preview *Excel 2007:* Introduction, Workbook, Worksheet, Formatting in excel, Advanced formatting in Excel, Working with formulas, Printing worksheets *MS PowerPoint:* Introduction, Creating a Presentation, Basic Formatting in PowerPoint, Advanced Formatting, Using Templates, Inserting charts, Inserting tables, Printing presentations

Textbooks:

1. "Introduction to Information Technology", ITL Education Solutions Ltd., Pearson Education
2. Sinha P. K. &SinhaPriti, "Computer Fundamentals", BPB Publications.,

References:

1. Raja Raman V.,"Introduction to Computers", PHI Publications
2. Leon Alex & Leon Mathews,"Introduction to Computers", Vikas Publishing House
3. Norton. Peter,"Introduction to Computers", TMH
4. SaxenaSanjay.,"A First Course in Computers", Vikas Publishing House Pvt. Ltd.
5. NagpalD.P.,"Computer Fundamentals", S. Chand Publications
6. BharihokeDeepak,"Fundamentals of Information Technology", Excel Books

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Define computer hardware and peripheral devices
CO2: Discuss with software applications
CO3: Explain file management
CO4: Experiment on Creating basic documents, worksheets, presentations with their properties.
CO5: Experiments on working with email and recognize email netiquette.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L1	H	L	M	M	-	-	-	-	-	H	-	H	M	L
CO2	L2	L	M	M	H	M	-	-	-	-	L	-	M	M	M
CO3	L2	M	L	L	M	M	-	-	-	-	M	-	M	H	M
CO4	L3	H	H	H	H	H	-	-	L	-	H	L	H	H	L
CO5	L4	M	L	M	M	L	-	-	L	-	M	-	M	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	CO3, CO4, CO5

BCA-102 – Programming in C

Course Objective:

* To learn essential knowledge on the need of programming languages and problem solving techniques.

* To explore major concepts of computer science and the process of computer programming, including programming, procedural and data abstraction and program modularity.

* To learn effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.

* To analyze and find the solution of computer specific problems.

Course Contents:

Unit-I   Overview of Programming Language: Introduction to algorithms, Flow charts, Tracing Flow charts, Problem solving methods, Need for computer languages, History and importance of C, Reading programs written in C language. **C Basics:** C character set, Identifiers and Keywords, Data types, Declarations, Expressions, statements and symbolic constants, Input-Output: getchar, putchar, printf, gets, puts functions.Preprocessor commands, # include, #define, ifdef, preparing and running a complete C program.

Unit-II   Loops, Operators and Expressions: Arithmetic, Unary, Logical, bit-wise assignment and conditional operators, Library functions, Control statements, while, do-while, for statements, nested loops, if else, switch, break, continue and goto statements, comma operators.**Arrays :**Defining and processing, One-dimensional Arrays, Two Dimensional Arrays, Multidimensional Arrays. Enum

Unit-III   Functions: Defining and accessing: Passing arguments, Function protypes, Recursions, Use of library functions, Storage classes: Automatic, external and static variables **String functions:** strings, operations on strings, String handling functions: string comparing, concatenating, copying.

Unit-IV   Pointers: Pointer Declarations, accessing a variable through its pointer, chain of pointers, Passing to a functions, Operations on pointers, Pointer and arrays, Arrays of pointers, pointers to functions, pointers and structures. **Dynamic Memory allocation:** Dynamic memory allocation, allocating a block of memory: Malloc, allocating multiple blocks of memory: Calloc, releasing the used space: Free, Altering the size of a block: Realloc.

Unit-V   Structures and Unions: Defining and declaring structure variables, accessing structure variables, operations on structures, Arrays of structures, arrays within structures, passing to a function, size of structures, Unions.

File Management in C: Defining and opening and closing a file, input/output operations on files, error handling during I/O operations on unformatted data files.

Textbooks:

1. Balaguruswamy E., *"Programming in ANSI C"*, Third Edition, Tata McGraw Hill Publishing Company Limited.

References:

1. SubburajR.,*"Programming in C*", Vikas Publishing house Pvt. Ltd.

Course Outcomes

At the end of the course, the student will be able to:

CO1: Understand the basic terminology used in computer programming
CO2: Use different data types in a computer program.
CO3: Define programs involving decision structures, loops and functions.
CO4: Explain the difference between call by value and call by reference.
CO5: Classify the dynamics of memory by the use of pointers.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	L	L	L	M	M	-	-	-	-	L	-	L	H	L
CO2	L3	M	M	M	H	L	-	-	L	L	M	L	M	M	M
CO3	L1	H	H	H	H	M	-	-	M	M	H	M	M	M	L
CO4	L2	M	M	M	M	L	-	-	-	-	M	-	L	H	L
CO5	L4	H	L	L	L	L	-	-	-	-	H	-	-	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	---

BCA-103 - Mathematics

Course Objective:

- To perform the operations of addition, subtraction, multiplication, and division on wholenumbers, fractions, and decimals, by hand.
- To evaluate numerical expressions involving whole number exponents and square roots.
- To identify basic geometrical figures and find their perimeter and area.
- To solve problems involving ratios and proportions.
- To solve problems involving percents.
- To apply knowledge of basic arithmetic skills to problem solving.
- To reason clearly and express them coherently in a mathematical context.
- To transfer basic arithmetic skills to subsequent courses such as pre- and introductory algebra.

Course Contents:

Unit-I **Algebra:**Revision of equations reducible to quadratic form Simultaneous equations (linear and quadratic) upto 2 variables only. Determinants and their six important properties, solutions of simultaneous equations by Cramer's rules. Matrices, definition of special matrices (like unit, singular, diagonal matrices etc…) arithmetic operation on matrices, transpose, ad joint and inverse of matrix, solution of simultaneous equations using matrices. **Trigonometry:** Revision of angle measurement and T-ratios addition, subtraction and transformation formulae. T-ratio of multiple and allied angles.

Analytical plane geometry: Cartesian coordinates, distance between two points, area of triangle, locus of point, straight line, slope and intercept form, general equation of first degree.

Unit-II **Differential Calculus:** Limit of functions, differential coefficient, differentiation of standard functions, including functions of function (chain rule), differentiation of implicit functions, logarithmic differentiation, parametric differentiation, successive differentiation. **Integral Calculus:** Integration as inverse of differentiation, indefinite integrals of standard forms, integration by parts, by partial and by substitution, formal evaluation of definite integrals.

Unit–III **Differential equations:** Definition and formation of ordinary differential equations, equations of first order and first degree, variable separable, homogeneous equations, non homogeneous equations, linear equations and differential equations reducible to these types. **Statistics:** Measure of central tendency, ideal characteristics, mean, median, mode, GM, H.M. and weighted mean form, quartile, deciles, percentiles

Unit–IV   Measures of dispersion, range, quartile deviation, standard deviation, mean deviation.Discrete and continuous frequency distribution .Calculation of standard deviation for discrete and continuous frequency distribution.Standard errors of means, coefficient of variation.

Unit–V   **Probability:** Events and Baye's theorem, probability distributions: Binomial, Poisson and Normal distribution.**Linear correlation and regression analysis:** Scatter plots, methods of least squares, fitting of straight lines and parabolas. Pearsonian coefficient of correlation.Lines of regression. Regression coefficient

Textbooks:

1. Grewal . B.S., *"Elementary Engineering Mathematics"*, Khanna publications 34th Ed., 1998.

2. Gupta, S. P and Kapoor V.K, *Fundamental of Mathematical Statistics*, Sultan Chand and Sons, New Delhi.

References:

1. Kreszyig E., "Advanced Engineering Mathematics", 5th Edition, John Wiley & Sons,1999

2. Dass . H.K., "Advanced Engineering Mathematics", S. Chand & Company, 9th Revised

a. Edition,2001.

3. Narayan . Shanti*,* "Integral Calculus", S. Chand & Company, 1999

4. Narayan . Shanti, "Differential Caluculs", S.Chand& Company, 1998

Course Outcomes

At the end of the course, the student will be able to:

CO1.Demonstrate competency in the areas that comprise the core of the mathematics major
CO2.Compute the ability to understand and write mathematical proofs
CO3.Use appropriate technologies to solve mathematical problems
CO4.Describe appropriate mathematical models to solve a variety of practical problems
CO5.Solve a problems related to Linear correlation and regression model

	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L3	-	L	M	-	M	-	-	-	-	-	-	-	L	M
CO2	L2	L	L	H	-	H	-	M	L	-	-	-	L	M	L
CO3	L3	H	-	H	-	-	-	L	H	-	L	L	-	L	M
CO4	L1	H	L	L	M	H	L	H	M	-	M	M	L	M	L
CO5	L4	-	M	-	-	L	-	-	-	-	-	-	-	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	------
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	-------

BCA 104 DLBCA-104 English

Course Objective

- The Objective of this course is to develop capability of the student to write and speak in English correctly being the back bone of legal education.

Course Contents :

Unit I Transformation & Analysis of Sentence

Elements of a sentence, Subject, predication, object, Types of Sentence: Simple Compound And Complex, Transactions of Sentences:

- Direct and indirect Narration
- Active and Passive Voice

Unit II Usage of Nouns, Pronouns, Adjectives, Conjunctions

Unit III **Tenses**

Simple Past tense, Simple Present Tense, Simple future Tense, Past Continuous, Present continuous, Future continuous, Past perfect, Present Perfect, Future Perfect, Past Perfect continuous, Present Perfect continuous, Future perfect continuous

Unit IV **Comprehension passage**

Inferring facts, opinions, reasons, conclusion, General statementsfrom Comprehension passage

Unit V Application & Letter (Official-formal and informal), Application & Letter (Personal), *Paragraph writing* (for developing better writing skill)

Text books:

1. Wren and Martin-English Grammar

Course Outcomes:

CO	Statement
	After completion of the course the students will be able to
CO1	Understand the types and transactions of sentences
CO2	Interpreting general grammatical usage of nouns , pronouns , verbs , adverbs , adjectives and conjunctions
CO3	Understand the usage of all types of tenses
CO4	Summarizing and journaling comprehension passage
CO5	Articulating paragraph writing , applications and letter writing.

BCA-105: Principles of Management

Course Objectives:

- To gain an understanding of principles and functions of management.
- To gain insights into history and development of management thought.
- To analyze the managerial issues and problems arising in an organization

Course Contents:

Unit I   **Introduction:** Concept, Nature, Process and Significance of Management; Managerial levels, skills, Functions and Roles; Management vs. Administration; Coordination as Essence of Management; Development of Management Thought: Classical, Neo-Classical, Behavioral, Systems and Contingency Approaches.

Unit II   **Planning**: Nature, Scope and Objectives of Planning; Types of plans; Planning Process; Business Forecasting; MBO: Concept, Types, Process and Techniques of Decision-Making; Bounded Rationality.

Unit III   **Organizing:** Concept, Nature, Process and Significance; Principles of an Organization; Span of Control; Departmentation; Types of an Organization; Authority-Responsibility; Delegation and Decentralization; Formal and Informal Organization.

Unit IV   **Staffing**: Concept, Nature and Importance of Staffing.Scope of staffing Motivating and Leading: Nature and Importance of Motivation; Types of Motivation

Unit V   **- Controlling:** Nature and Scope of Control; Types of Control; Control Process; Control Techniques – Traditional and Modern; Effective Control System

Textbooks:

1. Gupta C.B., Principles and Practice of Management, Mayoor paperbacks

References:

1. Prasad L.M., Principles and Practice of Management, Sultan Chand and Sons.
2. Terry George R., Franklin Stephen G., C, A.I.T.B.S. Publisher sand Distributors Singh Nirmal, Principles of management, Deep and Deep Publications Pvt. Ltd

Course Outcomes:

After completion of the course the students will be able to:

CO1. Assume the roles and responsibilities associated with managerial functions.
CO2. Identify the key contributors and their contributions in the development of management thought.
CO3. Differentiate various approaches in management for problem solving.
CO4. Understand and Importance of Motivation
CO5. Apply Technique of control and types of control

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	-	M	-	-	-	-	M	H	L	L	L	L	L	M
CO2	L2	-	M	L	-	-	L	L	M	H	M	L	-	M	L
CO3	L4	-	M	L	-	L	L	M	H	H	M	L	L	L	M
CO4	L1		M	-	-	-	-	M	H	L	L	L	L	L	M
CO5	L3		M	-	-	-	-	M	H	L	L	L	L	L	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3 , CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4,CO5
CD3	Seminars	---
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	----

BCA-VAC 001- Environment Studies

Course Objectives:
- To provide student with an understanding of the natural, human and social dimensions of local and wider environments.\
- To provide students with opportunities to engage in active learning
- To encourage students to use a wide range of skills, and acquire open, critical and responsible attitudes.

Course Contents:

Unit I   Ecosystems and Biodiversity

Ecosystem – Introduction- Abiotic and Biotic components. Structure and functions of Ecosystem, Food Chain, Food web, Ecological pyramids, Energy flow and biogeochemical cycle, Biodiversity – Values, Type and levels of Biodiversity. Causes of depletion. Conservation of biodiversity.

Unit II   Natural Resources and Environment

Forest resources: types and Values, Water resources: Types of water resources-fresh water and marine resources; Availability and use of water resources, Soil and mineral resources: Important minerals; Mineral exploitation; Environmental problems due to extraction of minerals and use; Soil as a resource and its degradation, Non-Conventional energy sources, Introduction, renewable sources of energy, Potential of renewable energy resources in India, solar energy, wind energy, Energy from ocean, energy from biomass, geothermal energy and nuclear energy.

Unit III   Environmental Pollutions

Water Pollution – Sources of water, water quality standards, type of pollutants – its sources and effects, Air Pollution – composition of atmosphere, Air quality standards, Sources and adverse effects of air pollution, Greenhouse effect, global warming, acid rain, ozone depletion, Noise Pollution – Introduction, Level of noise, Sources and adverse effects of noise, Control of noise pollution.

Unit IV   Environmental Management and Sustainable Development

Solid Waste Management, Municipal waste – Introduction, classification of solid waste, composition and characteristics of solid waste, Collection conveyance and disposal of solid waste, recovery of resources. Sanitary land filling, Vermi-composting, incineration, Biomedical waste – Generation, collection and disposal. Water Conservation, Rain Water Harvesting.

Unit V   Social Issues and Environmental Legislation

Social Issues and Environmental Impact Assessment (EIA), Sustainable development, Public awareness and environmental education, Environmental Legislations in India – Environmental Protection act-1986, Air (Prevention and control of Pollution) act, water (Prevention and control of Pollution) act, wildlife protection act, Forest conservation act.

Suggested Readings

1. Bamanayha B.R., Verma, L.N. and Verma A (2005). Fundamentals of Environmental Sciences, Yash Publishing House, Bikaner.

2. Dhaliwal G.S., Sangha G.S. and Ralhan P.K. (2000) Fundamentals of Environmental Sciences,Kalyani Publishers, New Delhi.

3. Odum E.P. and Barrett G.W.(2007) Fundamentals of Ecology, Akash Press, New Delhi.

4. Agrawal, K.C.(1999) Environmental Biology, Agro Botanica, Bikaner.

5. Ranjeeta Soni, Environmental Studies and Disaster management" New India Publication Agency (NIPA), New Delhi.

6. Shikha Agarwal, Suresh Sahu, Environmental Engineering, Dhanpat Rai Publication.

7. M N Rao, HVN Rao ,Air Pollution,Tata Mcgraw Hill Education Private Limited.

Course Outcomes:

At the end of the course, students will able to:

CO1: Understand the interdisciplinary branches of environment and their scopes. Ecosystem Links between environmental components and their role and types of ecosystems. Types of biodiversity, their values, depletion and various conservation methods.

CO2: Concepts and classification of natural resources. They will able to understand about biotic resources, soil and mineral resources, Concept of non Conventional energy resources, types and various applications of renewable resources and current potentials of energy resources.

CO3: Understand about various types of pollutions and their classification, types of pollutants and their sources. Various quality standards for pollutions, adverse health effects including air, water, soil, noise thermal and radioactive pollutions.

CO4: Basic knowledge about management system, cost benefit analysis, EIA and EA solid and hazardous waste management ,concept of 3Rs and Sustainable development Goals and strategies.

CO5: Basic knowledge about various constitutional acts, laws, agreements and about organizations on international level for environmental initiatives.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	L	L	L	M	-	-	L	-	-	L	-	L	M	L
CO2	L1	H	M	M	H	-	-	M	-	-	H	-	H	H	M
CO3	L2	H	L	L	L	-	-	L	-	-	H	-	H	M	L
CO4	L3	H	L	L	M	-	-	L	-	-	H	-	H	M	M
CO5	L1	H	L	L	L	-	-	L	-	-	H	-	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	------

BCA-106 - C Programming Lab

Course Objectives:

- To provide a comprehensive study of the C programming language.
- To identify problems that requires programmed solution.
- To study, analyze and implement pointers, memory allocation, data handling through files and graphics in 'C'.

LIST OF EXPERIMENTS:

1 Write a program to calculate the area & perimeter of rectangle.

2 Write a program to calculate the area and circumference of a circle for a given radius.

3 Write a program to calculate simple interest for a given principal/amount.

4 Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

5 Write a program to find profit and loss (in percentage) of a given cost price and selling price.

6 Write a program to find out the maximum among the three given numbers.

7 Write C programs that use both recursive and non-recursive functions To find the factorial of a given integer.

8 Write a program to print the list of first 100 odd number.

9 Write a program to calculate the sum of the digits of a number and display it in reverse order.

10 Write a program to generate a Fibonacci series.

11 Write a program to generate the following series:

    *
    * *
    * * *
     * * * * *
    * * * * * *

12 Write a program to generate the following series:

    01
    01 0
    01 01
    01 01 0

13 Write a program using a function to check whether the given number is prime or not.

14 Write a program to check whether the given string is a palindrome or not.

15 Write a C program that uses functions to perform the following operations: To insert a sub-string in to given main string from a given position.

16 Write a C program to determine if the given string is a palindrome or not.

17 Write a program to swap two variables a & b using pointers.

18 Write a program to enter a line of text from keyboard and store it in the file. User should enter file name.

19 Write a recursive program for tower of Hanoi problem

20 Write a C program that uses functions to perform the following:

o   Addition of Matrices.

o   Multiplication of Matrices.

21. Write a program to copy one file to other, use command line arguments.

22. Write a C program to reverse the first n characters in a file. (Note: The file name and n are specified on the command line.)

23. Write a program to perform the following operators an Strings without using String functions

- To find the Length of String.
- To concatenate two string.
- To find Reverse of a string.
- To Copy one sting to another string.

24. Write a Program to store records of an student in student file. The data must be stored using Binary File.Read the record stored in "Student.txt" file in Binary code.Edit the record stored in Binary File.Append a record in the Student file.

25. Write a programmed to count the no of Lowercase, Uppercase numbers and special Characters presents in the contents of File.

Course Outcomes:

By the end of the course students will be able to

CO1. Analyze the advance concepts of C- language.
CO2. Define the pointers, memory allocation techniques and use of files for dealing with variety of problems.
CO3. Develop graphics programs using C.
CO4. Apply the operation on string
CO5. Understand and apply the File Handling

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L4	M	M	M	H	H	-	-	M	-	H	L	H	M	L
CO2	L1	M	L	L	M	L	-	-	L	-	M	-	M	M	M
CO3	L3	H	M	M	H	M	-	-	H	-	H	L	H	H	M
CO4	L3	M	L	L	M	L	-	-	L	-	M	-	M	M	M
CO5	L2	H	M	M	H	M	-	-	H	-	H	L	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3,CO4,CO5
CD3	Seminars	-----------
CD4	Self- learning advice using internets	CO1,CO2, CO3
CD5	Industrial visit	

BCA-107 - Computer Fundamental Lab

Course Objective(s):

- Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.

- Provide hands-on use of Microsoft Office 2010 applications Word, Excel, Access and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills

LIST OF EXPERIMENTS:

1. Create simple news letter in ms word.
2. Create greeting card in ms word.
3. Create a mail merge letter in MS Word.
4. Create a macro for inserting a picture and formatting the text.
5. Create a simple presentation in MS Power Point to list simple dos commands, hardware, software.
6. In Power Point create an animation with video and sound.
7. In MS Excel create a report containing the pay details of the employee with followings:

   It contains: sl no, name, employee id

   Enter the following formula to calculate the respective values.

   da (60% of basic)

   hra (7.5% of basic)
8. Create a student result sheet:
9. Create a pie chart for a sample data and give legends
10 create a macro which creates a line chart using the data in the worksheet

Course Outcomes:

Upon completion of this course, the student will be able apply technical knowledge and perform specific technical skills, including:

CO1. Understand the Usage of computers and why computers are essential components in business and society.
CO2. Determine the Internet Web resources and evaluate on-line e-business system.
CO3. Solve common business problems using appropriate Information Technology applications and systems.
CO4. Compute and Identify categories of programs, system software and applications. Organize and work with files and folders.
CO5. Describe various types of networks network standards and communication software.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	M	L	L	M	-	-	-	-	-	M	-	-	L	H
CO2	L2	H	M	M	H	M	-	-	-	-	H	-	H	M	M
CO3	L4	M	L	L	M	-	-	-	-	-	M	-	M	L	M
CO4	L3	L	L	L	M	-	-	-	-	-	L	-	L	H	H
CO5	L1	M	L	L	L	L	-	-	-	-	M	-	-	L	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4 ,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4,CO5
CD3	Seminars	-----------
CD4	Self- learning advice using internets	CO1,CO2, CO3, CO4,CO5
CD5	Industrial visit	

Semester – II

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 201	Computer organization & Architecture	Core	30	70	100	4
BCA 202	Programming in C++	Core	30	70	100	4
BCA 203	Operating System	Core	30	70	100	4
BCA 204	Management Information System	AECC	30	70	100	4
BCA 205	**Constitutional Values**	**Multi Disciplinary**	**15**	**35**	**50**	**2**
BCA 206	Basics of Hardware & PC Maintenance	SEC	30	70	100	4
PRACTICALS/VIVA-VOCE		**Type**	**Internal Marks**	**External Marks**	**Total**	**Credits**
BCA 207	C++ lab	Practical	60	40	100	1
BCA 208	Personality Development Lab	Practical	60	40	100	1
BCA 209	PC Maintenance Lab	Practical	60	40	100	1
TOTAL			**345**	**505**	**850**	**25**

Note for Exit Option:

- **Students who opt to exit after completion of the I year and have secured 48 credits, in addition to one project of 4 credits at the end of I year, will be awarded a UG Certificate.**

BCA-201- Computer Organization & Architecture

Course Objective:

- Have a thorough understanding of the basic structure and operation of a digital computer.

- Discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication &division.

- Study the different ways of communicating with I/O devices and standard I/O interfaces.

Course Contents:

Unit-I **Register Transfer and Micro-operations:** Register transfer language, Register transfer, control function, Memory transfer, Arithmetic Micro-operations, Logical Micro-operations.**Basic Computer Organization and Design**: Instruction Codes, Computer Instructions, Timing and Control, Instruction cycle

Unit-II **Central Processing Unit:** General Register Organization, Stack Organization, Instruction Formats, Addressing Modes.**Pipelining**: parallel processing, Instruction Pipeline

Unit-III **Micro programmed Control Unit:** Control Memory, Address sequencing, Micro program sequencer.

Unit-IV **Input-Output Organization:** Peripheral Devices, I/O Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access

Unit-V **Memory Organization:** Memory hierarchy, RAM & ROM chips, Auxiliary Memory, Cache Memory, Associative Memory, virtual Memory

Text books:

1. Mano .M.Morris ; "Computer System Architecture" ; Prentice–Hall of India

Reference books:

1. William Stallings ; "Computer Organization & Architecture – Designing for Performance" ;Prentice–Hall of India
2. Hayes . John P. ; "Computer Architecture and Organization" ; Tata McGraw-Hill

Course Outcomes

At the end of the course, the student will be able to:

CO1: Understand the major components of a computer including CPU, memory, I/O and storage.
CO2: Define the uses for cache memory.
CO3: Understand a wide variety of memory technologies both internal and external.
CO4: Appy the role of the operating system in interfacing with the computer hardware.
CO5: Understand the basic components of the CPU including the ALU and control unit.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	P01 1	PO 12	PS O1	PS O2
CO1	L2	M	L	L	M	-	-	-	-	-	M	-	M	L	L
CO2	L1	M	L	L	M	-	-	-	-	-	M	-	M	M	M
CO3	L2	L	M	M	H	-	-	-	-	-	L	-	-	L	L
CO4	L2	M	L	L	L	-	-	-	-	-	M	-	M	M	L
CO5	L2	L	M	M	M	-	-	-	-	-	L	-	L	L	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	------

BCA-202 Programming in C++

Course Objectives:

- Learn to design software using abstract data and control structures.
- Learn structures including lists, stacks, queues, trees, and graphs.
- Choose appropriate data structures and algorithms for problem solving.

Course Contents:

Unit-I   **Introduction:** Introducing Object-Oriented Approach, Relating to other paradigms(functional, data decomposition).

Basis Features of OOPs: Abstraction, Encapsulation, Inheritance, Polymorphism, Review ofC, Difference between C and C++ - cin, cout, new, delete operators.

Unit-II   **Classes and Objects:** Encapsulation, information hiding, abstract data types, Object &classes, attributes, methods, C++ class declaration, State identity and behavior of an object, Constructors and destructors, instantiation of objects, Default parameter value, object types, C++ garbage collection, dynamic memory allocation, Meta class/abstract classes.

Unit-III   **Inheritance and Polymorphism:** Inheritance, Class hierarchy, derivation – public, private & protected, Aggregation, composition vs classification hierarchies, Polymorphism, Categorization of polymorphism techniques, Method polymorphism, Polymorphism by parameter, Operator overloading, Parametric polymorphism,

Unit-IV   **Generic function –** template function, function name overloading, Overriding inheritance methods, Run time polymorphism, Multiple Inheritance.

Unit-V   **Files and Exception Handling:** Persistent objects, Streams and files, Namespaces, Exception handling, Generic Classes

Text/ Reference Books:

1. A.R.Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997.
2. S. B. Lippman& J. Lajoie, "C++ Primer", 3rd Edition, Addison Wesley, 2000.
3. R. Lafore, "Object Oriented Programming using C++", Galgotia Publications, 2004.
4. D .Parasons, "Object Oriented Programming withC++", BPB Publication.
5. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication.
6. Schildt Herbert, "C++: The Complete Reference", 4th Ed., Tata McGraw Hill, 1999.
7. Tony Gaddis, Watters, Muganda, "Object-Oriented Programming in C++", 3rd Ed., Wiley Dreamtech, 2004.

Course Outcomes

At the end of the course, the student will be able to:

CO1: Understand object-oriented programming features in C++.
CO2: Apply these features to program design and implementation.
CO3: Understand object-oriented concepts and how they are supported by C++.
CO4: Explain practical experience of C++.
CO5: Apply the facilities offered by C++ for Object-Oriented Programming.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	M	L	L	M	-	-	-	-	-	M	-	M	M	H
CO2	L3	M	L	L	L	-	-	-	-	-	M	-	M	M	M
CO3	L1	L	L	L	M	-	-	-	-	-	L	-	L	H	M
CO4	L2	H	M	M	H	M	-	-	L	-	H	-	M	H	H
CO5	L3	M	L	L	M	-	-	-	-	-	M	-	H	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	**Course Delivery methods**	**Course Outcomes**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	----

BCA 203 : Operating System

Course Objective:

- To learn the mechanisms of Operating System to handle processes and threads.

- To learn the mechanisms involved in memory management in OS.

- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols

- To know the components and management aspects

Course Contents:

Unit I: **Introduction and History of Operating systems:** Structure and operations; processes and files Processor management: inter process communication, mutual exclusion, semaphores, wait and signal procedures, process scheduling and algorithms, critical sections, threads, multithreading

Unit II: **Memory management:** contiguous memory allocation, virtual memory, paging, page table structure, demand paging, page replacement policies, thrashing, segmentation, case study

Unit III: **Deadlock:** Shared resources, resource allocation and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms.

Device management: devices and their characteristics, device drivers, device handling, disk scheduling algorithms and policies

Unit IV: **File management:** file concept, types and structures, directory structure, cases studies, access methods and matrices, file security, user authentication

Unit V: UNIX and Linux operating systems as case studies; Time OS and case studies of Mobile OS

Text/Reference Books:

- Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.

- Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

- Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing

- Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley

- Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India

- Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Course Outcomes

At the end of the course, the student will be able to:

CO1: Understand the structure of OS and basic architectural components involved in OS design

CO2: Practice and design the applications to run in parallel either using process or thread models of different OS

CO3: Discuss the various device and resource management techniques for timesharing and distributed systems

CO4: Understand the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system

CO5: Understand the concept of time OS and Mobile OS

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	H	M	M	M	-	-	-	-	M	M	-	L	M	M
CO2	L3	H	H	M	H	-	-	-	-	M	M	-	M	M	M
CO3	L3	H	H	M	H	-	-	-	-	M	L	-	L	H	M
CO4	L2	H	H	L	H	-	-	-	-	L	L	-	M	H	M
CO5	L2	H	M	M	H	-	-	-	-	L	L	-	M	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,CO4,CO5
CD2	Tutorials/Assignments	CO2, CO3,CO4
CD3	Seminars	CO3,CO4
CD4	Self- learning advice using internets	CO3, CO4
CD5	Industrial visit	-

BCA-204: Management Information System

Course Objectives:

- Get the knowledge about the important management concepts & their application, to have an insight of various functional departments in an organization.

- Discuss the importance of security, privacy, and ethical issues as they relate to information systems.

- Identify some of the strategies employed to lower costs and improve service.

Course Contents:

Unit-I   **Basics of MIS:** Introduction, Structure of MIS, Purpose, Objectives, Benefits, Limitations, Requirements, Characteristics, Role of MIS in Organizations, Nature and Scope, Foundation of IS- IS classification, General Support System, Information system for decision making , The role of system analyst , Data base management system.

Unit-II   **System Study:** SDLC, System Designing models, System Analysis Tools : DFD. Decision Trees, Decision Tables, Structured English, Data Dictionary along with its Pros and Cons.

Unit-III **Trends and applications of IS:** Information Concepts:- Types, Information Quality, Dimensions of Information.System Concepts- Kinds of System, System Related Concepts.

Information Technology, a Managers overview, managerial overview of Computer hardware & software, Telecommunication, Database management.

Unit-IV   **IS for Business Applications:** Business application of Information Technology, internet & electronic commerce, intranet, extranet & Information system for managerial decision support system and Types of Decisions in Organization, information system for strategic advantage.

Unit-V   **Advanced Concepts of IS:** Enterprise Resource planning, Supply chain management, Customer Relationship Management (CRM), Procurement Management System, Implementation Process, System Maintenance and System Evaluation, IS Security and Ethical responsibility

Text books/reference books:

1. Brian, "Management Information System", TMH.
2. Alter, "Information Systems: A Management Perspective" Addison Wesley
3. Jawadegar, "Management Information System", TMH.
4. Bansal, "Information System Analysis & Design", TMH.

Course Outcomes

At the end of the course, the student will be able to:

CO1: Understand the usage of MIS in organizations and the constituents of the MIS.
CO2: Understand the classifications of MIS, understanding of functional MIS and the different functionalities of these MIS. This would be followed by case studyon Knowledge management.
CO3: Define and linking MIS to business strategy and the areas in which MIS would lead to strategic advantage. This would be followed by case study and guest lecture.
CO4: Apply and Learns the functions and issues at each stage of system development. Further different ways in which systems can be developed are also learnt.
CO5 understanding about emerging MIS technologies like ERP, CRM,SCM and trends in enterprise applications.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P0 11	PO1 2	PSO1	PSO2
CO1	L2	M	L	L	M	-	-	-	-	-	M	-	M	H	L
CO2	L2	M	M	M	H	-	-	-	-	-	M	-	M	M	M
CO3	L1	H	M	M	M	-	-	-	-	L	H	-	H	M	M
CO4	L2	M	L	L	M	-	-	-	-	-	M	-	M	H	L
CO5	L2	H	M	M	H	-	-	-	-	M	H	-	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	-----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	-----

BCA 205 Constitutional Values in Indian Constitution

Course Objectives:

On the completion of the course, the learners will be able to:

Understand the values of Constitutional form of Governance those are to safeguard the human rights of every citizen of the Country and to pursue the analytical and critical study of the Constitution of India in terms of these values with its functional dimensions carried out in course of time through the instrumentalities of the State since the inception of the Constitution of India.

Course Contents:

Unit I	Lassize faire theory - concept of Freedom
	Liberty, Equality, Fraternity, Secularism, Socio-Economic Justice,Universal franchise
	Human Dignity. Rule of law, Sovereignty, limited government, separation of powers, federalism, Individual rights.
Unit II	Constitutional governance in India: Republican Democracy
	Legal values of democracy; Freedom, Equality, Separation of Power and Rule of Law , Freedom and Equality
Unit III	Right to life (Article 21) Right of persons in custody and preventive detention laws (Articles 22) Freedom of religion (Articles 25-28) Cultural and educational Rights of Minorities(Articles 29-30) Right to Equality (Articles 14-18) discriminatory justice Fundamental freedoms (Articles19)
Unit IV	**Legal values of democracy;** Separation of Power and Rule of Law
	Parliament and State Legislatures; Union and State Executive List challenges to separation of power in India context
Unit V	Rule of Law; Independent and integrated judiciary- Power of Judicial Review; theory of basic structure Right to constitutional Remedies, Writs
	Socio-Economic Justice and Universal Franchise
	Preamble; Directive principles of the State (Articles 36-51)
	Fundamental duties (Article 51 A)
	Role of Election Commission in Democratic Process

Text Books:

1. V.N. Shukla, *Constitution of India*, Eastern Book Agency, 2014

2. M.P. Jain, *Indian Constitutional Law*, Lexis Nexis, 2013

Suggested Readings:

1. D.D. Basu, *Introduction to the Indian Constitution of India*, Prentice Hall of India Private Ltd., New Delhi, 1994

2. H. M. Seervai, *Constitutional Law of India*, Universal Law Publishing Co., Reprint, 2013

3. Glanville Austin, *Indian Constitution-Cornerstone of the Nations*, Oxford University Press, 1999

4. P.M. Bakshi, *TheConstitution of India*, Universal Law Publishing Co., 2014

Course Outcomes: - At the end of the course, a student will be able to understand:

CO1	Concept of 'State' in reference to the fundamental rights.
CO2	The fundamental rights and the procedure for compliance of fundamental rights and Writ jurisdiction of Supreme Court and high court under Article 32 and 226.
CO3	The duty of state and inter- relationship between fundamental rights and directive principles. (L1)Apply the theories of Basic Structure in general.
CO4	State responsibility towards its citizens
CO5	Detailed analysis of directive principles and its enforcement.

BCA-206- Basics of Hardware & PC Maintenance

Course Objectives:

- To introduce students to the fundamental concepts and principles of computer hardware and networking.
- To develop students' ability to identify and troubleshoot hardware issues effectively.
- To equip students with practical skills in installing and configuring hardware components for computer systems.

Course Contents:

Unit I: Introduction to Input & Output Devices, Types of Input & Output Devices, Specifications of Input & Output Devices, Central Processing Unit (CPU), CPU Basics

CPU Architecture, CPU Types, Memory Devices, Primary Memory

Secondary Memory

Types of Memory Devices

Unit II: Motherboard

Motherboard Basics

RAM, ROM, CMOS, and POST

Bus Connections

Connections of Various Devices

Display Adapter Connections

Serial, Parallel, and USB Port Connections

Modem Connections

CPU Cooling and Motherboard Troubleshooting

Importance of CPU Cooling

Troubleshooting Motherboard Issues

Unit III: Keyboard Basics and Troubleshooting

Switches and Keyboard Organization

Types of Keyboards

Wireless Keyboard Troubleshooting

Mouse Basics and Troubleshooting

Types of Mouse

Scroll and Optical Mouse Function

Connecting Mouse and Troubleshooting

Ports, Modems, and Printers

Working of LED, DMP, Ink Jet, and Laser Printer

Line Printer and MFP Troubleshooting

Working of Scanners and Troubleshooting

Plotters

Unit 4: System Software and Application Software

Types of System Software

Types of Application Software

Driver Software Installation

Windows and Other Software

Windows Components and Tools

Windows Registry

Scandisk and Disk Defragmenter

Disk Management

Boot Process and CMOS Setup

Setting of CMOS and Setup

PC Tools

Boot Process

Unit 5: Computer Installation

Site Preparation

Air-Conditioning Requirements

False-Ceiling and False-Flooring

Fire-Protection System

Electrical Earthling

Power Supply and Protection Equipment

Power Supply Requirements

Clean Power Supply

Power Supply Problems

Power Conditioning

Spike Suppressor, CVT, UPS (Online and Off-line), SMPS

Safety and Security Measures

Safety from Natural Calamities

Theft and Fire Hazards

Data Security

Security from Unauthorized Users

Virus Protection Techniques

Firewalls and Folder Locking

Course Outcomes:

CO 1. Students will be able to demonstrate a comprehensive understanding of computer hardware components, including input and output devices, CPU, memory devices, motherboard, and various connections.

CO 2. Students will be able to troubleshoot and repair common hardware issues, including keyboard, mouse, printer, modem, and scanner problems.

CO 3. Students will be able to explain the importance of CPU cooling and motherboard maintenance and perform basic troubleshooting.

CO 4. Students will be able to install and configure hardware components, including peripherals and power supply equipment.

CO 5. Students will be able to understand and implement safety and security measures for computer systems.

BCA-207 C++ Lab

Course Objectives:

- To know different programming paradigms.
- To study and understand the object oriented programming concepts and methodology.
- To implement object oriented programming concepts in C++.

List of Exercises

1   Write a program to Create Class with Static Data Member.

2   Write a program to define a class to represent a bank account. Include the following members

Data Members

a) Name of the depositor

b) Account number

c) Type of account

d) Balance amount in the account

Member Functions

a) To assign initial values

b) To deposit an amount

c) To withdraw an amount after checking the balance

d) To display name and balance

Write a program to test the program.

3   Write a program to using INLINE function.

4   Write a program to using FRIEND function

5   Write a program to using Operator Overloading Unary Minus.

6   Write a program to using inheritance

7   Write a program to using Function Overloading.

8. Write a program to create files with constructor function.

9. Write a program reading from two files simultaneously.

10. Write program containing a possible exception. Use a try block to throw it and a catch block to handle it properly.

Course Outcomes:

By the end of the course students will be able to

CO1. Understand key features of the object oriented programming language such as encapsulation (abstraction), inheritance, and polymorphism.
CO2. Apply and implement object oriented applications.
CO3. Analyze problems and implement simple C++ applications using an object oriented software engineering approach.
CO4. Describe different functions in oops.
CO5. Analyze problems and implement simple C++ program using file handling

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	M	L	L	M	L	-	-	-	-	M	-	M	H	L
CO2	L3	H	M	M	H	H	-	-	M	M	H	M	H	M	M
CO3	L4	M	M	M	H	M	-	-	L	L	M	-	M	H	L
CO4	L2	H	M	M	H	H	-	-	M	M	H	M	H	M	M
CO5	L4	M	M	M	H	M	-	-	L	L	M	-	M	H	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3,CO4,CO5
CD3	Seminars	-----------
CD4	Self- learning advice using internets	CO1,CO2, CO3
CD5	Industrial visit	

BCA-208: Personality Development Lab

Course Objectives:-

- To listen to different texts and comprehend them.

- To train students to use appropriate language for public speaking.

- To encourage students to make writing habit.

- To make the students understand the importance of working in teams in the present day scenario.

- To make students understand how setting goals in life is important.

- To make students realize how group decision making is better than decisions made individually.

- To help students better understand basic leadership qualities and personality traits.

- To stress upon students, the importance of time management.

- To facilitate critical thinking and analysis of activities and attitudes that support company's success.

List of Exercises

1. **Resume / Report Preparation / Letter Writing**

   Structuring the resume / report – Letter writing / Email Communication – Samples.

2. How to give your Self Introduction.

3. **Presentation skills:**

   Elements of effective presentation – Structure of presentation – Presentation tools –

   Body language – Video samples

4. Soft Skills

5. **Presentation Skills:** Students make presentations on given topics.

6. **Group Discussion:** Students participate in group discussions.

7. **Interview Skills:** Students participate in Mock Interviews

Course Outcomes:

By the end of this course, students will be able to:

CO1. Compute conversations and speeches.
CO2. Discuss Speak with clarity and confidence, thereby enhancing their employability skills.
CO3 Describe his/her creative self, and express effectively the same in writing.
CO4. Explain the advantages of teamwork and how the tasks could be completed effectively when done as a cohesive unit.
CO5.Analize that selecting goal is a fundamental component to long-term success of an individual.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L3	L	L	L	M	-	-	-	L	-	L	-	L	L	H
CO2	L2	M	L	L	L	-	-	-	L	-	M	-	M	M	M
CO3	L1	L	L	L	M	-	-	-	M	-	L	-	L	L	M
CO4	L2	M	L	L	L	-	-	L	L	-	M	-	M	H	H
CO5	L4	H	M	M	H	L	-	M	L	-	H	-	L	L	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4 ,CO5
CD2	Tutorials/Assignments	CO1, CO2, CO3, CO4 ,CO5
CD3	Seminars	---
CD4	Self- learning advice using internets	CO1, CO2, CO3, CO4 ,CO5
CD5	Industrial visit	--

Semester – III

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 301	Data Structure using C	Core	30	70	100	4
BCA 302	Data Base Management System	Core	30	70	100	4
BCA 303	Computer Network	Core	30	70	100	4
BCA 304	Communication Skills	AECC	30	70	100	4
BCA 305	Discrete Mathematics	Core	30	70	100	4
BCA VAC 002	Stock Market Operations	VAC	15	35	50	2
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 306	Data Structure & Algorithms Lab	Practical	60	40	100	1
BCA 307	DBMS Lab	Practical	60	40	100	1
TOTAL			**285**	465	750	**24**

BCA 301 : Data Structures and Algorithms

Course Objectives:

- To impart the basic concepts of data structures and algorithms.
- To understand concepts about searching and sorting techniques.
- To understand basic concepts about stacks, queues, lists, trees and graphs.
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.

Course Contents:

Unit-I **Stacks:** Basic Stack Operations, Representation of a Stack using Static Array and Dynamic Array, Multiple stack implementation using single array, Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions and Towers of Hanoi.

Unit-II **Queues**: Basic Queue Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack, Applications of Queues- Round Robin Algorithm. Circular Queues, DeQueue Priority Queues.

   Linked Lists: Introduction, single linked list, representation of a linked list in memory, Different Operations on a Single linked list, Reversing single linked list, Advantages and disadvantages of single linked list, circular linked list, double linked list and Header linked list.

Unit-III **Searching Techniques:** Sequential and binary search. Sorting Techniques: Basic concepts, Sorting by: bubble sort, Insertion sort, selection sort, quick sort, heap sort; merge sort, radix sort and counting sorting algorithms.

Unit-IV **Trees:** Definition of tree, Properties of tree, Binary Tree, Representation of Binary trees using arrays and linked lists, Operations on a Binary Tree, Binary Tree Traversals (recursive), Binary search tree, B-tree , B+tree, AVL tree, Threaded binary tree.

Unit-V **Graphs**: Basic concepts, Different representations of Graphs, Graph Traversals (BFS & DFS), Minimum Spanning Tree(Prims &Kruskal), Dijkstra's shortest path algorithms. Hashing: Hash function, Address calculation techniques, Common hashing functions, Collision resolution: Linear and Quadratic probing, Double hashing.

Textbooks/References:

- Schaum Series, "Introduction to Data Structures", TMH.
- R.B. Patel, "Expert Data Structures with C", Second Edition, Khanna Book publishing Co (P) Ltd.
- Tenenbaum, "Data Structure using C++", PHI.
- Chattopadhyay S., Dastidar d G.and Chattopadhyay Matangini., "Data Structure through C language", BPB publications.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Discuss the algorithms to determine the time and Computation complexity and justify the correctness.

CO2: Implement given Search problem (Linear Search and Binary Search).

CO3: Implement Stack and Queue and analyze the same to determine the time and computation complexity.

CO4: Apply an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.

CO5: Implement Graph search and traversal algorithms and determine the time and computation complexity.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	P011	PO12	PSO 1	PSO 2
CO1	L2	H	H	H	H	-	L	-	-	L	M	-	L	M	M
CO2	L3	H	H	M	H	M	-	-	-	L	M	-	M	H	L
CO3	L3	H	M	L	M	M	-	-	-	L	M	M	L	M	M
CO4	L3	M	H	M	H	M	L	-	-	L	M	M	M	H	M
CO5	L4	H	M	H	M	L	L	-	-	L	M	M	L	H	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO2, CO3, CO5
CD3	Seminars	CO3, CO4, CO5
CD4	Self- learning advice using internets	CO2, CO3, CO5
CD5	Industrial visit	CO4, CO5

BCA 302 : Database Management System

Course objectives:

- To understand the different issues involved in the design and implementation of a database system.

- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models

- To understand and use data manipulation language to query, update, and manage a Database

- To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.

- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Course Contents:

Unit I: **Introduction to database systems**: Overview and History of DBMS. File System v/s DBMS. Advantage of DBMS Describing and Storing Data in a DBMS. Queries in DBMS. Structure of a DBMS.

Entity Relationship model: Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model- Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, and Design with ER Model- Entity v/s Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation v/s ternary Relationship Conceptual Design for a Large Enterprise.

Unit II: **Relationship Algebra and Calculus:** Relationship Algebra Selection and Projection, Set Operations, Renaming, Joints, Division, Relation Calculus, Expressive Power of Algebra and Calculus.

SQL queries programming and Triggers: The Forms of a Basic SQL Query, Union, and Intersection and Except, Nested Queries, Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.

Unit III: **Schema refinement and Normal forms:** Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form, Normalization-Decomposition into BCNF Decomposition into 3-NF.

Unit IV: **Transaction Processing:** Introduction-Transaction State, Transaction properties, Concurrent Executions. Need of Serializability, Conflict vs. View Serializability, Testing for Serializability, Recoverable Schedules, Cascadeless Schedules.

Unit V: **Concurrency Control:** Implementation of Concurrency: Lock-based protocols, Timestamp-based protocols, Validation-based protocols, Deadlock handling,

Database Failure and Recovery: Database Failures, Recovery Schemes: Shadow Paging and Log-based Recovery, Recovery with Concurrent transactions.

References:

1 Date C J, "An Introduction to Database System", Addision Wesley.
2 Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
3 Elmasri, Navathe, "Fundamentals of Database Systems", Addision Wesley
4 Leon & Leon, "Database Management System", Vikas Publishing House.
5 Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication
6 Ramakrishnan, Gehrke, "Database Management System", McGraw Hill
7 Kroenke, "Database Processing: Fundamentals, Design and Implementation", Pearson.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand given query write relational algebra expressions for that query and optimize the developed expressions

CO2: Understand given specification of the requirement design the databases using E-R method and normalization.

CO3: Understand given specification construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.

CO4: Demonstrate given query optimize its execution using Query optimization algorithms

CO5: Discuss a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	H	L	M	L	H	-	-	-	L	L	L	M	M	M
CO2	L2	H	M	M	M	M	-	-	-	-	M	L	L	M	M
CO3	L2	H	L	M	L	H	-	-	-	-	L	L	M	M	M
CO4	L3	H	H	H	H	M	-	-	-	L	H	L	L	H	M
CO5	L2	H	H	M	H	M	-	-	-	L	H	M	L	H	M

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO2, CO3, CO4, CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	CO2, CO5

BCA 303 : Computer Networks

Course objectives:

- To Understand about the evolution of data communication and networking paradigms
- To Understand the principles of data communication, channel characteristics, signaling, modulation and encoding, and multiplexing (SONET/SDH)
- To know about the various transmission media, their comparative study.
- To Understand about the channel error detection and correction, MAC protocols, Ethernet and WLAN
- To understand the operations of TCP/UDP, FTP, HTTP, SMTP, SNMP, etc.

Course Contents:

Unit I: **Introduction:** Objective, scope and outcome of the course.

Unit II: **Introductory Concepts:** Network hardware, Network software, topologies, Protocols and standards, OSI model, TCP model, TCP/IP model, Physical Layer: Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System.

Unit III: **Data Link Layer:** Error Detection and Correction, Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction, Protocols: Stop and wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding window, Piggy backing, Pure ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA.

Unit IV: **Network Layer:** Design issues, Routing algorithms: IPV4, IPV6, Address mapping: ARQ, RARQ, Congestion control, Unicast, Multicast, Broadcast routing protocols, Quality of Service, Internetworking.

Unit V: **Transport Layer:** Transport service, Elements of transport protocols, User Datagram Protocol, Transmission Control Protocol, and Quality of service, Leaky Bucket and Token Bucket algorithm.

        Application Layer: WWW, DNS, Multimedia, Electronic mail, FTP, HTTP, SMTP, Introduction to network security

References:

1. Computer Networking; J. F. Kurose and K.W.Ross, Pearson education
2. Data Communications and Networking; B.A. Forouzon, Tata-McGraw-Hill
3. Computer Networks; A.S. Tannenbaum
4. Communication Networks; Garcia and Widija, Tata-McGraw-Hill.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Explain the functions of the different layer of the OSI Protocol.

CO2: Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.

CO3: Calculate requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component

CO4: Calculate problem related TCP/IP protocol developed the network programming.

CO5: Discuss DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

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Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
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CO2	L3	H	M	M	M	-	-	-	-	-	M	-	L	L	L
CO3	L2, L3	H	L	M	L	-	-	-	-	-	L	-	M	M	M
CO4	L3	H	H	H	H	-	-	-	-	-	H	-	L	L	M
CO5	L2	H	H	M	H	-	-	-	-	-	M	-	L	M	M

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO2, CO3, CO4, CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	CO2, CO5

BCA 304: Communication Skills

Course Objectives:

- To identify common communication problems that may be holding learners back
- To identify what their non-verbal messages are communicating to others
- To understand role of communication in teaching-learning process
- To learn to communicate through the digital media
- To understand the importance of empathetic listening
- To explore communication beyond language.

Course Contents

Unit I   Listening

Techniques of effective listening, Listening and comprehension, Probing questions, Barriers to listening

Unit II   Speaking and Non-verbal communication

Speaking: Pronunciation, Enunciation, Vocabulary, Fluency, Common Errors

Meaning of non-verbal communication, Introduction to modes of non-verbal communication, Breaking the misbeliefs , Open and Closed Body language, Eye Contact and Facial Expression

Hand Gestures, Do's and Don'ts, Learning from experts, Activities-Based Learning

Unit III   Reading

Techniques of effective reading, Gathering ideas and information from a given text: Identify the main claim of the text, Identify the purpose of the text, Identify the context of the text, Identify the concepts mentioned, Evaluating these ideas and information: Identify the arguments employed in the text, Identify the theories employed or assumed in the text, Interpret the text: To understand what a text says, To understand what a text does, To understand what a text means.

Unit IV   Writing and different modes of writing

Clearly state the claims, Avoid ambiguity, vagueness, unwanted generalisations and oversimplification of issues, Provide background information, Effectively argue the claim, Provide evidence for the claims, Use examples to explain concepts, Follow convention, Be properly sequenced, Use proper signposting techniques, Be well structured: Well-knit logical sequence, Narrative sequence, Category groupings, Different modes of Writing: E-mails, Proposal writing for Higher Studies, Recording the proceedings of meeting: Any other mode of writing relevant for learners

Unit V   **Digital Literacy and Effective use of Social Media**

Role of Digital literacy in professional life: Trends and opportunities in using digital technology in workplace, Internet Basics, Introduction to MS Office tools: Paint, Office, Excel ,.PowerPoint

Introduction to social media websites, Advantages of social media, Ethics and etiquettes of social media, How to use Google search better, Effective ways of using Social Media, Introduction to Digital Marketing

Text Books:

1. SenMadhucchanda (2010), *An Introduction to Critical Thinking*, Pearson, Delhi
2. Silvia P. J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

Suggested Readings:

1. Public Speaking, Michael Osborn and Suzanne Osborn, Biztantra
2. Handbook of Practical Communication Skills-Chrissie Wrought, published by Jaico Publishing House.

Course Outcomes:

CO	Statement
	After completion of this course, students will be able to:
CO1	Adapt effective listening skills
CO2	Learn and demonstrate effective speech.
CO3	Learn and demonstrate effective reading skills
CO4	Know and practice effective writing skills
CO5	Understand and recognize the importance of digital literacy and social media

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom's Levels	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2
CO1	L3	M	H	L	-	-	-	-	M	-	M	M	-	-	-
CO2	L3	-	H	M	M	-	-	-	-	-	M	M	-	-	-
CO3	L3	-	H	M	M	-	-	-	-	-	M	M	-	-	-
CO4	L3	-	H	M	M	M	-	-	-	-	M	M	-	-	L
CO5	L2	-	H	H	M	M	-	-	-	-	M	M	-	-	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3, CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3, CO4,CO5
CD3	Seminars	CO2,CO3, CO4,CO5
CD4	Self- learning advice using internets	CO1, CO2,CO3, CO4
CD5	Industrial visit	CO5

BCA-305: Discrete Mathematics

Course Objectives:

* To develop logical thinking and its application to computer science (to emphasize the importance of proving statements correctly and de-emphasize the hand-waving approach towards correctness of an argument). The subject enhances one's ability to reason and ability to present a coherent and mathematically accurate argument. About 40% of the course time will be spent on logic and proofs and remaining 60% of the course time will be devoted to functions, relations, etc.

Course Contents:

Unit-I   **Graphs**: Directed and undirected graphs, chains, circuits, paths, cycles, connectivity, adjacency and incidence matrices, Minima's path application (flow charts and state transition graphs, algorithms for determining cycle and minimal paths, polish notation and trees, flows ion networks.)

Unit-II   **Groups and Subgroups**: Group axioms, semi-groups, Permutation Groups, Subgroups, Cosets, Normal subgroups.

Applications of Groups: FREE Semi-groups, Applications, (modular arithmetic, error correcting codes, grammars, languages, Finite State Machine)

Unit-III   **Finite Fields:** Definition Representation, Structure, Integral domain, Irreducible polynomial, polynomial roots, Splitting fields.

Unit-IV   **Posets and Lattices:** Posets, Relations to partial ordering, Hasse diagram, Lattices.

Boolean algebra: Axiomatic definition of Boolean algebra as algebraic structures with two operations basic results truth values and truth tables.

Unit-V   Thealgebra of prepositional function.The Boolean algebra of truth-values, Application (Switching circuits, Gate circuits).

Text Books:

1. C.L.Liu *Elements of Discrete Mathematics*McGraw-Hill Book, 1985.

2. Kenneth G. Rosen, "*Discrete Mathematics and its applications*", McGraw – Hill International Editions, Mathematics Series

3. Kolman, Busby and Ross, *"Discrete Mathematical Structure*", PHI, 1996.

4. Sarkar . S.K., "*Discrete Maths*"; S. Chand & Co., 2000

5. ScymourLipschutz, "*Discrete Mathematics*", McGraw-Hill International Editions, Marc Lars Lipson, Schaum's Series.

Reference Books:,

1. Dass . H.K., "*Advanced Engineering Mathematics*", S. Chand & Company, 9th Revised Edition, 2001.

2. Richard Johnsonbough," *Discrete Mathematics"* Pearson Eduction Inc., 2002.

3. Alan Doerr, "*Applied Discrete Structures for Computer Science*", Galgotia Publications Pvt. Ltd

Course Outcome:

At the end of the course student will be able to know:

CO1.	Describe the multiple levels of detail and abstraction, being aware, in particular, of the applicability and limitations of tools from mathematics and theoretical computer science and Graphs
CO2	.Define the context in which a computer system may function, including its interactions with people and the physical world and able to communicate with, and learn from, experts from different domains throughout their careers
CO3.	Demonstrate a solid foundation that allows and encourages them to maintain relevant skills as the field evolves
CO4.	Calculate and Manage their own learning and development, including managing time, priorities, and progress
CO5	Describe an appreciation of the interplay between theory and practice.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	M	L	L	M	-	-	-	-	-	M	-	L	L	L
CO2	L1	L	L	L	M	-	-	-	-	-	L	-	L	M	M
CO3	L3	H	M	M	M	-	-	-	-	-	H	-	M	L	M
CO4	L3	H	L	L	L	-	-	-	-	-	H	-	M	L	L
CO5	L2	M	M	M	M	-	-	-	-	-	M	-	H	L	M

1- High, 2- Moderate, 3- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1, CO2, CO3, CO4, CO5
CD3	Seminars	-----
CD4	Self- learning advice using internets	CO1, CO2, CO3, CO4, CO5
CD5	Industrial visit	-----

VAC 002: Stock Market Operations

Course Objectives

- To learn from basics to advance concepts of stock market
- To learn to make money from SM, Gold & Real Estate
- To know practically to open account & start investing

Course Contents:

Unit I	Why to Learn and Invest in the Securities Markets?
	Basics of Securities Market;
	Career Opportunities in Stock Market
	Business of Stock Market;
	Mindset for Investing;
	Management of Risk in SM
Unit II	How to Open 3 in 1 Trading Account?;
	How to buy sell shares for investment, trading?,
	Mathematics of SM
	Fundamental Analysis-Economic, Industry, Company;
	When to Buy or Sell Shares using Technical Analysis?
Unit III	Special Strategies for Investment in Shares;
	New Issues, How to Make Money?
	Miscellaneous issues in SM
Unit IV	How to Build Wealth with Exchange Traded Funds;
	Building Wealth with Mutual Funds
	Taxation of Shares, MFs, ETFs & F&O
	Introduction to Future, Options, Greeks
	Handling Grievances and Complaints
	Introduction to Nifty Indices
Unit V	How to Earn Part-time from SM as a Student
	How to Retire as Crorepati
	How to Make Money from Gold
	How to Make Money from Real Estates

Text Books:

1. GbBaligar, Stock Market Operations, Ashok Prakashan

2. Gitman and Joehnk, Fundamentals of Investing, Pearson.

Suggested Books:

1. Hirt and Block, Fundamentals of Investment Management, McGraw Hill Publishing Co.

Course Outcomes

CO	Statements
CO1	Understand the basics of Securities Markets and Management of Risk
CO2	Analyse the stocks using Fundamental Analysis and do technical analysis for buying and selling the shares
CO3	Understand the strategies for investing in SM to generate wealth
CO4	Have the knowledge of Future, Options and Nifty indices
CO5	To be able to make money through ETFs, Mutual funds, Gold and Real Estates

BCA 306: Data Structures and Algorithms Lab

Course Objectives:

- To impart the basic concepts of data structures and algorithms.
- To understand concepts about searching and sorting techniques.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

List of Experiments:

S.No.	List of Exercises
1	Write a program to insert an element at desire position in the array.
2	Write a program to delete an element at desire position from the array.
3	Write a program to replace an element at desire position in the array.
4	Write a program to search (linear search) an element in the array.
5	Write a program to search (binary search) an element in the array.
6	Write a program to addition and multiply of two matrices.
7	Write a program to implementation of stack using array.
8	Write a program to implementation of queue using array.
9	Write a program to implementation link list.
10	Write a program that sorts the array through Bubble sort.
11	Write a program that sorts the array through Quick sort.
12	Write a program that sorts the array through Merge sort.
13	Write a program that sorts the array through Insertion sort.
14	Write a program to BST (binary search tree) addition, deletion and searching.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Select appropriate data structures as applied to specified problem definition.

CO2: Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.

CO3: Implement Linear and Non-Linear data structures.

CO4: Implement appropriate sorting/searching technique for given problem.

CO5: Determine and analyze the complexity of given Algorithms.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L1	H	M	H	M	M	-	-	-	L	M	L	L	M	L
CO2	L3	M	M	H	M	L	-	-	-	-	M	L	M	M	L
CO3	L3	M	M	H	M	L	-	-	-	L	M	-	L	H	M
CO4	L3	H	L	H	L	L	-	-	-	-	L	-	M	M	M
CO5	L4	H	M	H	M	M	-	-	-	M	M	L	L	M	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO2, CO3, CO5
CD3	Seminars	-
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	CO5

BCA-307 DBMS LAB

Course Objectives:

- To understand the different issues involved in the design and implementation of a database system.

- To study the physical and logical database designs, database modeling, and relational models.

- To understand and use SQL to query, update, and manage a database.

- To develop an understanding of essential DBMS concepts such as: transaction processing, integrity, concurrency, and recovery in databases.

- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

List of Exercises

1. Create the student/employee Table and construct the following requires for the database…

    1..1.   Create the table for student/employee.

    1..2.   Find out name of all students.

    1..3.   Retrieve the list of name and the city of all students.

    1..4.   List of all students/employee who stay in city "BOMBAY" or city DELHI".

    1..5.   List of all students /employee who are located in "MADRAS".

2. (1)Apply these Operations on employee table

    2..1.   Insert

    2..2.   Select

    2..3.   Update

    2..4.   Drop

    2..5.   Delete

    2..6.   Alter

3. Create table with attributes emp. No., emp. Name, Designation, Salary, and Department no. Construct for following queries…..

    .1   Display complete information of all the employees working as a manager.

    .2   Display name of all the employees working as a clerk.

    .3   Suppose DA for manager is 75% of salary then display name of all managers.

    .4   Select names and designation whose salary is greater then 15000.

    5.   Apply key constraints as Primary Key, Foreign Key etc as per requirement.

4. Between operation- list of all Employee Name & DOJ (date of joining) to join the Company in 2010

5. Join operation- list of all the employees along with their department information by using join operation.

6. AND/OR operation- make a table that have an employee Perform AND/ORoperation.

7. Group by function-

   Create the table for facilities having faculty-id, dept. no., designation name and group by similar dept.no. Facilities by using count function.

8. Order by ACS function-

   (a) Create a table for emp. Using following data:- emp. name, emp age, emp salary, emp city & display the emp salary in ascendingand descending order.

9. Max-Min function- create a table for student having similar attributes s_name, S_marks, s_id, s_sec&remark.

   9..i.   Find the maximum marks obtained by student.

   9..ii.   Find the minimum marks obtained by student.

   9..iii.   Sum of all students marks using sum function.

   9..iv.   Find the average of marks using avg function.

10. Drop operation- Perform Drop Operation.

11. a) Define DBMS.

    b) Key Component- Entity, Attributes

    c) SQL

        1)DDL

        2)DML

    d) Relational data model-

        1) Relation

        2) Tuple

        3) Domain

        4) Degree

Course Outcomes:

By the end of the course students will be able to

CO1. Demonstrate an understanding of the relational data model.
CO2. Describe an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
CO3. Define relational algebra, solutions to a broad range of query problems.
CO4. Explain SQL, solutions to a broad range of query and data update problems.
CO5.Solve Experiment related to Functions

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

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CO2	L2	M	M	M	H	-	-	-	-	-	M	-	M	M	M
CO3	L1	L	M	M	M	M	-	-	L	L	L	-	L	H	M
CO4	L1	M	H	H	H	M	-	-	L	L	M	-	M	H	L
CO5	L3	M	H	H	H	M	-	-	L	L	M	-	M	H	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4,CO5
CD3	Seminars	-----------
CD4	Self- learning advice using internets	CO1,CO2, CO3, CO4
CD5	Industrial visit	

Semester – IV

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 401	JAVA Programming	Core	30	70	100	4
BCA 402	Internet Programming	Core	30	70	100	4
BCA 403	Software Engineering	Core	30	70	100	4
BCA 404	Universal Human Values	AECC	30	70	100	4
BCA 405	Cyber Crime & Protection	Multi-Disciplinary	15	35	50	2
BCA 406	Digital Design Essentials	SEC	30	70	100	4
BCA 407	Linux Programming	Core	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 408	Java Programming Lab	Practical	60	40	100	1
BCA 409	Software Engineering Lab	Practical	60	40	100	1
BCA 410	Adv. Internet Programming Lab	Practical	60	40	100	1
BCA 411	Industrial Training	Practical	60	40	100	1
TOTAL			**435**	**615**	**1050**	**30**

BCA-401 Java Programming

Course Objectives:

- Be familiarizing with good design and programming.

- Create Java programs that leverage the object-oriented features of the Java language, such as encapsulation, inheritance and polymorphism; use data types, arrays and other data collections.

- Implement error-handling techniques using exception handling.

Course Contents:

Unit-I   Features of Java Programming Language; Introduction to JDK, JVM, Bytecode; Java Programming: Data types, accessspecifiers, operators, control statements, arrays; Classes: Fundamentals, objects, methods, constructors.

Polymorphism: method overloading, constructor overloading.

Unit-II   **Inheritance:** Types of inheritance; Concept of super class, sub class, this and super operator, method overriding, Use of final, packages, abstract class, interface.

Unit-III   **Exception Handling:** Exception Class, built in checked and unchecked exceptions, user defined exceptions, use of try, catch, throw, throws, finally.

Multi threaded programming: Overview, comparison with multiprocessing, Thread class and runnable interface, life cycle, creation of single and multiple threads, thread priorities.

Unit-IV   **Java Library:** String handling (only main functions), String Buffer class. Elementary concepts of Input/Output: byte and character streams, System.in and Sysem.out, print and println, reading from a file and writing in a file.

Unit-V   **Applets:** Introduction, Life cycle, creation and implementation, AWT controls: Button, Label, TextField, TextArea, Choice lists, list, scrollbars, check boxes, Layout managers, Elementary concepts of Event Handling: Delegation Event Model, Event classes and listeners, Adapter classes, Inner classes. Swings: Introduction and comparison with AWT controls.

Textbooks:

1. E. Balagurusamy, *Programming with Java*, TMH
2. Herbert Schieldt, *The Complete Reference:Java*, TMH
3. Horstmann, *Core Java*, Addison Wesley
4. Rich raposa, *Learning Java*, Wiley

Course Outcomes

At the end of the course, the student will be able to:

CO1:	understand Java Programming language.
CO2:	Describe The development of small to medium sized application programs that demonstrate professionally acceptable coding.
CO3:	Demonstrate the use of Java Programming language.
CO4:	Understanding of the principles and practice of object oriented programming in the construction of robust maintainable programs which satisfy the requirements.
CO5:	Define and implement an application that demonstrates their competency with Java syntax, structure and programming logic, incorporating basic features of the language as well as some features from the I/O (Input/Output) or GUI libraries.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	L	L	L	M	L	-	-	-		M	-	M	L	L
CO2	L1	H	H	H	H	H	-	-	M	L	H	M	H	M	M
CO3	L3	M	M	M	M	M	-	-	-	-	M	-	M	L	M
CO4	L2	M	L	L	M	-	-	-	-	-	M	-	M	H	L
CO5	L1	H	H	H	H	H	-	-	M	M	H	M	H	L	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	------

BCA-104 - Basics of Internet Programming

Course Objective:

- To gain the skills and project-based experience needed for entry into web design and development careers.
- To use a variety of strategies and tools to create websites.
- To develop awareness and appreciation of the myriad ways that people access the web and will be able to create standards-based websites that are accessible and usable by a full spectrum of users.

Course Contents:

Unit-I **Introduction to Internet-** Web Browser, What the web browser does, Overview of famous web browsers, Web servers,Uniform resource locators (URL), what is www, Search Engines, Electronic mail, Email software

Unit-II **HTML an introduction**What HTML is-and What It isn't, History of HTML, Structuring HTML page, The HTML><HEAD><TITLE><BODY>tags, Paragraphs, Font tags, Creating different types of Links, Introduction to lists, Different types of lists.

Unit-III **Tables**Introduction, Table pats, Sizing tables, borders, cells, Table and cell color and alignment, Aligning your table content, spanning multiple rows and columns, grouping and aligning rows and columns.

Unit-IV **Forms & Frames** Understanding forms and functions, Essential elements of forms, Displaying control labels, Grouping control with field set and legend, What are frames , Working with linked windows, Working with frames, Changing frame borders

Unit-V **DHTML**What is DHTML, The concept of style sheets, Approaches to style sheets, commonly used style sheet properties and values, Controlling page layout CSS properties, Backgrounds, colors and images, setting border appearance Inline style sheets

References:

1. Jonathan Gennick with Tom Luers, 'Teach yourself HTML', 2nd Edition ,SAMS

2. HTML: A Beginner's GuidebyWendy Willard (Author)

Course Outcomes

At the end of the course, the student will be able to:

CO1:Analyze a web page and identify its elements and attributes.
CO2: Apply and Create web pages using HTML and Cascading Styles sheets.
CO3: Describe and Build dynamic web pages using JavaScript (client side programming).
CO4: Give examples and Create XML documents used in Web Publishing.
CO5: Identify and Create XML Schema for data transfer in distributed environment.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L4	H	L	L	M	-	-	-	-	-	M	-	M	H	L
CO2	L3	M	M	M	H	M	-	-	M	-	H	L	M	M	M
CO3	L1	L	M	M	M	M	-	-	L	-	M	-	H	H	L
CO4	L2	H	H	H	H	H	-	-	H	-	H	L	M	H	M
CO5	L2	M	M	M	H	M	-	-	H	-	H	M	M	M	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	-------
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	----

BCA 403- Software Engineering

Course Objectives:

- To help students to develop skills that will enable them to construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain.
- To foster an understanding of why these skills are important.

Course Contents:

Unit-I Introduction, software life-cycle models, software requirements specification, formal requirements specification, verification and validation.

Unit-II **Software Project Management:** Objectives, Resources and their estimation, LOC and FP estimation, effort estimation, COCOMO estimation model, risk analysis, software project scheduling.

Unit-III **Requirement Analysis:** Requirement analysis tasks, Analysis principles. Software prototyping and specification data dictionary, Finite State Machine (FSM) models. Structured Analysis: Data and control flow diagrams, control and process specification behavioral modeling

Unit-IV **Software Design:** Design fundamentals, Effective modular design: Data architectural and procedural design, design documentation.

Unit-V **Object Oriented Analysis:** Object oriented Analysis Modeling, Data modeling. Object Oriented Design: OOD concepts, Class and object relationships, object modularization, Introduction to Unified Modeling Language.

Text/ Reference Books:

- R. S. Pressman, "Software Engineering – A practitioner's approach", McGraw Hill Int. Ed.
- I. Sommerville, "Software Engineering", Addison Wesley, 2004
- Rajib Mall, "Fundamental of Software Engineering", 3rd Edition, PHI Learning Private Limited
- K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers
- K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2nd Ed., New Age International, 2005.
- James Peter, W. Pedrycz, "Software Engineering: An Engineering Approach", John Wiley & Sons.
- Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa, 3rd Ed., 2005.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand large scale software development from a broader perspective, and function in multidisciplinary teams.

CO2: Apply knowledge gained in the course to practical software development situations.

CO3: Describe software systems to meet desired needs with realistic constraints.

CO4: Describe software development activities.

CO5: Discuss contemporary issues in Software development and engage in life-long learning, understand professional and ethical responsibility

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	H	M	H	M	-	-	-	-	L	L	L	M	H	M
CO2	L3	H	L	M	L	M	-	-	-	M	L	L	M	M	H
CO3	L1	H	M	L	M	M	-	-	-	H	M	-	M	M	M
CO4	L1	M	L	M	L	M	-	-	-	M	L	L	M	H	M
CO5	L2	H	H	H	H	L	-	-	-	M	L	L	L	M	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO2, CO3, CO5
CD3	Seminars	CO3, CO4, CO5
CD4	Self- learning advice using internets	CO2, CO3, CO5
CD5	Industrial visit	CO4, CO5

BCA 404: Universal Human Values

Course Objective:

- To Know the basic guidelines, content and Process for Value Education

- To develop understanding different Harmony concept.

- To understand professional ethics and natural acceptance of human values.

Course Contents:

Unit I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, Self Exploration – its content and process; 'Natural Acceptance' and Experiential Validation, Continuous Happiness and Prosperity- Human Aspirations, Right understanding, Relationship and Physical Facilities, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

Unit II: Understanding Harmony in the Human Being - Harmony in Myself

Understanding human being as a co-existence of the sentient 'I' and the material 'Body 'Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha Understanding the Body as an instrument of 'I', Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

Unit III: Understanding Harmony in the Family and Society- Harmony inHuman-Human Relationship

Understanding harmony in the Family, Understanding values inhuman-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect(Samman) , meaning of Vishwas; Difference between intention and competence, meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, harmony in the society , Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals ,Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family.

Unit IV: Understanding Harmony in the Nature and Existence – Whole existence as Coexistence

Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in

nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in allpervasive Space. Holistic perception of harmony at all levels of existence

Unit V: Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values

Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models. Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers. Case studies related to values in professional life and individual life.

Suggested Text / Reference Books

1.   Gaur R.R., Sangal R. and. Bagaria, G.P:"A Foundation Course in Human Values Professional Ethics," Excel Books, 2010.

2.   Sadri S & Sadri, J Business Excellence through Ethics & Governance, 2ndedition, 2015.

3.   Mathur, U C Corporate Governance and business ethics, MacMillan India Ltd, 2009.

4.   Baxi, C V: Corporate Governance, Excel Books, 2009

5.   Sadri S, Sinha A K and Bonnerjee, P: Business Ethics: concepts and cases, TMH, 1998.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand and analyze Basic Guidelines, Content and Process for Value Education.

CO2: Understand Harmony in the Human Being - Harmony in Myself.

CO3: Understand Harmony in the Family and Society- Harmony in Human-Human Relationship.

CO4: Understand Harmony in the Nature and Existence – Whole existence as Coexistence.

CO5: Understand of Harmony on Professional Ethics. Natural acceptance of human values

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom's Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	-	-	-	-	L	L	M	H	L	M	-	L	M	M
CO2	L2	-	-	-	-	-	L	M	M	M	M	-	L	M	M
CO3	L2	-	-	-	-	-	L	M	H	L	M	-	L	M	L
CO4	L2	-	-	-	-	L	L	L	M	M	L	L	H	M	M
CO5	L2	L	-	-	-	-	M	M	H	L	M	-	L	M	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	CO5
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	

BCA 405- Cyber Crime and Protection

Course Objectives:

- Concepts of cyber Law
- Providing elementary understanding the authorities under IT Act
- Penalties & Offences under IT Act
- Cyber Space Jurisdiction
- Scope of Cyber Laws.

Course Contents:

Unit I	Meaning and Nature of Cyber Crimes, Evolution of Cyber Crimes, types of Computer Crimes
	Cybercrime: Online based Cyber Crimes - Phishing and its Variants - Web Spoofing and E-mail Spoofing, Cyber Stalking, Web defacement, Spamming
Unit II	Security policies violations, Crimes related to social media, ATM, Online and Banking Frauds. Intellectual Property Frauds. Cyber Crimes against Women and Children.
Unit III	Cyber Crimes & Cloud Computing; Different types of tools used in cybercrimes – Password cracking; Random passwords; virus and its types – Cyber Criminal syndicates.
Unit IV	Information Technology Act, 2000: Information Technology (amendment) Act, 2008- Aims and Objects - Overview of the Act.
Unit V	Electronic Governance, Electronic Evidence
	Digital signatures, Digital Signature Certificates, Duties of Subscribers, Role of Certifying Authorities
	Penalties and Adjudication: The Cyber Regulations Appellate Tribunal

Suggested Readings;

1. N.S Nappinai – Technology Laws, 1st Ed LexisNexis (2017)
2. Apar Gupta, Commentary on Information Technology Act (2016).
3. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing, UP, 2016.
4. Farouq Ahmed, Cyber Law in India, Allahabad Law Agency, 2015
5. Karnika Seth, Computers, Internet and New Technology Laws-A Comprehensive Reference Work With Special Focus On Developments In India, LexisNexis, Nagpur, 2016.

Course Outcome:

CO	Statement
CO1	Understands the scope of Cyber world
CO2	Student knows the essential legal provisions of internet-governance.
CO3	The student knows various legal provisions of cyber-crimes and the mechanism of their
CO4	Providing an elementary understanding of IPR in cyber world
CO5	Making the student comprehend the working of various Agencies of cyber-crimes in India

BCA 406: Digital Design Essentials

Course Objectives:

- Develop proficiency in using Adobe Photoshop and CorelDRAW to create and edit digital images and graphics.

- Understand fundamental concepts related to image editing and design, such as resolution, color correction, layers, and blending modes.

- Apply design principles to create effective visual communications for a variety of media and purposes.

- To introduce students to open source graphics and image designing tools, and equip them with the skills and knowledge necessary to create professional-quality designs using these tools.

Course Contents:

Unit-I **Introduction to Photoshop:** This unit covers the basics of Photoshop, including navigating the software, understanding the menus and panels, opening and creating new files, and customizing the interface to suit your needs. **Working with Images:** In this unit, you will learn how to work with images in Photoshop, including zooming and panning, using rulers, guides, and grids, undoing actions, adjusting color, and using new tools like the Masks panel and Vibrance color correction command.

Unit-II **Resizing and Cropping Images:** Understanding pixels and resolution is crucial for working with digital images. This unit covers the Image Size command, interpolation options, resizing for print and web, cropping, and canvas rotation. **Getting Started with Layers:** Layers are a key feature of Photoshop that allow you to work non-destructively and make complex edits to your images. This unit covers creating, selecting, linking, and deleting layers, using layer styles, filling and grouping layers, and using blending modes.

Unit-III **Painting in Photoshop:** Painting in Photoshop can be done with a variety of tools, including brushes, pencils, and erasers. This unit covers using the brush tool, working with colors and gradients, creating and modifying brushes, and painting with selections. **Introduction to CorelDRAW:** CorelDRAW is a vector graphics editor that is commonly used for print and digital design. This unit covers the basics of the software, including creating a new file, using the title bar and menu bar, understanding the work area, and using the toolbox. **Drawing in CorelDRAW:** This unit covers the tools and techniques for drawing in CorelDRAW, including lines, ellipses, circles, rectangles, polygons, and curve and straight lines. You will also learn how to change the shape of objects, combine and skew objects, and fill objects with color.

Unit-IV **Working with Views:** Understanding how to manage views in CorelDRAW is important for working efficiently. This unit covers the different view modes, including normal, preview, wireframe, and draft, and how to zoom and create views. **Rotating and Grouping Objects:** In this unit, you will learn how to rotate and group objects in CorelDRAW, as well as fill objects with the spray tool and use the fill tool fly out. **Creating Text:** Text is a fundamental part of design, and this unit covers how to create and edit text in both Photoshop and CorelDRAW, including selecting fonts, adjusting size and alignment, and using special effects like drop shadows and gradients.

Unit- 5 **Exporting and Saving:** Once your design is complete, you will need to save or export it in a suitable file format. This unit covers the options for saving and exporting in both Photoshop and CorelDRAW, as well as preparing files for print or digital distribution. **Introduction to Open Source Graphics and Image Designing Tools**

Overview of Open Source Graphics and Image Designing Tools, Comparison between Open Source and Proprietary Graphics Tools, Advantages of Open Source Graphics and Image Designing Tools **Introduction to Canva**, Overview of Canva Interface, Tools for creating designs in Canva, Creating Graphic Designs with Canva

Creating Flyers, Posters, and Banners, Designing Business Cards and Letterheads, Creating Social Media Graphics**Working with Figma**, Introduction to Figma, Overview of Figma Interface, Tools for creating designs in Figma, Creating UI/UX Designs with Figma, Designing Mobile Apps and Websites, Creating UI Kits and Style Guides, Collaborating on Design Projects with Figma, **Advanced Design Techniques**

Understanding Design Principles, Using Typography in Design, Using Color in Design, Exporting Designs for Print

Exporting Designs for Web, Creating PDFs and Image Files for Sharing

Course outcomes:

CO 1. Create and edit digital images and graphics using Adobe Photoshop and CorelDRAW software.

CO 2. Apply best practices for image resolution, color correction, and other fundamental techniques to enhance the quality of digital images and graphics.

CO 3. Use layers, blending modes, and other advanced features of Photoshop and CorelDRAW to create sophisticated and visually compelling designs.

CO 4. Develop a portfolio of original designs and images that demonstrate proficiency in using Adobe Photoshop and CorelDRAW.

CO 5. Use Open source platforms to create a variety of graphic designs, including flyers, posters, banners, business cards, letterheads, and social media graphics

BCA 407: Linux Programming

Course Objective:

- This comprehensive course is designed to provide the knowledge and skills to students so that they can work in Linux environments.

- The course covers areas of Linux Architecture, file system and graphical environment, Linux commands, file permissions, processManagement and shell meta characters, working of vi editors, different scripts.

Course Contents:

Unit-I   **Linux** – The Operating System: Linux history, Linux features, Linux distributions, Linux's relationship to Unix, Overview of Linux architecture, Installation, Booting, Login and Shutdown Process, Start up scripts, controlling processes, system processes (an overview).

        Linux Internals - System Calls, Process Management, Memory Management, Disk and filesystems ,Networking ,Security, Graphical User Interface, Device Drivers.

Unit-II   **Files:** File Concept, File System Structure, File Attributes, File types, The Linux File System: Basic Princples,Pathnames, Mounting and Unmounting File Systems,Different File Types, File Permissions,DirectoryStructure,System calls, file descriptors, low level file access – File structure related system calls (File APIs), file and record locking, file and directory management – Directory file APIs, Symbolic links & hard links.

Unit-III   **Working with the Bourne again shell (bash):**Introduction, shell responsibilities, types of shell,pipes and input Redirection, output redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples Simple filters pr, head,tail etc. filter using regular expression-grep,sedinterrupt processing, debugging shell scripts.

Unit-IV   **Process** – Process concept, Kernel support for process, process attributes, process control process creation, waiting for a process, process termination, zombie process, orphan process, Process APIs. Signals– Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions.

        Interprocess Communication: Introduction to IPC, Pipes, and FIFOs, Introduction to three types of IPC-message queues, semaphores and shared memory.

Unit-V   **Multi threaded Programming:** Differences between threads and processes, Thread structure and uses Threads and Lightweight Processes, POSIX Thread APIs, Creating Threads, Thread Attributes, Thread Synchronization with semaphores and Mutexes.

Text books:

1. Unix System Programming using C++, T.Chan, PHI.(Unit III to Unit VIII)
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.
3. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones,Wrox, Wiley India Edition.

Reference books:

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the Unix environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. Unix Network Programming ,W.R.Stevens,PHI.
4. Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson Education.

Course Outcomes

At the end of the course, the student will be able to:

CO1: Describe and use the LINUX operating system.
CO2: Understand the fundamental LINUX system tools and utilities.
CO3: Describe and write shell scripts in order to perform basic shell programming.
CO4: understand the Process in LINUX system.
CO5: Apply Commands and understand the LINUX file system.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L1	L	L	L	M	-	-	-	-	-	L	-	M	M	H
CO2	L2	M	L	L	L	-	-	-	-	-	M	-	M	M	M
CO3	L1	H	M	M	H	M	-	-	M	-	H	-	H	H	L
CO4	L2	M	L	L	M	-	-	-	-	-	M	-	M	H	H
CO5	L3	M	L	L	M	-	-	-	-	-	M	-	M	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4 ,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4 ,CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	----

BCA-408: Java Lab

Course Objectives:

- To understand object oriented features of java and implementing it in java programming.

- To learn and understand inheritance, interfaces, multithreading and exception handling.

- To understand different input/output objects (input vs. output, character vs. byte, data vs. processing, object) and methods and the structure of the java.io package.

- To learn and understand the use of applets and file handling.

List of Exercises

Practical 1: Write a program to compute the sum of the digits of a given integer number.

Practical 2: Given a number, write a programming using (while/ do..while/for) loop to reverse the digits of the number. For example, the number 12345 should be written as 54321.

Practical 3: Write a program (making use of class and methods), which will read a string and rewrite it in the alphabetical order. For example, the word JAIPUR should be written as AIJPRU.

Practical 4: Write a program that accepts a shopping list of five items from the command line and stores them in a vector.

Practical5: Write a program to show the application of interface and abstract class.

Practical6: Define an exception called "NoMatchException" that is thrown when a string is not equal to "India". Write a program that uses this exception.

Practical7: Write a program to implement multithreading making use of **Thread** class and/or **Runnable** interface.

Practical 8: Write a program to implement the concept of packages.

Practical9: Develop an applet that receives three numeric values as input from the user and then displays the largest of the three on the screen. Write a HTML page and test the applet.

Practical10: Develop an applet which runs a banner with text "Welcome to JaganNath University" making use of multithreading.

Course Outcomes:

At the end of the course, a student will be able to understand

CO1. Explain The model of object oriented programming and fundamental features of an object oriented language.
CO2. Apply How to test, document and prepare a professional looking package for each business project.
CO3. Describe a computer program to solve specified problems and to use the Java SDK environment to create, debug and run simple Java programs.
CO4.Explain and Understand programs for inheritance, multithreading, applets, exception handling and file handling.
CO5. Apply programming on examples html and applet.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L1	M	L	L	M	-	-	-	-	-	M	-	H	M	M
CO2	L3	M	M	M	H	-	-	-	L	-	M	-	L	H	L
CO3	L1	H	H	H	H	M	-	-	M	M	H	-	H	M	M
CO4	L2	M	H	H	H	H	-	-	L	H	M	-	M	H	L
CO5	L3	M	H	H	H	H	-	-	L	H	M	-	M	H	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4,CO5
CD3	Seminars	-----------
CD4	Self- learning advice using internets	CO1,CO2, CO3, CO4
CD5	Industrial visit	

BCA-409: Software Engineering Lab

Course Objectives:

- To understand various concepts of Unified Modeling Language.
- To learn and implement UML views, static views, design views etc.
- To understand deployment view, model management views.

Tool Required: Rational Rose Enterprise Edition

<u>List of Experiments:</u>

1. Write down the problem statement for a suggested system of relevance.
2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
3. To perform the function oriented diagram: Data Flow Diagram (DFD) and Structured chart.
4. To perform the user's view analysis for the suggested system: Use case diagram.
5. To draw the structural view diagram for the system: Class diagram, object diagram.
6. To draw the behavioral view diagram : State-chart diagram, Activity diagram
7. To perform the behavioral view diagram for the suggested system : Sequence diagram, Collaboration diagram
8. To perform the implementation view diagram: Component diagram for the system.
9. To perform the environmental view diagram: Deployment diagram for the system.
10. To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system.
11. Perform Estimation of effort using FP Estimation for chosen system.
12. To Prepare time line chart/Gantt Chart/PERT Chart for selected software project.

Text Books:

1. K.K. Aggarwal&Yogesh Singh, "Software Engineering", New Age International, 2005
2. PankajJalote, "An Integrated Approach to Software Engineering", Second Edition, Springer.

NOTE: - At least 8 Experiments out of the list must be done in the semester.

Course Outcomes:

At the end of the course, a student will be able to understand

CO1. Describe and Create models for software applications.
CO2. Understand Use the different UML notations for designing software.
CO3. Analyze computer program to solve specified problems
CO4. Apply the Use the different UML notations for designing software.
CO5. Describe and define computer program to solve specified problems

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L1	M	M	M	M	L	-	-	M	L	M	-	M	H	H
CO2	L2	H	H	H	H	H	-	-	M	-	H	M	M	M	M
CO3	L3	M	H	H	H	M	-	-	L	L	M	L	H	H	M
CO4	L3	H	H	H	H	H	-	-	M	-	H	M	M	M	M
CO5	L1	M	H	H	H	M	-	-	L	L	M	L	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	-----------
CD4	Self- learning advice using internets	CO1,CO2,CO3
CD5	Industrial visit	

BCA-410: Internet Programming Lab

Course Objectives:

- To study designing the web pages.
- To study formatting and validating web pages.
- To study designing web sites and deploying web sites on web servers.

LIST OF EXPERIMENTS

1. Web page creation using HTML
    i) To embed an image map in a web page
    ii) To fix the hot spots
    iii) Show all the related information when the hot spots are clicked.
2. Web page creation with all types of cascading style sheets.
3. Create an attractive form using the html code.
4. Create an attractive CV using the html code.
5. Create a web page uses frame by the html code.
6. Write an html code for creates the ordered list.
7. Write an html code for creates the unordered list.
8. Write an html code for creates the definition list.
9. Web page creation using DHTML.
10. Web page creation using java script.

Course Outcomes:

Students will be able to

CO1. Define and Design web pages.
CO2. Compute and validate web pages.
CO3. Describe web sites and deploy it on web servers.
CO4. Analyze list on web pages.
CO5. Determine steps web sites and deploy it on web servers.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L1	M	M	M	H	L	-	-	M	-	H	-	M	H	L
CO2	L3	H	H	H	H	-	-	-	L	-	H	-	H	M	M
CO3	L2	M	M	M	M	M	-	-	H	-	M	-	M	H	L
CO4	L4	H	H	H	H	-	-	-	L	-	H	-	H	M	M
CO5	L5	M	M	M	M	M	-	-	H	-	M	-	M	H	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	**Course Delivery methods**	**Course Outcomes**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3
CD3	Seminars	-----------
CD4	Self- learning advice using internets	CO1,CO2, CO3
CD5	Industrial visit	

Semester – V

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 501	Advance Java	Core	30	70	100	4
BCA 502	Advance Internet Programming	Core	30	70	100	4
BCA 503 A	Theory of Computation	Core Elective	30	70	100	4
BCA 503 B	Data Mining & Data Warehousing	Core Elective	30	70	100	4
BCA 503 C	Compiler Design	Core Elective	30	70	100	4
BCA 504	Leadership Skills & Management	AECC	30	70	100	4
BCA VAC 003	New Venture Development	VAC	15	35	50	2
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 505	Advance Java Lab	Practical	60	40	100	1
BCA 506	Advance Internet Programming Lab	Practical	60	40	100	1
BCA 507	Compiler Design Lab	Practical	60	40	100	1
BCA 508	Seminar	Seminar	60	40	100	1
TOTAL			**435**	**615**	**1050**	**22**

BCA-501: Advance Java

Course Objectives:

- Objectiveofthis courseistoprovidetheabilitytodesignconsole based,GUI based and web based applications.
- Studentswillalsobeabletounderstandintegrateddevelopment environment to create, debug and run multi-tier and enterprise-level applications

Course Contents:

Unit-I   Introduction to Java & Object Oriented Programming, Importance of Java for Internet , Java Magic, Byte Code Java Buzzwords Simple program of java Using super keyword Dynamic method dispatch· Final class and Methods Packages, Access Protections Interfaces Exception Handling FundamentalsWorking with finally clause

Unit-II   Threads and Multithreading Basics Creating and Running a Thread The Thread control Methods Thread life cycle Thread Priorities Thread synchronization,

The Applet & Event Handling Applet Fundamentals Applet Architectures An Applet skeleton The HTML APPLET tag Passing parameters to Applet Delegation based Event handling Event class Action Event Window Event Mouse Event Key Event.

Unit-III   **Introduction to AWT: Working with windows, Graphics Text** AWT Classes Windows fundamentals working with Frame window working with Graphics Working with Colors & Fonts.

A Tour of SwingJ Applet Icons& Labels Button & Label, Text Field &Buttons, Checkboxes, Radio buttons Combo Box & Various controls of Swing.

Unit-IV   **String Handling, Streams and Input/Outputs Programming** String class String Buffer class Java I/O Stream classes **Java Beans** Introduction & Advantages of JavaBeans Application Building Tools Bean Development Kit JAR Files Developing Simple Bean Using the BDK The Java Bean API.

Unit-V   Introduction Of Servlets**,** Life cycle of servlet , Handling HTTP Get Request, Handling HTTP Post Request , Introduction of JSP , Life cycle of JSP, custom tag library of JSP , event handling of JSP and servlet.

Text Books/Reference Books

1. Java The Complete Reference- by Herbert Schildt Tata McGraw-Hill
2. Mastering Java2 J2SE1.4- by John Zukouski PBP Publication
3. JavaTM How to Program sixth Edition- By H.M Deitel, P.J. Deitel
4. JAVA 2, J2SE 1.4 Complete, BPB Publication.

Course Outcomes

At the end of the course, the student will be able to:

CO1: Define and Understand Swing-based GUI.
CO2: Practice client/server applications and TCP/IP socket programming
CO3: Describe and retrieve the data from the databases using SQL
CO4: Apply component-based Java software using JavaBeans.
CO5: Understand server side programs in the form of servlets.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L1	H	H	H	H	M	-	-	M	M	H	-	M	H	L
CO2	L3	H	H	H	H	M	-	-	H	L	H	-	M	M	M
CO3	L1	H	M	M	M	L	-	-	M	M	H	-	L	M	L
CO4	L3	M	H	H	H	H	-	-	H	H	M	-	H	H	L
CO5	L2	H	M	H	H	H	-	-	M	L	H	-	H	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	---

BCA-502: Advance Internet Programming

Course Objective:

- To study and designing the web pages in ASP.
- To study formatting and validating web pages in ASP.
- To Learn Web Service Essentials.
- To gain knowledge of Rich Internet Application Technologies.
- To study and designing web sites and deploying web sites on web servers.

Course Contents:

Unit-I Introduction to dynamic web designing and scripting languages, client side and server side scripting , Introduction to ASP, ASP set up, ASP running, ASP first script, ASP syntax, ASP with VB script andjava script, Displaying date , time and text.

Unit-II **PROGRAMMING FEATURES OF ASP**-Operators, variables, If statement, select statement, static and dynamic arrays, ASP procedures, Do loop, for loop, Subroutines and include virtual, Strings

Unit-III **COOKIE-** Creation of Cookies, retrieval of cookie values, cookies with keys, **ASP SESSION OBJECT-** starting and ending of session, storing and retrieval of session values, removing session variables. ASP APPLICATION OBJECT-store and retrieval of application variables lock and unlock application

Unit-IV Global.asa file, send email, displaying pictures from an asp file, asp objects, asp comments, asp components, asp special characters, asp vs PHP, open read and creates files

Unit-V ASP forms- forms with get and post method, accessing a database from an asp page, Ado- active x data objects, ADO databaseconnection, display records, add records, sort records, delete rercords, update recordsfrom an asp page through ADO's .

Text Books/Reference Books

1. Greg Buczek, "ASP Developer's Guide", TMH.
2. SAMS book co-written by the course author/instructor, Paul Litwin, and Mike Amundsen

Course Outcomes

At the end of the course, the student will be able to:

CO1: Analyze a web page and identify its elements and attributes.
CO1: Describe Design, Format and validate web pages in ASP.
CO2: Discuss and Build dynamic web pages using ASP.
CO3: Create Database using ADO.
CO4: Define and Create XML documents used in Web Publishing.
CO5: Understand and Design web sites and deploy it on web servers.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L3	M	M	M	M	L	-	-	L	-	M	-	M	H	L
CO2	L1	M	H	H	H	M	-	-	M	M	M	-	M	M	M
CO3	L2	H	M	M	M	H	L	-	L	L	H	-	H	M	L
CO4	L1	M	H	H	H	H	M	-	M	M	M	-	M	H	L
CO5	L2	H	M	M	M	M	L	-	H	L	H	-	H	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	----

BCA-503: A Theory of Computation

Course Objectives:

- To Develop a formal notation for strings, languages and machines.

- To Design finite automata to accept a set of strings of a language.

- To Prove that a given language is regular and apply the closure properties of languages.

- To Design context free grammars to generate strings from a context free language and convert them into normal forms.

- To Prove equivalence of languages accepted by Push Down Automata and languages generated by context free grammars

- To Identify the hierarchy of formal languages, grammars and machines.

- To Distinguish between computability and non-computability and Decidability and un-decidability.

Course Contents:

Unit I: **Finite Automata & Regular Expression**: Basic machine, Finite state machine, Transition graph, Transition matrix, Deterministic and nondeterministic finite automation, Equivalence of DFA and NDFA, Decision properties, minimization of finite automata, Mealy & Moore machines.

Alphabet, words, Operations, Regular sets, relationship and conversion between Finite automata and regular expression and vice versa, designing regular expressions, closure properties of regular sets, Pumping lemma and regular sets, Myhill- Nerode theorem , Application of pumping lemma, Power of the languages.

Unit II: Context Free Grammars (CFG), Derivations and Languages, Relationship between derivation and derivation trees, leftmost and rightmost derivation, sentential forms, parsing and ambiguity, simplification of CFG, normal forms, Greibach and Chomsky Normal form , Problems related to CNF and GNF including membership problem.

Unit III: Nondeterministic PDA, Definitions, PDA and CFL, CFG for PDA, Deterministic PDA, and Deterministic PDA and Deterministic CFL , The pumping lemma for CFL's, Closure Properties and Decision properties for CFL, Deciding properties of CFL.

Unit IV: Turing Machines: Introduction, Definition of Turing Machine, TM as language Acceptors and Transducers, Computable Languages and functions, Universal TM & Other modification, multiple tracks Turing Machine.

Hierarchy of Formal languages: Recursive & recursively enumerable languages, Properties of RL and REL, Introduction of Context sensitive grammars and languages, The Chomsky Hierarchy.

Unit V: Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, Un-decidability, examples of these problems like vertex cover problem, Hamiltonian path problem, traveling sales man problem.

References:

1. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science, PHI

2. Martin J. C., "Introduction to Languages and Theory of Computations", TMH

3. Hopcroft, Ullman, "Introduction to Automata Theory, Language and Computation", Nerosa Publishing House, 3rd Edition.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Calculate formal notation for strings, languages and machines.

CO2: Describe finite automata to accept a set of strings of a language.

CO3: Understand language determine whether the given language is regular or not.

CO4: Design context free grammars to generate strings of context free language.

CO5: Define equivalence of languages accepted by Push Down Automata and languages generated by context free grammars

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	H	L	M	L	-	-	-	-	-	L	-	M	L	L
CO2	L1	H	M	M	M	-	-	-	-	-	L	-	L	L	L
CO3	L2	H	L	M	L	-	-	-	-	-	L	-	M	M	L
CO4	L1	H	H	H	H	-	-	-	-	-	L	-	L	L	M
CO5	L5	H	H	M	H	-	-	-	-	-	L	-	L	M	L

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO2, CO3, CO4, CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	CO2, CO5

BCA-503 B: Data Mining & Data Warehousing

Course Objective:

- Data warehouse is used to manage the old data and mining is used for finding the appropriate information for decision making.
- The course provides knowledge of Data warehousingand Data mining.

Course Contents:

Unit-I   What is Data Mining? Data mining Functionalities, Pattern Interestingnees, Classification of data mining system, major issues in data mining.

Why preprocess the data? Data cleaning, Data integration and Transformation, Data reduction

Unit-II   Difference between OLTP and OLAP.What is data warehouse, a multidimensional data model, Data warehouse architecture, Datawarehouseimplementation.Concept of Data mart.

Unit-III   Data Mining primitives, Data Mining Query language, Designing GUI based on DMQL, Architecture of Data Mining System.

Association rule Mining, Mining single-dimensional Boolean Association rules from relational databases &datawarehouses, Constraint based association mining.

Unit-IV   Whatis classification? What is prediction issues regarding classificationprediction classification by decision tree induction, Bayslan classification, classification by back propagation.

What is cluster analysis, categorization of major clustering methods, partitioning methods, Hierarchical methods, outlier analysis

Unit-V   Application and trends in data mining, data mining applications, social impacts of data mining, trends in data mining.

Textbooks/reference books:

1. J. Han &MichelizeKamber, "Data mining-Concepts & techniques" , Morgan Kaufman Publisher.
2. Sam Anahory& Dennis Murray, "Datawarehousing", Pearson Education.
3. Micheal J.A. Berry, Gordan S. Linoff, "Mastering Data Mining" , John Willey & Sons.
4. ClandeSeidman, "Data Mining with Microsoft SQL server 2000", Prentice Hall India.

Course Outcomes

At the end of the course, the student will be able to:

CO1:Understand the Data Mining and its architecture.
CO2: Describe the Data Mining Techniques.
CO3: Define the Frame work and architecture of Data Warehouse.
CO4:Understand the different Components of Data Warehouse.
CO5: Implement On-Line Analytical Processing.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	L	L	L	M	-	-	-	-	-	L	-	L	M	L
CO2	L2	M	M	M	H	-	-	-	-	-	M	-	M	M	M
CO3	L1	L	L	L	M	-	-	-	-	-	L	-	L	H	M
CO4	L2	M	L	L	M	-	-	-	-	-	M	-	M	H	L
CO5	L3	H	M	M	H	-	-	-	-	-	H	-	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	----

BCA-503C: Compiler Design

Course Objective:

- To understand and list the different stages in the process of compilation.
- To Identify different methods of lexical analysis
- To Design top-down and bottom-up parsers
- To Identify synthesized and inherited attributes
- To Develop syntax directed translation schemes
- To Develop algorithms to generate code for a target machine

Course Contents:

Unit I: **Introduction:** Objective, scope and outcome of the course. Compiler, Translator, Interpreter definition, Phase of compiler,Bootstrapping, Review of Finite automata lexical analyzer, Input,Recognition of tokens, Idea about LEX: A lexical analyzer generator, Error handling.

Unit II : **Review of CFG Ambiguity of grammars:** Introduction to parsing.Top down parsing, LL grammars & passers error handling of LL parser, Recursive descent parsing predictive parsers, Bottom up parsing, Shift reduce parsing, LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar. Operator precedence parsing, Introduction of automatic parser generator: YACC error handling in LR parsers.

Unit III : Syntax directed definitions; Construction of syntax trees, S Attributed Definition, L-attributed definitions, Top down translation. Intermediate code forms using postfix notation, DAG,Three address code, TAC for various control structures, Representing TAC using triples and quadruples, Boolean expression and control structures.

Unit IV : Storage organization; Storage allocation, Strategies, Activation records, Accessing local and non-local names in a block structured language, Parameters passing, Symbol table organization, Data structures used in symbol tables.

Unit V: Definition of basic block control flow graphs; DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG.

Text/Reference Books:

- 'Compilers Principles, Techniques and Tools',Aho, Pearson Education.
- 'Modern Compiler Design', Galles, Pearson Education.
- 'The Essence of Compilers', Hunter, Pearson Education

Course Outcomes

At the end of the course, the student will be able to:

CO1: Understand grammar specification to develop the lexical analyzer

CO2: Understand parser specification design top-down and bottom-up Parsers

CO3: Develop syntax directed translation schemes

CO4: Develop algorithms to generate code for a target machine

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	H	M	H	M	-	-	-	-	L	M	-	L	M	M
CO2	L2	H	M	M	M	L	-	-	-	-	M	-	L	M	M
CO3	L6	H	M	M	M	L	-	-	-	L	M	-	L	H	M
CO4	L6	H	M	M	M	L	-	-	-	-	M	-	L	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,CO4,CO5
CD2	Tutorials/Assignments	CO2, CO3,CO4
CD3	Seminars	CO3,CO4
CD4	Self- learning advice using internets	CO2,CO3, CO4
CD5	Industrial visit	-

BCA 504 : Leadership & Management Skills

Course Objectives:
- To help students to develop essential skills to influence and motivate others
- To inculcate emotional and social intelligence and integrative thinking for effective leadership
- To create and maintain an effective and motivated team to work for the society
- To nurture a creative and entrepreneurial mindset
- To make students understand the personal values and apply ethical principles in professional and social contexts.

Module 1- Leadership Skills

a. Understanding Leadership and its Importance
- What is leadership?
- Why Leadership required?
- Whom do you consider as an ideal leader?

b. Traits and Models of Leadership
- Are leaders born or made?
- Key characteristics of an effective leader
- Leadership styles
- Perspectives of different leaders

c. Basic Leadership Skills
- Motivation
- Team work
- Negotiation
- Networking

Module 2 - Managerial Skills

a. Basic Managerial Skills
- Planning for effective management
- How to organise teams?
- Recruiting and retaining talent
- Delegation of tasks
- Learn to coordinate
- Conflict management

b. Self Management Skills
- Understanding self concept
- Developing self-awareness

- Self-examination
- Self-regulation

Module 3 - Entrepreneurial Skills

a. Basics of Entrepreneurship
- Meaning ofentrepreneurship
- Classification and types of entrepreneurship
- Traits and competencies of entrepreneur

b. Creating Business Plan
- Problem identification and idea generation
- Idea validation
- Pitch making

Module 4 - Innovative Leadership and Design Thinking

a. Innovative Leadership
- Concept ofemotional and social intelligence
- Synthesis of human and artificial intelligence
- Why does culture matter for today's global leaders

b. Design Thinking
- What is design thinking?
- Key elements of design thinking:
- Discovery
- Interpretation
- Ideation- Experimentation - Evolution.
- How to transform challenges into opportunities?
- How to develop human-centric solutions for creating social good?

Module 5- Ethics and Integrity

a. Learning through Biographies
- What makes an individual great?
- Understanding the persona of a leader for deriving holistic inspiration
- Drawing insights for leadership
- How leaders sail through difficult situations?

b. Ethics and Conduct
- Importance of ethics
- Ethical decision making
- Personal and professional moral codes of conduct
- Creating a harmonious life

Bibliography and Suggested Readings :

Books

1. Ashokan, M. S. (2015). *Karmayogi: A Bbiography of E. Sreedharan*. Penguin, UK.

2. Brown, T. (2012). *Change by Design.* Harper Business

3. Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin Books India

4. Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential Within Us All.* William Collins

5. McCormack M. H. (1986).*What They Don't Teach You at Harvard Business School: Notes From A Street-Smart Executive*. RHUS

6. Sternberg R. J., Sternberg R. J., &Baltes P. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge University Press.

E-Resources

1. India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/ talks/anil_gupta_india_s_hidden_hotbeds_of_invention

2. Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - . "A Leader Should Know How to Manage Failure" https://www.youtube.com/ watch?v=laGZaS4sdeU

3. NPTEL Course on Leadership - https://nptel.ac.in/courses/122105021/9

Course Outcome:

CO	Statement
	After completion of this course, students will be able to:
CO1	Apply various leadership models and understand/assess their skills, strengths abilities that affect their own leadership style and can create their leadership vision
CO2	Learn and demonstrate a set of practical skills such as time management, management, handling conflicts, team leadership, etc.
CO3	Understand the basics of entrepreneurship and develop business plans
CO4	Apply the design thinking approach for leadership
CO5	Discuss the importance of ethics and moral values for making of a balanced personality

	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom's Levels	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2
CO1	L3	M	M	-	-	M	M	M	H	-	L	L	-	M	M
CO2	L3	M	M	M	M	M	M	L	M	-	M	M	-	M	M
CO3	L2	M	M	M	H	M	M	M	M	-	L	L	-	M	M
CO4	L3	M	M	M	M	M	M	M	H	-	L	L	-	M	M
CO5	L1`	-	M	L	H	H	H	M	M	-	L	L	-	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3, CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3, CO4,CO5
CD3	Seminars	CO1,CO2,CO3, CO4,CO5
CD4	Self- learning advice using internets	CO1, CO2,CO3, CO4
CD5	Industrial visit	

BCA-505: Advance Java Lab

Course Objective:

- Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.

- Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.

- Design and develop Web applications

- Designing Enterprise based applications by encapsulating an application's business logic.

- Designing applications using pre-built frameworks.

List of Experiments

1. Write a program to show How Exception Handling is in JAVA
2. Write a program to show Inheritance
3. Write a program to show Polymorphism
4. Write a program to show Interfacing between two classes
5. Write a program to Add a Class to a Package
6. Write a program to demonstrate AWT.
7. Write a program to Hide a Class
8. Write a program to implement String Operation
9. Write a program to show "HELLO JAVA " in Explorer using Applet
10. Write a Program to calculate mathematical operation using JSP
11. Write a program to demonstrate multithreading using Java.
12. Write a program to demonstrate applet life cycle.

Course Outcomes:

At the end of the course, the student will be able to:

CO1.	Understand the Internet Programming, using Java Applets
CO2.	Experiment a full set of UI widgets and other components, including windows, menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, using Abstract Windowing Toolkit (AWT) & Swings
CO3.	Apply event handling on AWT and Swing components.
CO4.	Learn to access database through Java programs, using Java Data Base Connectivity (JDBC).
CO5.	Describe and Create dynamic web pages, using Servlets and JSP.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	H	L	L	M	-	-	-	-	-	H	-	H	M	L
CO2	L4	M	H	H	H	H	-	-	L	M	M	-	M	M	M
CO3	L3	H	L	L	M	-	-	-	-	-	H	-	H	L	M
CO4	L2	M	L	L	M	-	-	-	-	-	M	-	M	H	L
CO5	L1,L2	H	M	M	M	H	-	-	M	L	H	-	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	-----------
CD4	Self- learning advice using internets	CO1,CO2,CO3,CO4,CO5
CD5	Industrial visit	

BCA-506: Advance Internet Programming Lab

Course Objectives:

- To design and deploy web application using servlets.

- To design and deploy web application using JSPs.

- To design and deploy web application using Ajax.

List of Experiments

1. Web page creation using HTML

     i) To embed an image map in a web page

     ii) To fix the hot spots

     iii) Show all the related information when the hot spots are clicked.

2. Web page creation with all types of Cascading style sheets

3. Client side scripts for validating web form controls using DHTML

4. Java programs to create applets

     i) Create a color palette with matrix of buttons

     ii) Set background and foreground of the control text area by selecting a color from colorpalette.

     iii) In order to select foreground or background use check box control as radio buttons.

     iv) To set background images.

5. Programs in java using servlets

6. Programs in java to create three-tier applications using JSP and Databases

     i) for conducting online examination

     ii) for displaying students mark list.

7. Programs using XML-schema-XSLT/XSL

8. Programs using AJAX

9. Implementation of web services and databases.

Course Outcomes:

At the end of the course, the student will be able to:

CO1. Analyze and deploy web application using servlets.
CO2. Understand and deploy web application using JSPs.
CO3. Apply operation on web application DHTML
CO4 Understand and deploy web application using XML
CO5. Define and deploy web application using Ajax.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L4	M	M	M	H	H	-	-	M	L	M	H	L	H	L
CO2	L2	M	H	H	H	H	-	-	M	L	M	M	M	M	M
CO3	L3	H	M	M	H	H	-	-	H	M	H	H	H	M	M
CO4	L2	M	H	H	H	H	-	-	M	L	M	M	M	M	M
CO5	L1	H	M	M	H	H	-	-	H	M	H	H	H	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3,CO4,CO5
CD3	Seminars	-----------
CD4	Self- learning advice using internets	CO1,CO2, CO3
CD5	Industrial visit	

BCA 507 : Compiler Design Lab

Course Objective:

- To deepen the understanding of compiler design - Develop problem solving ability using programming - Develop ability to design and analyze a compiler
- To implement Lexical Analyzer using Lex tool & Syntax Analyzer or parser using YACC Tool
- To implement front end of the compiler by means of generating Intermediate codes.
- To implement code optimization techniques.

List of Experiments:

1. Introduction: Objective, scope and outcome of the course.
2. To identify whether given string is keyword or not.
3. Count total no. of keywords in a file. [Taking file from user]
4. Count total no of operators in a file. [Taking file from user]
5. Count total occurrence of each character in a given file. [Taking file from user]
6. Write a C program to insert, delete and display the entries in Symbol Table.
7. Write a LEX program to identify following:
   1) Valid mobile number
   2) Valid url
   3) Valid identifier
   4) Valid date (dd/mm/yyyy)
   5) Valid time (hh:mm:ss)
8. Write a lex program to count blank spaces,words,lines in a given file.
9. Write a lex program to count the no. of vowels and consonants in a C file.
10. Write a YACC program to recognize strings aaab, abbb using a^nb^n, where b>=0.
11. Write a YACC program to evaluate an arithmetic expression involving operators +,-,* and /.
12. Write a YACC program to check validity of a strings abcd, aabbcd using grammar a^nb^nc^md^m, where n , m>0
13. Write a C program to find first of any grammar.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Discuss grammar specification develop the lexical analyzer

CO2: Discuss parser specification design top-down and bottom-up Parsers

CO3: Practice syntax directed translation schemes

CO4: Experiment algorithms to generate code for a target machine

CO5: Practice LEX programs and understands the principles of it

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcomes	Bloom level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	H	L	H	L	L	-	-	-	-	L	-	L	M	M
CO2	L2	H	M	H	M	L	-	-	-	-	M	-	M	H	M
CO3	L3	H	M	H	M	M	-	-	-	-	M	-	M	H	M
CO4	L4	H	L	M	L	M	-	-	-	-	L	-	M	H	M
CO5	L3	H	M	M	L	L	-	-	-	-	L	-	M	H	M

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO2, CO3, CO4
CD3	Seminars	CO1, CO2
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	-

Semester – VI

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 601	Python Programming	Core	30	70	100	4
BCA 602 A	Advance Computer Networks	Core Elective	30	70	100	4
BCA 602 B	Machine Learning	Core Elective	30	70	100	4
BCA 602 C	Artificial Intelligence	Core Elective	30	70	100	4
BCA 603	Professional Skills	AECC	30	70	100	4
BCA 604	Critical Thinking	Multi - Disciplinary	15	35	50	2
BCA 605	Digital Marketing	SEC	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 606	Major Project	Practical	100	100	200	6
BCA 607	Python Lab	Practical	60	40	100	1
BCA 608	Machine Learning Lab	Practical	60	40	100	1
TOTAL			**355**	**495**	**850**	**26**

BCA 601: Python Programming

Course Objective:

The course is designed to provide Basic knowledge of Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language.

Course Contents:

Unit I: Python Interpreter, The Interpreter and Its Environment, Control Flow Tools if Statements, for Statements, The range() Function, break and continue Statements, and else Clauses on Loops, pass Statements, Defining Functions, More on Defining Functions .

Unit II: **Data Structures :** More on Lists , The del statement , Tuples and Sequences, Sets, Dictionaries Looping Techniques, More on Conditions, Comparing Sequences and Other Types .

Unit III: Functions, Modules, Standard Modules, The dir() Function, Packages, Files, Tuple Packing and Unpacking

Unit IV: **Input and Output:**   Fancier Output Formatting , Reading and Writing Files, Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions , Defining Clean-up Actions, Predefined Clean-up Actions

Unit V: **Classes :** A Word About Names and Objects, Python Scopes and Namespaces, Inheritance, Private Variables, Odds and Ends, Iterators, Generators, Generator Expressions, Standard Library : Operating system Interface, command line Argument, String Pattern matching, Internet access

References:

1. Starting Out with Python (2009) Pearson , Tonny Gaddis

2. Beginning Pyhton Wrox Publication Peter Norton, Alex Samuel

3. Python Algorithms Apress, Magnus Liet Hetland,

4. Python Object Oriented Programming PACKT Press, Dusty Phillips

5. Python for Unix and Linux System Administration O'Relly, Noad Gift

Course Outcomes:

CO1: Define and learn basics of Python

CO2: develop console application in python

CO3: Implement Data structures using puthon.

CO4: Develop database application in python

CO5: Use various data analysis libraries available in Python

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	H	-	M	-	M	L	H	M	-	M	-	M	M	M
CO2	L2	H	-	L	-	H	H	M	-	-	L	-	L	H	M
CO3	L3	M	-	M	-	H	M	H	L	L	L	L	L	H	H
CO4	L6	M	-	M	-	H	M	H	L	L	L	L	L	H	H
CO5	L2	M	-	M	-	H	M	H	L	L	L	L	L	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO2, CO3 ,CO4,CO5
CD3	Seminars	CO3
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	CO3

BCA-602A: Advance Computer Network

Course Objectives:

* ThecourseisaimedatprovidingbasicunderstandingofComputernetworksstartingwithOSIReferenceModel,Protocolsatdifferentlayerswith special emphasis on IP, TCP & UDP and Routing algorithms.
* SomeofthemajortopicswhichareincludedinthiscourseareCSMA/CD,TCP/IPimplementation, LANs/WANs ,internet working technologies, Routing and Addressing.
* Provide the mathematical background of routing protocols.
* Aim of this course is to develop some familiarity with current research problems and research methods in advance computer networks

Course Contents:

Unit-I   Foundation: Building a Network, Getting Connected: encoding, links, framing error detection, Reliable transmission, Ethernet &MAC. Internetworking: Switching & Bridging, Basic Internetworking, Routing, Implementation, Performance.

Unit-II   Advance Internetworking: The global Internet, Multicast, MPLS, and Routing among mobile Devices. End to End Protocols: Simple Demultiplexer, Reliable Byte Stream (TCP), RPC, RTP

Unit-III   Congestion Control & Resource Allocation: Issues, Queuing Disciplines, TCP Congestion Control Avoidance mechanisms.

Unit-IV   Quality of Service. Multimedia Networking: Multimedia Networking applications, RTSP, RTCP,SIP, H.323.And discussion of Various RFC of SIP 3261.

Unit-IV   Network Security: Cryptographic Building Blocks, Symmetric Key Encryption, Public Key Encryption, authentication protocols, PGP, TLS, SSL, Firewalls, Intrusion Detection

Text Books/ Reference Books

1. Computer Networks, Fifth Edition: A Systems Approach (The Morgan Kauf Man Series).
2. Computer Networking: A Top Down Approach (Fifth Edition), James F. Kurose.
3. W. Stallings, Networks Security Essentials: Application & Standards, Pearson

Course Outcomes

At the end of the course, the student will be able to:

CO1:	Illustrate reference models with layers, protocols and interfaces. & Summarize functionalities of different Layers.
CO2:	Combine and distinguish functionalities of different Layers
CO3:	Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation
CO4:	Identify and describe development history of routing protocols
CO5:	Describe Sub-netting and Addressing of IP V4.LT

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L3	M	L	L	M	-	-	-	-	-	M	-	M	H	L
CO2	L3	M	M	M	H	-	-	-	-	-	M	-	M	M	M
CO3	L2	H	M	M	M	-	-	-	-	-	H	-	H	M	M
CO4	L2	M	L	L	M	-	-	-	-	-	M	-	M	H	L
CO5	L2	H	L	L	M	-	-	-	-	-	H	-	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	------

BCA 602B: Machine Learning

Course Objectives:

- To introduce students to the basic concepts and techniques of **Machine Learning**.
- To develop skills of using recent **machine learning** software for solving practical problems.
- To gain experience of doing independent study and research.

Course Contents:

Unit I: **Supervised learning algorithm:** Introduction, types of learning, application, Supervised learning: Linear Regression Model, Naïve Bayes classifier Decision Tree, K nearest neighbor, Logistic Regression, Support Vector Machine, Random forest algorithm

Unit II: **Unsupervised learning algorithm:** Grouping unlabelled item susing k-means clustering, Hierarchical Clustering, Probabilistic clustering, Association rule mining, Apriori Algorithm, f-p growth algorithm, Gaussian mixture model.

Unit III: Introduction to Statistical Learning Theory, Feature extraction-Principal component analysis, Singular value decomposition. Feature selection–feature ranking and subset selection, filter, wrapper and embedded methods, Evaluating Machine Learning algorithms and Model Selection.

Unit IV: **Semi supervised learning, Reinforcement learning :** Markov decision process (MDP), Bellman equations, policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State-Action-Reward-State-Action (SARSA), Model-based Reinforcement Learning.

Unit V: Collaborative filtering, Content-based filtering Artificial neural network, Perceptron, Multilayer network, Back propagation, Introduction to Deep learning.

Refrence/Text Books:

- Tom M Mitchell, Machine Learning, McGraw Hill Education
- Bishop, C. (2006). Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.
- Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000. ISBN: 9780471056690.
- Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995. ISBN: 9780198538646.
- Introduction to MachineLearning - Ethem Alpaydin, MIT Press, Prentice hall of India.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Describe intelligent agents for search and games

CO2: Convert AI problems through programming with Python

CO3: Learning optimization and inference algorithms for model learning

CO4: Make programs for an agent to learn and act in a structured environment.

CO5: Learn recommended system in ML.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L1	H	M	M	M	M	M	-	-	-	M	-	M	M	M
CO2	L2	M	M	H	M	L	-	-	-	-	M	-	L	M	M
CO3	L1	M	H	M	H	-	-	-	-	-	H	-	L	H	M
CO4	L3	H	M	H	M	M	-	M	-	-	M	-	L	H	M
CO5	L1	M	H	M	H	-	-	-	-	-	H	-	L	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3.CO4,CO5
CD2	Tutorials/Assignments	CO1, CO2, CO3
CD3	Seminars	CO3
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	CO4

BCA-602C: Artificial Intelligence

Course Objective:

- To create appreciation and understanding of both the achievements of AI and the theory underlying those achievements.

- To introduce the concepts of a Rational Intelligent Agent and the different typesof Agents that can be designed to solve problems.

- To impart basic proficiency in representing difficult real life problems in a state space representation so as to solve the musing AI techniques like searching and game playing.

- To create an understanding of the basic issues of knowledge representation and Logic and blind and heuristic search, as well as an understanding of othertopicssuchas minimal, resolution, etc.Thatplaysan important role in AI programs.

- To introduce advanced topics of AI such as planning, Bayes networks, natural language processing and Cognitive Computing.

Course Contents:

Unit-I   Introduction to AI,AI Applications. AI techniques, Criteria for success. Problems solving in AI.Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem.

Unit-II   Heuristic search techniques: Generate and test, hill climbing, best first search technique. A* Algorithm, AO* Algorithm.

Unit-III   Knowledge representation: Definition and importance of knowledge, Knowledge representation, various approaches used in knowledge representation. Using Predicate and Propositional Logics: Representing Simple Facts in logic, representing instances and is a relationship.

Unit-IV   Learning: Introduction learning, Rote learning, learning by taking advice, learning in problem solving, learning from example-induction, Explanation based learning. Expert System: Introduction, Expert system shells, Example of Expert System.

Unit-V   Introduction to NLP, Steps of NLP, LISP and other AI Programming Language.

Text books/reference books:

1. Rich. E and Knight .K, "Artificial intelligence", TMH, 2nd ed., 1999.

2. Patterson . D.W., "Introduction to AI and Expert Systems", PHI, 1999

3. Nilsson . Nils J ,"Artificial Intelligence -A new Synthesis" 2nd Edition (2000), HarcourtAsia Ltd.

4. Charnaik . E and McDermott . D., "Introduction to artificial Intelligence",Addison-Wesley Publishing Company.

Course Outcomes

At the end of the course, the student will be able to:

CO1:	Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.
CO2:	Make and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
CO3:	Describe intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing
CO4:	Define the capability to represent various real life problem domains using logic based techniques and use this to perform inference or Learning
CO5:	Describe and Formulate to solve problems with uncertain information using NLp.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L3	M	L	L	M	-	-	-	-	-	M	-	M	H	L
CO2	L3	M	M	M	H	-	-	-	-	-	M	-	M	M	M
CO3	L2	H	M	M	H	M	-	-	M	M	H	-	H	H	M
CO4	L1	M	L	L	M	-	-	-	-	-	M	-	M	H	L
CO5	L2	H	M	M	H	M	-	-	L	M	H	-	H	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	-----

BCA-603: Professional Skills (Career & Team)

Course Objectives:

- To acquire career skills and fully pursue to partake in a successful career path
- To prepare good resume, prepare for interviews and group discussions
- To explore desired career opportunities in the employment market in consideration of an individual SWOT.
- Understand the significance of Team Skills and help them in acquiring them
- To help them design, develop and adapt to situations as an individual and as a team.

Course Contents

Unit I: Resume Skills & Interview Skills

Resume Skills : Preparation and Presentation, Introduction of resume and its importance, Difference between a CV, Resume and Bio data, Essential components of a good resume,Resume skills : common errors, Common errors people generally make in preparing their resume, Prepare a good resume of her/his considering all essential components

Interview Skills : Preparation and Presentation, Meaning and types of interview (F2F, telephonic, video, etc.), Dress Code, Background Research, Do's and Don'ts, Situation, Task, Approach and Response (STAR Approach) for facing an interview, Interview procedure (opening, listening skills, closure, etc.), Important questions generally asked in a job interview (open and closed ended questions), Interview Skills : Simulation, Observation of exemplary interviews, Comment critically on simulated interviews, Interview Skills : Common Errors, Discuss the common errors generally candidates make in interview, Demonstrate an ideal interview

Unit II: Group Discussion Skills & Exploring career opportunities

Meaning and methods of Group Discussion, Procedure of Group Discussion, Group Discussion- Simulation, Group Discussion - Common Errors, Knowing yourself – personal characteristics

Knowledge about the world of work, requirements of jobs including self-employment, Sources of career information, Preparing for a career based on their potentials and availability of opportunities

Unit III: Presentation Skills, Trust and Collaboration

Types of presentations, Internal and external presentation, Knowing the purpose, Knowing the audience, Opening and closing a presentation, Using presentation tools, Handling questions, Presentation to heterogenic group, Ways to improve presentation skills over time, Explain the importance of trust in creating a

collaborative team, Agree to Disagree and Disagree to Agree – Spirit of Team work, Understanding fear of being judged and strategies to overcome fear

Unit IV: Listening as a Team Skill& Brainstorming

Advantages of Effective Listening, Listening as a team member and team leader. Use of active listening strategies to encourage sharing of ideas (full and undivided attention, no interruptions, no prethink, use empathy, listen to tone and voice modulation, recapitulate points, etc.)., Use of group and individual brainstorming techniques to promote idea generation., Learning and showcasing the principles of documentation of team session outcomes

Unit V: Social and Cultural Etiquette &Internal Communication

Need for etiquette (impression, image, earn respect, appreciation, etc), Aspects of social and cultural/corporate etiquette in promoting teamwork, Importance of time, place, propriety and adaptability to diverse cultures,Use of various channels of transmitting information including digital and physical, to team members.

Course Outcomes:

CO	Statement
	After the completion of this course, students will be able to:
CO1	Make their resume in an appropriate template without grammatical and other errors and using proper syntax and Participate in a simulated interview
CO2	Apply Actively participate in group discussions towards gainful employment ,Capture a self - interview simulation video regarding the job role concerned and Enlist the common errors generally made by candidates in an interview.
CO3	Understand and effectively in group discussions and Explore sources (online/offline) of career opportunities
CO4	Use common technology messaging tools that are used in enterprises for flow of information and transition from command and control to informal communication during an online/offline team session & Actively use and operate online team communication tools: Webinar, Skype, Zoom, Google hangout etc
CO5	Describe appreciate and demonstrate Team Skills & Generate, share and maximise new ideas with the concept of brainstorming and the documentation of key critical ideas/thoughts articulated and action points to be implemented with timelines in a team discussion (as MOM)inidentified applicable templates

	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom's Levels	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	L3	L	H	L	M	L	H	H	M	-	H	M	-	L	L
CO2	L3	L	H	L	M	L	H	H	M	-	H	M	-	L	L
CO3	L2	L	H	L	M	L	H	H	M	-	H	M	-	L	M
CO4	L3	L	H	L	M	L	H	H	M	-	H	M	-	L	M
CO5	L2	L	H	L	M	L	H	H	M	-	H	M	-	L	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO1,CO2,CO3,CO4,CO5
CD5	Industrial visit	CO3, CO4, CO5

BCA 604: Critical Thinking

Objective

This course provides practical skills with some theoretical background in the reasoning processes by which we reach conclusions in everyday life, as well as in academic disciplines. It prepares the student for critical thinking and develops his/her critical awareness, needed when faced with texts, case studies, articles, arguments, speeches, and information from the media.

Course Contents :

Unit I	**Introduction** Fundamentals of Critical Thinking: the difference between literal meaning and implication, the principles of definition, how to identify when a disagreement is merely verbal, the distinction between necessary and sufficient conditions, and problems with the imprecision of ordinary language.
Unit II	**What is an Argument** (Examples drawn from everyday life, philosophical, moral and legal contexts.), Rhetoric: Persuasion vs. logical support, Recognizing Arguments
	Deductive Arguments: General Introduction, Validity, Soundness. Valid Argument Forms, Reductio Ad Absurdum., Fallacies related to deductive arguments.
Unit III	**Inductive Arguments:** General Introduction, Strength, Cogency,Inductive Generalizations (Enumerative Induction)
	Argument Reconstruction: Argument Assessment**:** Extraneous material; Defusing the rhetoric; logical streamlining; implicit and explicit; connecting premises; relevance; ambiguity and vagueness
	Practical Reasoning: Casual generalizations. Rationally persuasive arguments; some strategies for logical assessment; refutation by counter example.
Unit IV	**Fallacies** Identification of major logical fallacies (false authority, circular reasoning etc.), The difference between facts and inferences, The difference between the denotative and connotative meanings of words, The differences between conscious, unconscious, warranted and unwarranted assumptions
Unit V	**Moral, Legal and Aesthetic Reasoning**
	Principles of Moral Reasoning; Major perspectives in Moral Reasoning. Legal Reasoning. Justifying Laws, Four Perspectives. Aesthetic Reasoning. Eight aesthetic principles; Using Aesthetic Principles to Judge Aesthetic Value; Evaluating Aesthetic Criticism: Relevance and Truth; Why Reason Aesthetically

Text Books:

1. Bowell, T. and Kemp, G. "Critical Thinking: A Concise Guide." Oxon: Routledge, 3rd edition, 2009.

Suggested Readings:

1. Gardner, Peter S. "New Directions: Reading Writing and Critical Thinking." Cambridge Academic Writing Collection, 2005.
2. Mayfield, Marlys. "Thinking for Yourself: Developing Critical Thinking Skills through Reading and Writing." Eighth Edition. Boston: Wadsworth. Cengage Learning, 2010.
3. Audi, R. "Practical Reasoning and Ethical Decision." London: Routledge, 2006.

Course Outcome:

After completion of this course, students will be able:

CO	Statement
CO1	To enable students / learners to understand the logical connections between ideas.
CO2	To help them to identify, construct and evaluate arguments.
CO3	To equip them to detect inconsistencies and common mistakes in reasoning.
CO4	To enable them to write analytically for academic purpose
CO5	To distinguish between inferences of different types in various forms of communication.

BCA 605: Digital Marketing

Course Objectives:

- To understand the basics of Search Engine Optimization (SEO) and its importance in online marketing.

- To learn various on-page and off-page optimization techniques and strategies to improve the ranking of a website on search engines.

- To gain hands-on experience with various SEO tools and analytics to monitor and improve website performance.

Course Contents:

Unit I :

- Introduction to SEO
- Types of SEO techniques
- How search engines work
- Black hat techniques
- White hat techniques
- Keyword research and analysis
- Competitor website analysis
- SWOT analysis of website
- Choosing the best keywords
- Tools available for keyword research
- On-page optimization
- Page title, meta descriptions, meta keywords
- Headings, bold text
- Canonical tag, meta tags
- Images and alt text
- Internal link building
- The sitemap

Unit II :

- Off-page optimization
- Page rank, link popularity
- Link building in detail
- Directory submission
- Social bookmark submission
- Blog submission
- Article submission
- Link exchange

- Analytics
- Google analytics
- Interpreting bars and figures
- How Google analytics can help SEO
- Advanced reporting
- Website analysis using various SEO tools available
- Social media optimization: an overview
- What is social media?
- How can social media help my business?
- The big picture of social media training

Unit III :

- Blogging
- Why should you blog?
- What to blog about?
- Research methods for writing quality, timely content
- Twitter
- Setting up a Twitter account
- Retweets, hashtags, and lists
- Managing and enhancing Twitter with apps
- Tweeting rich media
- Facebook
- Introduction to Facebook
- The business benefits of a Facebook profile
- The ground rules for creating a business profile on Facebook
- How it works - the basics and the advanced features

Unit IV :

- LinkedIn
- Introduction to LinkedIn
- Setting your LinkedIn strategy
- Etiquette on LinkedIn
- Building your brand on LinkedIn
- Creating the right profile
- YouTube
- Introduction to YouTube
- How to create a YouTube channel
- Optimizing your YouTube channel
- How to gain more YouTube views and subscribers

- Social media optimization: advanced strategies
- Engaging your audience with video
- Making the best use of specific social media platforms
- Developing your profile to attract new prospects and clients

Unit V :

- Social media optimization: advanced strategies (continued)
- Developing your network to increase your reach and visibility
- Methods and approaches to extend your network
- Using the advanced search facilities to find new potential prospects and target new businesses
- SEO tools and reporting
- Keyword density analyzer tools
- Google tools
- Yahoo/Bing tools
- Rich snippet text tools
- Comparison tools
- SEO tools and reporting (continued)
- Link popularity tools
- Search engines tools
- Site tools
- Miscellaneous tools
- Reports submission and securing ranks

Course Outcomes:

CO 1. Students will be able to explain the concept of SEO and its importance in digital marketing.

CO 2. Students will be able to optimize the on-page elements of a website, including page titles, meta descriptions, headings, and images.

CO 3. Students will be able to develop effective off-page optimization strategies, including link building, social bookmarking, and article submission.

CO 4. Students will be able to create and manage social media profiles, including Twitter, Facebook, LinkedIn, and YouTube, to enhance brand visibility and engage with customers.

CO 5. Students will be able to use various SEO tools, including keyword density analyzers, Google and Yahoo/Bing tools, and reports submission tools, to monitor and improve website performance.

BCA 606: Major Project

Course Objective:

- To introduce the concept and methods required for the construction of large software intensive system.

- To develop a broad understanding of the discipline of software engineering and management of software system.

- To provide an understanding of both theoretical and methodological issues involve in modern software engineering project management and focus strongly on practical techniques.

Course Outcomes

At the end of the course, the student will be able to:

CO1: Understand programming language concepts, particularly Development languages and object-oriented concepts or go through research activities.

CO2: Plan, analyze, design and implement a software project or gather knowledge over the field of research and design or plan about the proposed work.

CO3: Demonstrate the ability to locate and use technical information from multiple sources.

CO4: Demonstrate the ability to communicate effectively in speech and writing.

CO5: Learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project.

BCA 607: Python Lab

Course Objective:

- To describe the need for Object-oriented programming concepts in Python.

- To infer the supported data structures like lists, dictionaries and tuples in Python.

- To illustrate the application of matrices and regular expressions in building the Python programs.

- To discover the use of external modules in creating excel files and navigating the file systems.

List of Experiments

1. Write a program to demonstrate basic data type in python.
2. Write a program to compute distance between two points taking input from the user
3. Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
4. Write a Program for checking whether the given number is an even number or not.
5. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
6. Write a Program to demonstrate list and tuple in python.
7. Write a program using for loop that loops over a sequence.
8. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
9. Find the sum of all the primes below two million.
10. By considering the terms in the Fibonacci sequence whose values do not exceed four million, WAP to find the sum of the even-valued terms.
11. Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
12. Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure
13. Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
14. Write a program to print each line of a file in reverse order.
15. Write a program to compute the number of characters, words and lines in a file.
16. Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on.
17. Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.
18. Write a program to implement Merge sort.
19. Write a program to implement Selection sort, Insertion sort.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Create, Test and Debug Python Programs

CO2: Implement Conditionals and Loops for Python Programs

CO3: Use functions and represent Compound data using Lists, Tuples and Dictionaries

CO4: Read and write data from & to files in Python and develop Application using Python.

CO5: Illustrate sort methods in Python Programs.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L6	H	M	M	M	M	-	-	-	L	M	L	L	M	M
CO2	L3	M	M	M	M	L	-	-	-	M	M	L	M	H	M
CO3	L2	H	L	H	L	M	-	-	-	L	L	L	M	H	H
CO4	L6	H	M	H	M	M	-	-	-	M	M	M	L	H	H
CO5	L3	M	M	M	M	L	-	-	-	M	M	L	M	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	-
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	-

BCA 608: Machine Learning Lab

Course Objective:

- To Make use of Data sets in implementing the machine learning algorithms

- To Analyze and evaluate simple algorithms for pattern classification.

- To implement the machine learning concepts and algorithms in any suitable language of choice.

List of Experiments

1. Implement and demonstrate the FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample

4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.

8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Build intelligent agents for search and games

CO2: Solve AI problems through programming with Python

CO3: Learning optimization and inference algorithms for model learning

CO4: Design and develop programs for an agent to learn and act in a structured environment.

CO5 : Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L6	H	M	H	M	M	-	-	-	L	M	-	L	M	M
CO2	L5	M	M	H	M	L	-	-	-	L	M	-	M	H	M
CO3	L1	H	L	H	L	L	-	-	-	L	L	-	M	H	H
CO4	L6	H	M	H	M	M	-	-	-	M	M	-	L	H	H
CO5	L3	M	M	M	M	L	-	-	-	M	M	L	M	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4
CD2	Tutorials/Assignments	CO2, CO3,CO5
CD3	Seminars	-
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	-

(UG Degree (Hons.) with Research)

Semester – VII

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 701	Fundamental of PHP	Core	30	70	100	4
BCA 702	Research Methodology	Core	30	70	100	4
BCA 703	ISS	Core	30	70	100	4
BCA 704 A	Cloud Computing	Core Elective	30	70	100	4
BCA 704 B	E- Commerce	Core Elective	30	70	100	4
BCA 704 C	Big Data Analytics	Core Elective	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 705	PHP Lab	Practical	60	40	100	1
BCA 706	ISS Lab	Practical	60	40	100	1
BCA 707	Synopsis Writing & Seminar	Practical	100	100	200	6
TOTAL			**340**	**460**	**800**	**24**

BCA-701 Fundamental of PHP

Course Objective:

- Understand the basics of the PHP.
- Examine how web pages are developed using PHP.
- Learn certain specific PHP variables and syntax.

Course Contents:

Unit I Introduction of web applications. Introduction to web designing with HTML and Cascaded Style Sheets. Concept of Client Side Scripting and Server Side Scripting. Static website vs Dynamic website development. Web Servers: Local Servers and Remote Servers.

Unit II Introduction to PHP, Installing Web servers, PHP configuration in IIS &Apache Web server. Data types in PHP, Variables, Constants, operators and Expressions. PHP Operator: Conditional Structure - if, switch case & Looping Structure - for, while, do while, foreach

Unit III Introduction to Arrays: Initialization of an array, Iterating through an array, Sorting arrays, Array Functions, Functions: Defining and Calling Functions, Passing by Value and passing By references, Inbuilt Functions: String Function, Math Function, Date Function and Miscellaneous Function.

Unit IV Working with Forms: Get and Post Methods, Query strings, HTML form controls and PHP, Maintaining User State: Cookies, Sessions and Application State. Working with Files: Opening and Closing Files, Reading and Writing to Files, Getting Information on Files

Unit V PHP Database Connectivity: Introduction to MYSQL, Creating database and other operations on database, connecting to a database, Use a particular database, Sending query to database, Parsing of the query results, Checking data errors.

Text/ Reference Books:

1. Steven Holzner " PHP: The Complete Reference"
2. Tim Converse, Joyce Park "PHP Bible", 2nd Edition
3. Dave W. Mercer, Allan Kent, Steven D. Nowicki, David Mercer, Dan Squier, Wankyu Choi with HeowEide-Goodman, Ed Lecky-Thompson, Clark Morgan "Beginning PHP5"

Course Outcomes

At the end of the course, the student will be able to:

CO1:	Understand process of executing a PHP-based script on a webserver.
CO2:	Apply containing several fields and be able to process the dataprovided on the form by a user in a PHP-based script.
CO3:	Understand basic PHP syntax for variable use, and standard language constructs, such asconditionals and loops.
CO4:	Understand the syntax and use of PHP object-oriented classes.
CO5:	Understand the syntax and functions available to deal with file processing for files on theserver as well as processing web URLs.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	P01 1	PO 12	PS O1	PS O2
CO1	L2	H	L	L	M	-	-	-	-	-	H	-	L	H	L
CO2	L3	M	H	H	H	M	-	-	-	M	M	H	H	M	M
CO3	L2	L	L	L	M	-	-	-	-	-	L	-	L	M	M
CO4	L2	M	L	L	L	-	-	-	-	L	M	-	M	H	L
CO5	L2	M	M	M	H	M	-	-	-	L	M	-	L	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	-----

BCA 702: Research Methodology

Course Objectives:

- To identify the concept of research.
- To identify the scientific conduct of research.
- To understand the publication Ethics.
- To understand Open access publications and publication misconduct.
- To understand the Research Data and Research Metrics.

Course Contents:

Unit I: Philosophy and Ethics

1. Introduction to Philosophy : definition, nature and Scope, Concept, Branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reaction

Unit II: Scientific Conduct

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication, and Plagiarism(FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data.

Unit II: Publication Ethics

1. Publication ethics: definition, introduction and importance
2. Best practices /Standards setting initiatives and guidelines: COPE. WAME, etc.,
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

Unit IV: Open Access Publishing and Publication Misconduct

1. Open access publications and initiatives
2. SHEERPA/RoMEO online resource to check publisher copyright & Self – archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder /Journal suggestion tools viz.JANE., Elsevier journal Finder, Springer Journal Suggester, etc.

5. Subject specific ethical issues, FFP, authorship

6. Conflicts of interest

7. Complaints and appeals: examples and fraud from India and abroad.

8. Use of plagiarism software like Turnitin, Urkund and other open source software tools

Unit V: **Databases and Research Metrics**

    A. Databases

        1.   Indexing databases

        2.   Citation databases: Web of Science, Scopus, etc.

    B. Research Metrics

        1.   Impact Factor of Journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score

        2.   Metrics: h-index, g index, i10 index, altmetrics

Reference:

1. Bird, A.(2006). Philosophy of Science.Routledge

2. Maclntyre, Alasdair (1967) A Short History of Ethics. London

3. P.Chaddah, (2018) Ethics in Competitive Research: Do not get Scooped; do not get Plagiarized, ISBN : 978-9387480865

4. National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). On Being a Scientist: A Guide to responsible conduct in Research: Third Edition, National Academies Press.

5. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN:978-81-939482-1-7
http://www.insaindia.res.in/pdf/Ethics_Book.pdf.

Course Outcomes:

COs   Statement After completion of this course, students will be able to:

CO1   Understand the concept of research.

CO2   Understand the scientific conduct of research.

CO3   Understand the publication Ethics.

CO4   Understand Open access publications and publication misconduct. ct.

CO5   Understand the Research Data and Research Metrics.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom's Levels	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L1	M	H	L	H	L	H	H	M	L	M		L
CO2	L2	H	H	M	M	M	L	-	L	-	M	L	-
CO3	L3	M	H	M	M	M	M	H	L	-	M	-	L
CO4	L4	H	H	M	M	M	-	H	-	L	M	-	L
CO5	L4	H	H	H	M	M	-	-	-	L	M	-	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3, CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3, CO4,CO5
CD3	Seminars	CO2,CO3, CO4,CO5
CD4	Self- learning advice using internets	CO1,CO2,CO3,CO4, CO5
CD5	Industrial visit	CO5

BCA 703: Information Security System

Course Objectives:

- To enhance knowledge and techniques for enforcement of security with some emphasis on cryptography.
- To develop an understanding of security policies (such as authentication, integrity and confidentiality).

Course Contents:

Unit I: **Introduction to security attacks:** services and mechanism, classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers.

Unit II: **Modern block ciphers:** Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation. Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode.

Unit III: **Public Key Cryptosystems with Applications:** Requirements and Cryptanalysis, RSA cryptosystem, Rabin cryptosystem, Elgamal crypto system, Elliptic curve cryptosystem

Unit IV: **Cryptographic Hash Functions, their applications:** Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA).Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers .Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm.

Unit V: **Key management and distribution:** symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure. Remote user authentication with symmetric and asymmetric encryption, Kerberos Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH

Text/ Reference Books:

- Stalling Williams: Cryptography and Network Security: Principles and Practices, 4th Edition, Pearson Education, 2006.
- Kaufman Charlie et.al; Network Security: Private Communication in a Public World, 2nd Ed., PHI/Pearson.
- Pieprzyk Josef and et.al; Fundamentals of Computer Security, Springer-Verlag, 2008.
- Trappe & Washington, Introduction to Cryptography, 2nd Ed. Pearson.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.

CO2: Apply computer technologies, digital evidence collection, and evidentiary reporting in forensic acquisition.

CO3: Understand approaches for incident analysis and response.

CO4: Understand Cryptographic Hash Functions and their applications.

CO5: Learn Key management system.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	H	M	M	M	-	-	-	-	-	M	-	M	M	M
CO2	L3	M	M	H	M	-	-	-	-	-	M	-	L	M	M
CO3	L2	M	H	M	H	-	-	-	-	-	H	-	L	H	M
CO4	L2	M	H	M	M	-	-	-	-	-	H	-	L	M	M
CO5	L1	M	H	M	M	-	-	-	-	-	M	-	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3
CD2	Tutorials/Assignments	CO1, CO2, CO3
CD3	Seminars	CO3
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	CO2

BCA 704A: Cloud Computing

Course Objectives:

- To understand the basics of Cloud Computing.

- To understand the movement from a traditional network infrastructure to a Cloud solution.

Course Contents:

Unit I: **Introduction:** Objective, scope and outcome of the course. Introduction Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges ,Risks and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things

Unit II: **Cloud Computing Architecture:** Cloud Reference Model, Layer and Types of Clouds, Services models, Data centre Design and inter connection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-Map Reduce, Had oop, High level Language for Cloud. Programming of Google App engine.

Unit III: **Virtualization Technology:** Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-centre

Unit IV: **Securing the Cloud:** Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture . Legal issues in cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery , Risk Mitigation, Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management

Unit V: **Cloud Platforms in Industry:** Amazon web services , Google App Engine, Microsoft Azure Design, Aneka: Cloud Application Platform-Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM

Text/ Reference Books:

- " Distributed and Cloud Computing " By Kai Hawang , Geofrey C.Fox, Jack J. Dongarra Pub: Elservier

- Cloud Computing ,Principal and Paradigms, Edited By Rajkumar Buyya, Jemes Broberg, A. Goscinski, Pub.- Wiley

- Kumar Saurabh, "Cloud Computing" , Wiley Pub

- Krutz , Vines, "Cloud Security " , Wiley Pub

- Velte, "Cloud Computing- A Practical Approach" ,TMH Pub

COURSE OUTCOMES

CO1: Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.

CO2: Design different workflows according to requirements and apply map reduce programming model.

CO3: Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.

CO4: Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds

CO5: Understand and Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L4	H	-	L	-	M	L	M	L	-	L	L	L	H	H
CO2	L2	H	-	M	-	L	M	L	-	-	M	M	M	H	H
CO3	L3	H	-	L	-	M	L	M	-	-	M	M	M	M	M
CO4	L3	M	-	M	-	M	L	M	-	-	H	H	H	H	H
CO5	L2	M	-	L	-	L	L	L	L	-	M	M	M	M	M

BCA 704B: E-Commerce

Course Objective:

* Define e-commerce and compare and contrast it from e-business.

* Identify some business applications of e-commerce, identify, define and differentiate the various forms of e-commerce.

* Recognize the business impact and potential of e-Commerce.

Course Contents:

Unit I **Introduction to E-Commerce:** The Scope of Electronic Commerce, Definition of Electronic Commerce, Electronic Commerce and the Trade Cycle, Electronic Markets, Electronic Data Interchange, Internet Commerce, E-Commerce in Perspective.

Business Strategy in an Electronic Age: Supply Chains, Porter's Value Chain Model, Inter Organizational Value Chains, Competitive Strategy, Porter's Model, First Mover Advantage, Sustainable Competitive Advantage, Competitive Advantage using E-Commerce, Business Strategy, Introduction to Business Strategy, Strategic Implications of IT, Technology, Business Environment, Business Capability, Existing Business Strategy, Strategy Formulation & Implementation Planning, E-Commerce Implementation, E-Commerce Evaluation.

Unit II **Business-to-Business Electronic Commerce:** Characteristics of B2B EC, Models of B2B EC, Procurement Management Using the Buyer's Internal Marketplace, Supplier-Oriented Marketplace, Intermediary-Oriented Marketplace, Just-in-Time Delivery, Other B2B Models, Auctions and Services from Traditional to Internet-Based EDI, Integration with Back-end Information Systems, The Role of Software Agents for B2B EC, Electronic Marketing in B2B, Solutions of B2B EC, Managerial Issues, Electronic Data Interchange (EDI), EDI: The Nuts and Bolts, EDI & Business.

Unit III **Intranet and Extranet:** Automotive Network Exchange, The Largest Extranet, Architecture of the Internet, Intranet, and Extranet, Intranet Software, Applications of Intranets, Intranet Application Case Studies, Considerations in Intranet Deployment, The Extranets, The Structure of Extranets, Extranet Products & Services, Applications of Extranets, Business Models of Extranet Applications, Managerial Issues.

Unit IV **Electronic Payment Systems:** Is SET a Failure, Electronic Payments & Protocols, Security Schemes in Electronic Payment Systems, Electronic Credit Card System on the Internet, Electronic Fund Transfer and Debit Cards on the Internet, Stored-Valued Cards and E-Cash, Electronic Check Systems, Prospect of

Electronic Payment Systems, Managerial Issues.

Public Policy: From Legal Issues to Privacy: EC-Related Legal Incidents, Legal, Ethical & Other Public Policy Issues, Protecting Privacy, Protecting Intellectual Property, Free Speech, Internet Indecency & Censorship, Taxation & Encryption Policies, Other Legal Issues: Contracts, Gambling & More, Consumer & Seller Protection in EC.

Unit V Internet Protocols, Web-Based client/ Server, Internet Security, Selling on the Web, chatting on the Web, Multimedia delivery, Analyzing Web Visits, Managerial issues.

Economics, Global & Other Issues in EC: Competition in Market space, Some Issues in Digital Economy and Success Factors, Impacts on Industry Structure, Intermediaries, and Others, virtual Communities, Global Electronic Commerce, Electronic Commerce in Small companies, Research in EC, The Future of EC

Text Books/ Reference Books

1. David Whiteley, "E-Commerce", Tata McGraw Hill, 2000 Eframi Turban, Jae Lee, David King, K. Michale Chung, "Electronic Commerce", Pearson Education, 2000

Course Outcomes

At the end of the course, the student will be able to:

CO1: Describe knowledge of e-commerce, its components, structure of e-banking, rules and regulations on e-commerce.
CO2:   Demonstrate knowledge of e-commerce, both the technical and business aspects;
CO3:   Understand the principles and practices of e-commerce and its related technologies;
CO4:   Discuss the trends in e-Commerce and the use of the Internet.
CO5:   Explain the economic consequences of e-Commerce.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	M	L	L	L	-	-	-	-	-	M	-	-	M	M
CO2	L2	M	L	L	M	-	-	-	-	-	M	-	L	M	L
CO3	L2	H	L	L	M	-	-	-	-	-	H	-	-	H	M
CO4	L2	M	M	M	H	-	-	-	-	-	M	-	M	H	L
CO5	L2	H	L	L	M	-	-	-	-	-	H	-	L	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	**Course Delivery methods**	**Course Outcomes**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	----

BCA 704 C: Big Data Analytics

Course Objectives:

- To provide an overview of an exciting growing field of big data analytics.

- To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.

- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.

- To enable students to have skills that will help them to solve complex real-world problems in for decision support

Course Contents:

Unit-I   **Introduction to Big Data:** Big data features and challenges, Problems with Traditional Large-Scale System, Sources of Big Data, 3 V's of Big Data, Types of Data. Working with Big Data: Google File System. Hadoop Distributed File System (HDFS) - Building blocks of Hadoop (Namenode. Data node. Secondary Namenode. Job Tracker. Task Tracker), Introducing and Configuring Hadoop cluster (Local. Pseudodistributed mode, Fully Distributed mode). Configuring XML files.

Unit-II   **Writing MapReduce Programs:** A Weather Dataset. Understanding Hadoop API for MapReduce Framework (Old and New). Basic programs of Hadoop MapReduce: Driver code. Mapper code, Reducer code. Record Reader, Combiner, Partitioner.

Unit-III   **Hadoop I/O:** The Writable Interface. Writable Comparable and comparators. Writable Classes: Writable wrappers for Java primitives. Text. Bytes Writable. Null Writable, Object Writable and Generic Writable. Writable collections. Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators.

Unit-IV   **Pig:** Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow. Working through the ABCs of Pig Latin. Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

Unit-V   **Applying Structure to Hadoop Data with Hive:** Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive. Examining the Hive Clients. Working with Hive Data Types. Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

References :

1. "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data" by EMC Education Services

2. "Big Data: Does Size Matter?" by Timandra Harkness

3. "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses" by Michael Minelli

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Describe the key issues in big data management and its associated applications in intelligent business and scientific computing.

CO2: Discuss fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.

CO3: Apply business models and scientific computing paradigms, and apply software tools for big data analytics.

CO4: Describe adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

CO5 : Discuss Hadoop Data with Hive

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	M	L	H	L	-	-	-	-	L	L	-	M	M	M
CO2	L2	H	M	M	M	-	-	-	-	M	M	-	M	M	M
CO3	L3	H	M	L	M	-	-	-	-	H	M	-	M	M	M
CO4	L1	M	L	M	L	-	-	-	-	M	L	-	M	H	M
CO5	L2	H	M	M	M	-	-	-	-	M	M	-	M	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	CO3, CO4,
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	-

BCA-705: PHP LAB

Course Objectives:

- To understand how server-side programming works on the web.
- To learn PHP Basic syntax for variable types and calculations.
- To use PHP built-in functions and creating custom functions.
- To understanding POST and GET in form submission.
- To provide the necessary knowledge to design and develop dynamic, databasedriven web applications using PHP.

List of Experiments :-

Experiment 1: Design the following static web pages required for online book store.

a) **Home page: -** the static home page must contains three pages

b) **Top: -** logo and college name and links to homepage, login page, registration Page, catalogue page and cart page

c) **Left: -** at least four links for navigation which will display the catalogue of Respective links

d) **Right: -** the pages to links in the left frame must be loaded here initially it Contains the description of the website

Experiment 2: Create registration and cart page in the previous created web site.

Experiment 3: Write a java script to validate the following fields in a registration page

a) userName (should contains alphabets and the length should not be less than 6 characters)

b) userPassword (should not be less than 6 characters)

c) userEmail (should not contain invalid addresses)

d) userCity (should select city from drop down)

e) userGender (Should selectgender)

Experiment 4: Implement CSS on the above create WebPages.

Experiment 5: Write an XML file which displays the book details that includes the following:

1) Title of book 2) Author name 3) Edition 4) Price Write a DTD to validate the above XML file and display the details in a table.

Experiment 6: Create a php program to demonstrate the different file handling methods.

Experiment 7: Create a php program to demonstrate the different loops in php.

Experiment 8: Create a php program to demonstrate the different predefined function in array, Math.

Experiment 9: Create a php program to demonstrate the different predefined function in Data & Regular Expression, date.

Experiment 10: Create a HTML form and process the HTML form in PHP.

Experiment 11: Create a php program to connect to MySQL Server.

Experiment 12: Create a php program to execute more SQL queries.

Course Outcomes

At the end of the course, the student will be able to:

CO1: Understand the PHP and scripting.
CO2: Understand Basics of PHP Language .
CO3: Analyze with Databases and Forms.
CO4: Apply methods with cookies.
CO5: Describe on Data and Tables in MYSQL.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	H	L	L	L	-	-	-	L	-	H	-	H	H	L
CO2	L2	M	L	L	M	M	-	-	L	L	M	-	M	M	M
CO3	L3	L	M	M	M	M	-	-	M	L	L	-	L	H	L
CO4	L3	M	L	L	M	H	-	-	M	M	M	-	M	H	H
CO5	L2	M	M	M	M	M	-	-	H	H	M	-	M	M	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4 ,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4,CO5
CD3	Seminars	-----------
CD4	Self- learning advice using internets	CO1,CO2, CO3, CO4,CO5
CD5	Industrial visit	

Semester – VIII

(UG Degree (Hons.) with Research)

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 801	Internet of Things	Core	30	70	100	4
BCA 802	Deep Learning	Core	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 803	Internet of Things Lab	Practical	60	40	100	2
BCA 804	Seminar	Practical	60	40	100	2
BCA 805	Dissertation	Practical	150	150	300	12
TOTAL			330	370	700	24

Note for award of BCA (Hons.) with Research:

- **Total Credits (210)**
- **The student who secures 201 credits including 12 Credit Project, will be awarded a UG degree BCA (Hons. with Research)**

BCA 801- Internet of Things

Course Objectives:

- To explore to the interconnection and integration of the physical world and the cyber space.
- To be able to design & develop IOT Devices.

Course Contents:

Unit-I   **Introduction:** Objective, scope and outcome of the course.

Unit-II   **Introduction to IoT:** Definition and characteristics of IOT, Design of IOT: Physical design of IOT, Logical Design of IOT- Functional Blocks, communication models, communication APIs, IOT enabling Technologies- Wireless Sensor Networks, Cloud computing, big data analytics, embedded systems. IOT Levels and deployment templates.

Unit-III   **IoT Hardware and Software:** Sensor and actuator, Humidity sensors, Ultrasonic sensor, Temperature Sensor, Arduino, Raspberry Pi, LiteOS, RIoTOS, Contiki OS, Tiny OS.

Unit-IV   **Architecture and Reference Model:** Introduction, Reference Model and architecture, Representational State Transfer (REST) architectural style, Uniform Resource Identifiers (URIs). Challenges in IoT- Design challenges, Development challenges, Security challenges, Other challenges.

Unit-V   **IOT and M2M:** M2M, Difference and similarities between IOT and M2M, Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Case study of IoT Applications: Domain specific IOTs- Home automation, Cities, environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyles.

Reference Books:

1. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN: 978-1-118-43062-0 2. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand the application areas of IOT

CO2: Discuss the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

CO3: Understand building blocks of Internet of Things and characteristics.

CO4: Demonstrate the Architecture and Reference Model of IOT.

CO5: Describe Case study of IoT Applications.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	H	L	H	L	-	-	-	-	L	L	-	M	M	M
CO2	L2	H	L	L	L	-	-	-	-	M	L	-	M	H	M
CO3	L2	H	M	L	M	-	-	-	-	H	M	-	M	H	H
CO4	L3	M	M	L	M	-	-	-	-	M	M	-	M	L	H
CO5	L1	M	L	L	L	-	-	-	-	M	L	-	M	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	CO2
CD4	Self- learning advice using internets	CO2
CD5	Industrial visit	

BCA 802: Deep Learning

Course Objectives:

- To introduce the idea of artificial neural networks and their architecture
- To introduce techniques used for training artificial neural networks
- To enable design of an artificial neural network for classification
- To enable design and deployment of deep learning models for machine learning problems

Course Contents:

Unit I **Artificial Neural Networks-** The Neuron-Expressing Linear Perceptrons as Neurons-Feed-Forward Neural Networks- Linear Neurons and Their Limitations –Sigmoid – Tanh – and ReLU Neurons -Softmax Output Layers – Training Feed-Forward Neural Networks-Gradient Descent-Delta Rule and Learning Rates

Unit II **Gradient Descent with Sigmoidal Neurons-** The Backpropagation Algorithm-Stochastic and Minibatch Gradient Descent – Test Sets – Validation Sets – and Overfitting- Preventing Overfitting in Deep Neural Networks – Implementing Neural Networks in TensorFlow.

Unit III **Local Minima in the Error Surfaces of Deep Networks-** Model Identifiability-Spurious Local Minima in Deep Networks- Flat Regions in the Error Surface – Momentum-Based Optimization – Learning Rate Adaptation.

Unit IV **Convolutional Neural Networks(CNN) –** Architecture -Accelerating Training with Batch Normalization- Building a Convolutional Network using Tensor Flow-Visualizing Learning in Convolutional Networks – Embedding and Representation Learning.

Unit V **Autoencoder Architecture-Implementing an Autoencoder in TensorFlow –** DenoisingSparsity in Autoencoders Models for Sequence Analysis – Recurrent Neural Networks- Vanishing GradientsLong Short-Term Memory (LSTM) Units-TensorFlow Primitives for RNN Models-Augmenting Recurrent Networks with Attention.

Text Books:

1. Nikhil Buduma, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithm", O'Reilly, 2017.
2. Ian Goodfellow, YoshuaBengio and Aaron Courville, "Deep Learning", MIT Press, 2016.

References:

1. AurélienGéron, "Hands-On Machine Learning with Scikit- Learn and TensorFlow", O'Reilly, 2017.
2. Nikhil Ketkar, "Deep Learning with Python: A Hands-on Introduction", Apress, 2017.

Course Outcomes:

CO1: Able to understand the mathematics behind functioning of artificial neural networks

CO2: Able to analyze the given dataset for designing a neural network based solution

CO3: Able to carry out design and implementation of deep learning models for signal/image processing applications

CO4: Able to design and deploy simple TensorFlow-based deep learning solutions to classification problems

CO5: Able to design and deploy Autoencoder Architecture and RNN Models

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L3	M	M	H	H	-	-	-	-	L	M	-	M	L	M
CO2	L1	M	H	M	H	-	-	-	-	M	H	-	M	L	M
CO3	L2	H	M	L	M	-	-	-	-	H	M	-	M	M	M
CO4	L3	M	H	M	H	-	-	-	-	M	H	-	M	M	M
CO5	L2	H	H	L	H	-	-	-	-	L	H	-	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	CO3, CO4,
CD4	Self- learning advice using internets	CO2, CO5
CD5	Industrial visit	-

BCA 803 - Internet of Things Lab

Course Objectives:

- To focus on research – design and development of IoT enabled technologies which are cost effective and socially relevant.

- To develop trained manpower (through student projects/research) in the field of IoT based application development.

List of Exercises

1. Start Raspberry Pi and try various Linix commands in command terminal window:

   ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.

2. Run some python programs on Pi like:
   a) Read your name and print Hello message with name
   b) Read two numbers and print their sum, difference, product and division.
   c) Word and character count of a given string.
   d) Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input.

3. Run some python programs on Pi like:
   a) Print a name 'n' times, where name and n are read from standard input, using for and while loops.
   b) Handle Divided by Zero Exception.
   c) Print current time for 10 times with an interval of 10 seconds.
   d) Read a file line by line and print the word count of each line.

4. a) Light an LED through Python program

   b) Get input from two switches and switch on corresponding LEDs

   c) Flash an LED at a given on time and off time cycle, where the two times are taken from a file.

5. a) Flash an LED based on cron output (acts as an alarm)

   b) Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.

   c) Get the status of a bulb at a remote place (on the LAN) through web.

6. The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Describe different types of commands ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown,bchgrp, ping .

CO2: Understand to run the programs on Pi

CO3: Implement the programs using different logics.

CO4: Demonstrate Linix commands.

CO5: Read and apply some python programs on Pi.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L1	H	M	H	M	M	-	-	-	L	M	-	L	H	H
CO2	L2	H	L	M	L	M	-	-	-	L	L	-	L	H	H
CO3	L3	M	M	M	M	L	-	-	-	L	M	-	M	H	H
CO4	L3	M	M	M	M	L	-	-	-	L	M	-	M	H	H
CO5	L3	M	M	M	M	L	-	-	-	L	M	-	M	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	CO3
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	

(UG Degree (Hons.)

Semester – VII

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 701	Fundamental of PHP	Core	30	70	100	4
BCA 702	Computer Graphics	Core	30	70	100	4
BCA 703 A	Cloud Computing	Core Elective	30	70	100	4
BCA 703 B	E- Commerce	Core Elective	30	70	100	4
BCA 703 C	Big Data Analytics	Core Elective	30	70	100	4
BCA 704	Research Methodology	AECC	30	70	100	4
BCA 705	ISS	Core	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 706	PHP Lab	Practical	60	40	100	1
BCA 707	Computer Graphics Lab	Practical	60	40	100	1
BCA 708	ISS Lab	Practical	60	40	100	1
BCA 709	Industrial Training	Practical	60	40	100	1
TOTAL			**390**	**510**	**900**	**24**

BCA-701 Fundamental of PHP

Course Objective:

- Understand the basics of the PHP.
- Examine how web pages are developed using PHP.
- Learn certain specific PHP variables and syntax.

Course Contents:

Unit I   Introduction of web applications. Introduction to web designing with HTML and Cascaded Style Sheets. Concept of Client Side Scripting and Server Side Scripting. Static website vs Dynamic website development. Web Servers: Local Servers and Remote Servers.

Unit II   Introduction to PHP, Installing Web servers, PHP configuration in IIS &Apache Web server. Data types in PHP, Variables, Constants, operators and Expressions. PHP Operator: Conditional Structure - if, switch case & Looping Structure - for, while, do while, foreach

Unit III   Introduction to Arrays: Initialization of an array, Iterating through an array, Sorting arrays, Array Functions, Functions: Defining and Calling Functions, Passing by Value and passing By references, Inbuilt Functions: String Function, Math Function, Date Function and Miscellaneous Function.

Unit IV   Working with Forms: Get and Post Methods, Query strings, HTML form controls and PHP, Maintaining User State: Cookies, Sessions and Application State. Working with Files: Opening and Closing Files, Reading and Writing to Files, Getting Information on Files

Unit V   PHP Database Connectivity: Introduction to MYSQL, Creating database and other operations on database, connecting to a database, Use a particular database, Sending query to database, Parsing of the query results, Checking data errors.

Text/ Reference Books:

1. Steven Holzner " PHP: The Complete Reference"
2. Tim Converse, Joyce Park "PHP Bible", 2nd Edition
3. Dave W. Mercer, Allan Kent, Steven D. Nowicki, David Mercer, Dan Squier, Wankyu Choi with HeowEide-Goodman, Ed Lecky-Thompson, Clark Morgan "Beginning PHP5"

Course Outcomes

At the end of the course, the student will be able to:

CO1:	Understand process of executing a PHP-based script on a webserver.
CO2:	Apply containing several fields and be able to process the dataprovided on the form by a user in a PHP-based script.
CO3:	Understand basic PHP syntax for variable use, and standard language constructs, such asconditionals and loops.
CO4:	Understand the syntax and use of PHP object-oriented classes.
CO5:	Understand the syntax and functions available to deal with file processing for files on theserver as well as processing web URLs.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	P01 1	PO 12	PS O1	PS O2
CO1	L2	H	L	L	M	-	-	-	-	-	H	-	L	H	L
CO2	L3	M	H	H	H	M	-	-	-	M	M	H	H	M	M
CO3	L2	L	L	L	M	-	-	-	-	-	L	-	L	M	M
CO4	L2	M	L	L	L	-	-	-	-	L	M	-	M	H	L
CO5	L2	M	M	M	H	M	-	-	-	L	M	-	L	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	-----

BCA 702: Computer Graphics

Course Objective:

- Understand contemporary graphics principles and graphics hardware.

- Have a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.

- Have thorough introduction to computer graphics techniques, focusing on 3D modeling, image synthesis, and rendering.

Course Contents:

Unit I   Introduction to Raster scan displays, Storage tube displays, refreshing, flicking, interlacing, color monitors, display processors resolution, working principle of dot matrix, inkjet laser printers, working principles of keyboard, mouse scanner, digitizing camera, track ball , tablets and joysticks, graphical input techniques, positioning techniques ,rubber band techniques, dragging etc.

Unit II   **Scan conversion techniques**, image representation, line drawing, simple DDA, Bresenham's Algorithm, Circle drawing, general method, symmetric DDA, Bresenham's Algorithm, curves, parametric function, Beizier Method, B-sp-line Method.

Unit III   **2D & 3D Co-ordinate system**, Translation, Rotation, Scaling, Reflection Inverse transformation, Composite, transformation, world coordinate system, screen coordinate system, parallel and perspective projection, Representation of 3D object on 2D screen.

Unit IV   **Algorithms**: Point Clipping. Line Clipping Algorithms, Polygon Clipping algorithms, Introduction to Hidden Surface elimination, Basic illumination model, diffuse reflection, specular reflection, phong shading, Gourand shading ray tracing, colormodels like RGB, YIQ, CMY, HSV etc.

Unit V   **Multimedia components**, Multimedia Hardware, SCSI, IDE, MCI, Multimedia data and file formats, RTF, TIFF, MIDI, JPEG, DIB, MPEG, Multimedia Tools, Presentation tools, Authoring tools, presentation.

Text Books/Reference Books

1. Foley et.al, Computer Graphics Principles & Practice, Addision , 1999

2. David F.Rogers, Procedural Elements for Computer Graphics, McGraw Hill Book Company

3. D.Heam and P.Baker, Computer Graphics, Prentice Hall 1986

4. R.Plastock and G.Kalley, Theory and Problems of Computer Graphics, Schaum's Series.,McGraw Hill.

Course Outcomes

At the end of the course, the student will be able to:

CO1: Demonstrate an understanding of contemporary graphics hardware.
CO2: Explain interactive graphics applications in C++ using one or more graphics.
CO3: Explain interactive graphics applications in C++ using one or more graphics application programming interfaces.
CO4: Define program functions to implement graphics primitives.
CO5: Understand and demonstrate geometrical transformations.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L3	M	L	L	M	-	-	-	-	-	M	-	M	H	L
CO2	L2	M	M	M	H	L	-	-	-	L	M	-	M	M	M
CO3	L2	H	L	L	M	L	-	-	-	M	H	L	H	M	L
CO4	L1	M	H	H	H	M	-	-	-	L	M	-	M	H	M
CO5	L2	H	M	M	H	-	-	-	-	L	H	L	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	----

BCA 703A: Cloud Computing

Course Objectives:

- To understand the basics of Cloud Computing.
- To understand the movement from a traditional network infrastructure to a Cloud solution.

Course Contents:

Unit I: **Introduction:** Objective, scope and outcome of the course. Introduction Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges ,Risks and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things

Unit II: **Cloud Computing Architecture:** Cloud Reference Model, Layer and Types of Clouds, Services models, Data centre Design and inter connection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-Map Reduce, Had oop, High level Language for Cloud. Programming of Google App engine.

Unit III: **Virtualization Technology:** Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-centre

Unit IV: **Securing the Cloud:** Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture . Legal issues in cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery , Risk Mitigation, Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management

Unit V: **Cloud Platforms in Industry:** Amazon web services , Google App Engine, Microsoft Azure Design, Aneka: Cloud Application Platform-Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM

Text/ Reference Books:

- " Distributed and Cloud Computing " By Kai Hawang , Geofrey C.Fox, Jack J. Dongarra Pub: Elservier
- Cloud Computing ,Principal and Paradigms, Edited By Rajkumar Buyya, Jemes Broberg, A. Goscinski, Pub.- Wiley
- Kumar Saurabh, "Cloud Computing" , Wiley Pub
- Krutz , Vines, "Cloud Security " , Wiley Pub
- Velte, "Cloud Computing- A Practical Approach" ,TMH Pub

COURSE OUTCOMES

CO1: Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.

CO2: Design different workflows according to requirements and apply map reduce programming model.

CO3: Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.

CO4: Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds

CO5: Understand and Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L4	H	-	L	-	M	L	M	L	-	L	L	L	H	H
CO2	L2	H	-	M	-	L	M	L	-	-	M	M	M	H	H
CO3	L3	H	-	L	-	M	L	M	-	-	M	M	M	M	M
CO4	L3	M	-	M	-	M	L	M	-	-	H	H	H	H	H
CO5	L2	M	-	L	-	L	L	L	L	-	M	M	M	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

BCA 703B: E-Commerce

Course Objective:

- Define e-commerce and compare and contrast it from e-business.
- Identify some business applications of e-commerce, identify, define and differentiate the various forms of e-commerce.
- Recognize the business impact and potential of e-Commerce.

Course Contents:

Unit I   **Introduction to E-Commerce:** The Scope of Electronic Commerce, Definition of Electronic Commerce, Electronic Commerce and the Trade Cycle, Electronic Markets, Electronic Data Interchange, Internet Commerce, E-Commerce in Perspective.

Business Strategy in an Electronic Age: Supply Chains, Porter's Value Chain Model, Inter Organizational Value Chains, Competitive Strategy, Porter's Model, First Mover Advantage, Sustainable Competitive Advantage, Competitive Advantage using E-Commerce, Business Strategy, Introduction to Business Strategy, Strategic Implications of IT, Technology, Business   Environment,

Business Capability, Existing Business Strategy, Strategy Formulation & Implementation   Planning,   E-Commerce   Implementation,   E-Commerce Evaluation.

Unit II   **Business-to-Business Electronic Commerce:** Characteristics of B2B EC, Models of B2B EC, Procurement Management Using the Buyer's Internal Marketplace, Supplier-Oriented Marketplace, Intermediary-Oriented Marketplace, Just-in-Time Delivery, Other B2B Models, Auctions and Services from Traditional to Internet-Based EDI, Integration with Back-end Information Systems, The Role of Software Agents for B2B EC, Electronic Marketing in B2B, Solutions of B2B EC, Managerial Issues, Electronic Data Interchange (EDI), EDI: The Nuts and Bolts, EDI & Business.

Unit III   **Intranet and Extranet:** Automotive Network Exchange, The Largest Extranet, Architecture of the Internet, Intranet, and Extranet, Intranet Software, Applications of Intranets, Intranet Application Case Studies, Considerations in Intranet Deployment, The Extranets, The Structure of Extranets, Extranet Products & Services, Applications of Extranets, Business Models of Extranet Applications, Managerial Issues.

Unit IV   **Electronic Payment Systems:** Is SET a Failure, Electronic Payments & Protocols, Security Schemes in Electronic Payment Systems, Electronic Credit Card System on the Internet, Electronic Fund Transfer and Debit Cards on the Internet, Stored-Valued Cards and E-Cash, Electronic Check Systems, Prospect of

Electronic Payment Systems, Managerial Issues.

Public Policy: From Legal Issues to Privacy: EC-Related Legal Incidents, Legal, Ethical & Other Public Policy Issues, Protecting Privacy, Protecting Intellectual Property, Free Speech, Internet Indecency & Censorship, Taxation & Encryption Policies, Other Legal Issues: Contracts, Gambling & More, Consumer & Seller Protection in EC.

Unit V   Internet Protocols, Web-Based client/ Server, Internet Security, Selling on the Web, chatting on the Web, Multimedia delivery, Analyzing Web Visits, Managerial issues.

Economics, Global & Other Issues in EC: Competition in Market space, Some Issues in Digital Economy and Success Factors, Impacts on Industry Structure, Intermediaries, and Others, virtual Communities, Global Electronic Commerce, Electronic Commerce in Small companies, Research in EC, The Future of EC

Text Books/ Reference Books

1. David Whiteley, "E-Commerce", Tata McGraw Hill, 2000 Eframi Turban, Jae Lee, David King, K. Michale Chung, "Electronic Commerce", Pearson Education, 2000

Course Outcomes

At the end of the course, the student will be able to:

CO1: Describe knowledge of e-commerce, its components, structure of e-banking, rules and regulations on e-commerce.
CO2:   Demonstrate knowledge of e-commerce, both the technical and business aspects;
CO3:   Understand the principles and practices of e-commerce and its related technologies;
CO4:   Discuss the trends in e-Commerce and the use of the Internet.
CO5:   Explain the economic consequences of e-Commerce.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	M	L	L	L	-	-	-	-	-	M	-	-	M	M
CO2	L2	M	L	L	M	-	-	-	-	-	M	-	L	M	L
CO3	L2	H	L	L	M	-	-	-	-	-	H	-	-	H	M
CO4	L2	M	M	M	H	-	-	-	-	-	M	-	M	H	L
CO5	L2	H	L	L	M	-	-	-	-	-	H	-	L	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	----

BCA 703 C: Big Data Analytics

Course Objectives:

- To provide an overview of an exciting growing field of big data analytics.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- To enable students to have skills that will help them to solve complex real-world problems in for decision support

Course Contents:

Unit-I **Introduction to Big Data:** Big data features and challenges, Problems with Traditional Large-Scale System, Sources of Big Data, 3 V's of Big Data, Types of Data. Working with Big Data: Google File System. Hadoop Distributed File System (HDFS) - Building blocks of Hadoop (Namenode. Data node. Secondary Namenode. Job Tracker. Task Tracker), Introducing and Configuring Hadoop cluster (Local. Pseudodistributed mode, Fully Distributed mode). Configuring XML files.

Unit-II **Writing MapReduce Programs:** A Weather Dataset. Understanding Hadoop API for MapReduce Framework (Old and New). Basic programs of Hadoop MapReduce: Driver code. Mapper code, Reducer code. Record Reader, Combiner, Partitioner.

Unit-III **Hadoop I/O:** The Writable Interface. Writable Comparable and comparators. Writable Classes: Writable wrappers for Java primitives. Text. Bytes Writable. Null Writable, Object Writable and Generic Writable. Writable collections. Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators.

Unit-IV **Pig:** Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow. Working through the ABCs of Pig Latin. Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

Unit-V **Applying Structure to Hadoop Data with Hive:** Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive. Examining the Hive Clients. Working with Hive Data Types. Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

References :

1. "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data" by EMC Education Services
2. "Big Data: Does Size Matter?" by Timandra Harkness
3. "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses" by Michael Minelli

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Describe the key issues in big data management and its associated applications in intelligent business and scientific computing.

CO2: Discuss fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.

CO3: Apply business models and scientific computing paradigms, and apply software tools for big data analytics.

CO4: Describe adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

CO5: Discuss Hadoop Data with Hive

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	M	L	H	L	-	-	-	-	L	L	-	M	M	M
CO2	L2	H	M	M	M	-	-	-	-	M	M	-	M	M	M
CO3	L3	H	M	L	M	-	-	-	-	H	M	-	M	M	M
CO4	L1	M	L	M	L	-	-	-	-	M	L	-	M	H	M
CO5	L2	H	M	M	M	-	-	-	-	M	M	-	M	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	CO3, CO4,
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	-

BCA 704: Research Methodology

Course Objectives:

- To identify the concept of research.
- To identify the scientific conduct of research.
- To understand the publication Ethics.
- To understand Open access publications and publication misconduct.
- To understand the Research Data and Research Metrics.

Course Contents:

Unit I: Philosophy And Ethics

1. Introduction to Philosophy : definition, nature and Scope, Concept, Branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reaction

Unit II: Scientific Conduct

3. Ethics with respect to science and research
4. Intellectual honesty and research integrity
5. Scientific misconducts: Falsification, Fabrication, and Plagiarism(FFP)
6. Redundant publications: duplicate and overlapping publications, salami slicing
7. Selective reporting and misrepresentation of data.

Unit III: Publication Ethics

8. Publication ethics: definition, introduction and importance
9. Best practices /Standards setting initiatives and guidelines: COPE. WAME, etc.,
10. Conflicts of interest
11. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
12. Violation of publication ethics, authorship and contributorship
13. Identification of publication misconduct, complaints and appeals
14. Predatory publishers and journals

Unit IV: Open Access Publishing and Publication Misconduct

15. Open access publications and initiatives
16. SHEERPA/RoMEO online resource to check publisher copyright & Self – archiving policies
17. Software tool to identify predatory publications developed by SPPU
18. Journal finder /Journal suggestion tools viz.JANE., Elsevier journal Finder, Springer Journal Suggester, etc.
19. Subject specific ethical issues, FFP, authorship
20. Conflicts of interest
21. Complaints and appeals: examples and fraud from India and abroad.
22. Use of plagiarism software like Turnitin, Urkund and other open source software tools

Unit V: **Databases and Research Metrics**

    A. Databases
       1. Indexing databases
       2. Citation databases: Web of Science, Scopus, etc.
    B. Research Metrics
       3. Impact Factor of Journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
       4. Metrics: h-index, g index, i10 index, altmetrics

Reference:

1. Bird, A.(2006). Philosophy of Science.Routledge

2. Maclntyre, Alasdair (1967) A Short History of Ethics. London

3. P.Chaddah, (2018) Ethics in Competitive Research: Do not get Scooped; do not get Plagiarized, ISBN : 978-9387480865

4. National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). On Being a Scientist: A Guide to responsible conduct in Research: Third Edition, National Academies Press.

5. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN:978-81-939482-1-7
   http://www.insaindia.res.in/pdf/Ethics_Book.pdf.

Course Outcomes:

COs   Statement After completion of this course, students will be able to:

CO1   Understand the concept of research.

CO2   Understand the scientific conduct of research.

CO3   Understand the publication Ethics.

CO4   Understand Open access publications and publication misconduct. ct.

CO5   Understand the Research Data and Research Metrics.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom's Levels	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PS O 1	PS O 2
CO1	L1	M	H	L	H	L	H	H	M	L	M		L
CO2	L2	H	H	M	M	M	L	-	L	-	M	L	-
CO3	L3	M	H	M	M	M	M	H	L	-	M	-	L
CO4	L4	H	H	M	M	M	-	H	-	L	M	-	L
CO5	L4	H	H	H	M	M	-	-	-	L	M	-	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3, CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3, CO4,CO5
CD3	Seminars	CO2,CO3, CO4,CO5
CD4	Self- learning advice using internets	CO1,CO2,CO3,CO4, CO5
CD5	Industrial visit	CO5

BCA 705: Information Security System

Course Objectives:

- To enhance knowledge and techniques for enforcement of security with some emphasis on cryptography.
- To develop an understanding of security policies (such as authentication, integrity and confidentiality).

Course Contents:

Unit I: **Introduction to security attacks:** services and mechanism, classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers.

Unit II: **Modern block ciphers:** Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation. Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode.

Unit III: **Public Key Cryptosystems with Applications:** Requirements and Cryptanalysis, RSA cryptosystem, Rabin cryptosystem, Elgamal crypto system, Elliptic curve cryptosystem

Unit IV: **Cryptographic Hash Functions, their applications:** Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA).Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers .Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm.

Unit V: **Key management and distribution:** symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure. Remote user authentication with symmetric and asymmetric encryption, Kerberos Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH

Text/ Reference Books:

1. Stalling Williams: Cryptography and Network Security: Principles and Practices, 4th Edition, Pearson Education, 2006.
2. Kaufman Charlie et.al; Network Security: Private Communication in a Public World, 2nd Ed., PHI/Pearson.
3. Pieprzyk Josef and et.al; Fundamentals of Computer Security, Springer-Verlag, 2008.
4. Trappe & Washington, Introduction to Cryptography, 2nd Ed. Pearson.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.

CO2: Apply computer technologies, digital evidence collection, and evidentiary reporting in forensic acquisition.

CO3: Understand approaches for incident analysis and response.

CO4: Understand Cryptographic Hash Functions and their applications.

CO5: Learn Key management system.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	H	M	M	M	-	-	-	-	-	M	-	M	M	M
CO2	L3	M	M	H	M	-	-	-	-	-	M	-	L	M	M
CO3	L2	M	H	M	H	-	-	-	-	-	H	-	L	H	M
CO4	L2	M	H	M	M	-	-	-	-	-	H	-	L	M	M
CO5	L1	M	H	M	M	-	-	-	-	-	M	-	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3
CD2	Tutorials/Assignments	CO1, CO2, CO3
CD3	Seminars	CO3
CD4	Self- learning advice using internets	CO2, CO3

BCA-706: PHP LAB

Course Objectives:

- To understand how server-side programming works on the web.
- To learn PHP Basic syntax for variable types and calculations.
- To use PHP built-in functions and creating custom functions.
- To understanding POST and GET in form submission.
- To provide the necessary knowledge to design and develop dynamic, databasedriven web applications using PHP.

List of Experiments :-

Experiment 1: Design the following static web pages required for online book store.

     a) **Home page: -** the static home page must contains three pages

     b) **Top: -** logo and college name and links to homepage, login page, registration Page, catalogue page and cart page

     c) **Left: -** at least four links for navigation which will display the catalogue of Respective links

     d) **Right: -** the pages to links in the left frame must be loaded here initially it Contains the description of the website

Experiment 2: Create registration and cart page in the previous created web site.

Experiment 3: Write a java script to validate the following fields in a registration page

     e) userName (should contains alphabets and the length should not be less than 6 characters)

     f) userPassword (should not be less than 6 characters)

     g) userEmail (should not contain invalid addresses)

     h) userCity (should select city from drop down)

     i) userGender (Should selectgender)

Experiment 4: Implement CSS on the above create WebPages.

Experiment 5: Write an XML file which displays the book details that includes the following:

1) Title of book

2) Author name

3) Edition

4) Price Write a DTD to validate the above XML file and display the details in a table.

Experiment 6: Create a php program to demonstrate the different file handling methods.

Experiment 7: Create a php program to demonstrate the different loops in php.

Experiment 8: Create a php program to demonstrate the different predefined function in array, Math.

Experiment 9: Create a php program to demonstrate the different predefined function in Data & Regular Expression, date.

Experiment 10: Create a HTML form and process the HTML form in PHP.

Experiment 11: Create a php program to connect to MySQL Server.

Experiment 12: Create a php program to execute more SQL queries.

Course Outcomes

At the end of the course, the student will be able to:

CO1: Understand the PHP and scripting.
CO2: Understand Basics of PHP Language .
CO3: Analyze with Databases and Forms.
CO4: Apply methods with cookies.
CO5: Describe on Data and Tables in MYSQL.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	H	L	L	L	-	-	-	L	-	H	-	H	H	L
CO2	L2	M	L	L	M	M	-	-	L	L	M	-	M	M	M
CO3	L3	L	M	M	M	M	-	-	M	L	L	-	L	H	L
CO4	L3	M	L	L	M	H	-	-	M	M	M	-	M	H	H
CO5	L2	M	M	M	M	M	-	-	H	H	M	-	M	M	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4 ,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4,CO5
CD3	Seminars	-----------
CD4	Self- learning advice using internets	CO1,CO2, CO3, CO4,CO5
CD5	Industrial visit	

BCA 707: Computer Graphics Lab

Course Objective:

- To implement different computer graphics algorithms, this algorithm make them learn about the creation of primitives of graphics, storage and generation.
- To create interactive graphics applications in C++ using one or more graphics application programming interfaces.
- To write programs that demonstrates geometrical transformations.

List of Experiments:

1. Implementation of Line, Circle and ellipse attributes
2. To plot a point (pixel) on the screen
3. To draw a straight line using DDA Algorithm
4. Implementation of mid-point circle generating Algorithm
5. Implementation of ellipse generating Algorithm
6. Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear
7. Composite 2D Transformations
8. Cohen Sutherland 2D line clipping and Windowing
9. Sutherland – Hodgeman Polygon clipping Algorithm
10. Three dimensional transformations - Translation, Rotation, Scaling
11. Composite 3D transformations
12. Drawing three dimensional objects and Scenes
13. Generating Fractal images

Course Outcomes

At the end of the course, a student will be able to:

CO1: List the basic concepts used in computer graphics.

CO2: Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.

CO3: Describe the importance of viewing and projections.

CO4: Define the fundamentals of animation, virtualreality and its related technologies.

CO5: Implement various algorithms to Fractal images, dimensional objects and Scenes

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L3	H	H	M	H	L	-	-	-	-	H	-	L	M	M
CO2	L3	H	L	M	L	M	-	-	-	-	L	-	M	H	M
CO3	L2	H	H	M	H	L	-	-	-	-	H	-	L	H	M
CO4	L1	H	M	H	M	H	-	-	-	-	M	-	L	H	M
CO5	L1	H	M	M	M	H	-	-	-	-	L	-	L	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	-
CD4	Self- learning advice using internets	CO2, CO3,CO4
CD5	Industrial visit	

Semester – VIII
(UG Degree (Hons.)

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	Credits
BCA 801	Internet of Things	Core	30	70	100	4
BCA 802	Cryptography and Network Security	Core	30	70	100	4
BCA 803	Deep Learning	Core	30	70	100	4
BCA 804 A	Cyber Ethics & Crime	Core Elective	30	70	100	4
BCA 804 B	Mobile Computing	Core Elective	30	70	100	4
BCA 804 C	Software Project Management	Core Elective	30	70	100	4
PRACTICALS/VIVA-VOCE		Type	Internal Marks	External Marks	Total	Credits
BCA 805	Internet of Things Lab	Practical	60	40	100	2
BCA 806	Project	Practical	100	100	200	6
TOTAL			**280**	**420**	**700**	**24**

Note for award of BCA (Hons.):

- **Total Credits (201)**

- **The student who secures 201 credits, will be awarded a UG degree - BCA (Hons.)**

BCA 801: Internet of Things

Course Objectives:

- To explore to the interconnection and integration of the physical world and the cyber space.
- To be able to design & develop IOT Devices.

Course Contents:

Unit-I   **Introduction:** Objective, scope and outcome of the course.

Unit-II   **Introduction to IoT:** Definition and characteristics of IOT, Design of IOT: Physical design of IOT, Logical Design of IOT- Functional Blocks, communication models, communication APIs, IOT enabling Technologies- Wireless Sensor Networks, Cloud computing, big data analytics, embedded systems. IOT Levels and deployment templates.

Unit-III   **IoT Hardware and Software:** Sensor and actuator, Humidity sensors, Ultrasonic sensor, Temperature Sensor, Arduino, Raspberry Pi, LiteOS, RIoTOS, Contiki OS, Tiny OS.

Unit-IV   **Architecture and Reference Model:** Introduction, Reference Model and architecture, Representational State Transfer (REST) architectural style, Uniform Resource Identifiers (URIs). Challenges in IoT- Design challenges, Development challenges, Security challenges, Other challenges.

Unit-V   **IOT and M2M:** M2M, Difference and similarities between IOT and M2M, Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Case study of IoT Applications: Domain specific IOTs-Home automation, Cities, environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyles.

Reference Books:

1. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN: 978-1-118-43062-0 2. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand the application areas of IOT

CO2: Discuss the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

CO3: Understand building blocks of Internet of Things and characteristics.

CO4: Demonstrate the Architecture and Reference Model of IOT.

CO5: Describe Case study of IoT Applications.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	H	L	H	L	-	-	-	-	L	L	-	M	M	M
CO2	L2	H	L	L	L	-	-	-	-	M	L	-	M	H	M
CO3	L2	H	M	L	M	-	-	-	-	H	M	-	M	H	H
CO4	L3	M	M	L	M	-	-	-	-	M	M	-	M	L	H
CO5	L1	M	L	L	L	-	-	-	-	M	L	-	M	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	CO2
CD4	Self- learning advice using internets	CO2
CD5	Industrial visit	

BCA 802: Cryptography and Network Security

Course Objectives:

- To enhance knowledge and techniques for enforcement of security with some emphasis on cryptography.
- To develop an understanding of security policies (such as authentication, integrity and confidentiality).

Course Contents:

Unit I: **Introduction to security attacks:** services and mechanism, classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers.

Unit II: **Modern block ciphers:** Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation. Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode.

Unit III: **Public Key Cryptosystems with Applications:** Requirements and Cryptanalysis, RSA cryptosystem, Rabin cryptosystem, Elgamal crypto system, Elliptic curve cryptosystem

Unit IV: **Cryptographic Hash Functions, their applications:** Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA).Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers .Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm.

Unit V: **Key management and distribution:** symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure. Remote user authentication with symmetric and asymmetric encryption, Kerberos Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH

Text/ Reference Books:

1. Stalling Williams: Cryptography and Network Security: Principles and Practices, 4th Edition, Pearson Education, 2006.
2. Kaufman Charlie et.al; Network Security: Private Communication in a Public World, 2nd Ed., PHI/Pearson.
3. Pieprzyk Josef and et.al; Fundamentals of Computer Security, Springer-Verlag, 2008.
4. Trappe & Washington, Introduction to Cryptography, 2nd Ed. Pearson.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.

CO2: Apply computer technologies, digital evidence collection, and evidentiary reporting in forensic acquisition.

CO3: Understand approaches for incident analysis and response.

CO4: Understand Cryptographic Hash Functions and their applications.

CO5: Learn Key management system.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	H	M	M	M	-	-	-	-	-	M	-	M	M	M
CO2	L3	M	M	H	M	-	-	-	-	-	M	-	L	M	M
CO3	L2	M	H	M	H	-	-	-	-	-	H	-	L	H	M
CO4	L2	M	H	M	M	-	-	-	-	-	H	-	L	M	M
CO5	L1	M	H	M	M	-	-	-	-	-	M	-	L	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	**Course Delivery methods**	**Course Outcomes**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3
CD2	Tutorials/Assignments	CO1, CO2, CO3
CD3	Seminars	CO3
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	CO2

BCA 803: Deep Learning

Course Objectives:

- To introduce the idea of artificial neural networks and their architecture
- To introduce techniques used for training artificial neural networks
- To enable design of an artificial neural network for classification
- To enable design and deployment of deep learning models for machine learning problems

Course Contents:

Unit I **Artificial Neural Networks-** The Neuron-Expressing Linear Perceptrons as Neurons-Feed-Forward Neural Networks- Linear Neurons and Their Limitations –Sigmoid – Tanh – and ReLU Neurons -Softmax Output Layers – Training Feed-Forward Neural Networks-Gradient Descent-Delta Rule and Learning Rates

Unit II **Gradient Descent with Sigmoidal Neurons**- The Backpropagation Algorithm-Stochastic and Minibatch Gradient Descent – Test Sets – Validation Sets – and Overfitting- Preventing Overfitting in Deep Neural Networks – Implementing Neural Networks in TensorFlow.

Unit III **Local Minima in the Error Surfaces of Deep Networks-** Model Identifiability-Spurious Local Minima in Deep Networks- Flat Regions in the Error Surface – Momentum-Based Optimization – Learning Rate Adaptation.

Unit IV **Convolutional Neural Networks (CNN) –** Architecture -Accelerating Training with Batch Normalization- Building a Convolutional Network using Tensor Flow-Visualizing Learning in Convolutional Networks – Embedding and Representation Learning.

Unit V **Autoencoder Architecture-** Implementing an Autoencoder in TensorFlow – DenoisingSparsity in Autoencoders Models for Sequence Analysis – Recurrent Neural Networks- Vanishing GradientsLong Short-Term Memory (LSTM) Units-TensorFlow Primitives for RNN Models-Augmenting Recurrent Networks with Attention.

Text Books:

1. Nikhil Buduma, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithm", O'Reilly, 2017.

2. Ian Goodfellow, YoshuaBengio and Aaron Courville, "Deep Learning", MIT Press, 2016.

References:

1. AurélienGéron, "Hands-On Machine Learning with Scikit- Learn and TensorFlow", O'Reilly, 2017.

2. Nikhil Ketkar, "Deep Learning with Python: A Hands-on Introduction", Apress, 2017.

Course Outcomes:

CO1: Able to understand the mathematics behind functioning of artificial neural networks

CO2: Able to analyze the given dataset for designing a neural network based solution

CO3: Able to carry out design and implementation of deep learning models for signal/image processing applications

CO4: Able to design and deploy simple TensorFlow-based deep learning solutions to classification problems

CO5: Able to design and deploy Autoencoder Architecture and RNN Models

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	P01 1	PO1 2	PSO 1	PSO 2
CO1	L3	M	M	H	H	-	-	-	-	L	M	-	M	L	M
CO2	L1	M	H	M	H	-	-	-	-	M	H	-	M	L	M
CO3	L2	H	M	L	M	-	-	-	-	H	M	-	M	M	M
CO4	L3	M	H	M	H	-	-	-	-	M	H	-	M	M	M
CO5	L2	H	H	L	H	-	-	-	-	L	H	-	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	CO3, CO4,
CD4	Self- learning advice using internets	CO2, CO5
CD5	Industrial visit	-

BCA-804A: Cyber Ethics & Crime

Course Objective:

- To understand the basics of cyber law, its related issues and ethical laws of computer for different countries.

- To examine how the online digital world has been inflicted with new cybercrimes, implications for society and law enforcement response and investigating how the computer and electronic devices have become both a target of attack and a tool for criminal activity

Course Contents:

Unit I Introduction to Cyber Law Evolution of Computer Technology, emergence of Cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace- Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

Unit II Information technology Act Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

Unit III Cyber law and related Legislation Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

Unit IV Electronic Business and legal issues: Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C,E security.

Unit V Application area: business, taxation, electronic payments, supply chain, EDI, E-markets Emerging Trends.

Text Books/ Reference Books

1. Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher.
2. Information Security policy &implementation Issues, NIIT, PHI.
3. Cyber CRIME notorious Aspects of the Humans & net Criminals activity in Cyber World
4. Barna Y Dayal D P Dominant Publisher.
5. Cyber Crime Impact in the new millennium, Marine R.C. Auther press
6. Spam Attack, Cyber Stalking & abuse, Barna Y, Dayal D P Dominant publisher
7. Frauds & Financial criouses in Cyber space, Barna Y, Dayal D P , Dominant publisher
8. Information Security , NIIT: PHI

Course Outcomes

At the end of the course, the student will be able to:

CO1:	Understand the consequences of ignoring and non-compliance with ethical imperatives.
CO2:	Describe about the best ethical practices and models.
CO3:	Make a sound methodology in resolving ethical conflicts and crisis.
CO4:	Learn about the issues directly related to information technology environment and professionals.
CO5:	Describe about the issues directly related to information technology

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	M	L	L	L	-	-	-	M	M	M	-	M	M	L
CO2	L1,L2	L	L	L	M	-	-	-	L	-	L	-	L	M	M
CO3	L3	H	H	H	H	M	-	-	M	L	H	-	H	H	L
CO4	L2	M	L	L	M	M	-	-	L	-	M	-	M	H	M
CO5	L2	M	L	L	M	M	-	-	L	-	M	-	M	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4
CD3	Seminars	-----
CD4	Self- learning advice using internets	CO2, CO3, CO4 ,CO5
CD5	Industrial visit	------

BCA-804B: Mobile Computing

Course Objectives:

- To understand the various terminology, principles, devices, schemes, concepts,generations, and different methodologies used in Mobile and Wireless CommunicationNetworks.

- TointroducethestudenttothemajorconceptsinvolvedinWirelessLAN(IEEE 802.11),and Bluetooth.

- To study the operation of basic cellular system and performance criterion, handoffmechanism, etc.

- To expose students to emerging technologies and their potential impact.

Course Contents:

Unit-I **Introduction:** Applications, A short history of wireless communications, a market for mobile communications, some open research topics, a simplified reference model.

Unit-II **Wireless transmission:** Frequency for radio transmission, signals, Antennas, Signal propagation, multiplexing, modulation, cellular systems.

Unit-IIΓ **GSM:** Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

Unit-IV **(Wireless) Medium Access Control :** Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA. Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

Unit-V **Mobile Transport Layer :** Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

Text Books/Reference Books

1. Jochen Schiller, "Mobile Communications", Addison-Wesley. (Chapters 4,7,9,10,11), second edition, 2004.

2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028. (Chapters 11, 15, 17, 26 and 27)

3. T. Rappaport, "Wireless Communication: Principles and Practice", Pearson Education.

4. Mobile computing,RajKamal,Oxford University press.

5. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden ,Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional, 2005.

Course Outcomes

At the end of the course, the student will be able to:

CO1:	Understandingofdifferentgenerations,terminologies,systems,operationsanddesign of wireless and mobile communications.
CO2:	Define about IEEE 802.11 and Bluetooth standards.
CO3:	Appreciate the contribution of Mobile and Wireless Communication networks to overall technological growth
CO4:	Understand the concepts and technology involved in 3G, 4G and 5G Networks
CO5:	Apply the contribution of Mobile and Wireless Communication networks to overall technological growth

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L2	L	L	L	L	-	-	-	L	-	L	-	L	M	L
CO2	L1	M	M	M	M	M	-	-	-	-	M	-	M	M	M
CO3	L2	M	L	L	M	L	-	-	-	-	M	-	M	H	L
CO4	L2	M	L	L	L	M	-	-	L	-	M	-	M	H	M
CO5	L3	M	L	L	L	M	-	-	L	-	M	-	M	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	-----

BCA 805: Internet of Things Lab

Course Objectives:

- To focus on research – design and development of IoT enabled technologies which are cost effective and socially relevant.

- To develop trained manpower (through student projects/research) in the field of IoT based application development.

List of Exercises

1. Start Raspberry Pi and try various Linix commands in command terminal window:

   ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.

2. Run some python programs on Pi like:

   a) Read your name and print Hello message with name

   b) Read two numbers and print their sum, difference, product and division.

   c) Word and character count of a given string.

   d) Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input.

3. Run some python programs on Pi like:

   a) Print a name 'n' times, where name and n are read from standard input, using for and while loops.

   b) Handle Divided by Zero Exception.

   c) Print current time for 10 times with an interval of 10 seconds.

   d) Read a file line by line and print the word count of each line.

4. a) Light an LED through Python program

   b) Get input from two switches and switch on corresponding LEDs

   c) Flash an LED at a given on time and off time cycle, where the two times are taken from a file.

5. a) Flash an LED based on cron output (acts as an alarm)

   b) Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.

   c) Get the status of a bulb at a remote place (on the LAN) through web.

6. The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Describe different types of commands ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown,bchgrp, ping .

CO2: Understand to run the programs on Pi

CO3: Implement the programs using different logics.

CO4: Demonstrate Linix commands.

CO5: Read and apply some python programs on Pi.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L1	H	M	H	M	M	-	-	-	L	M	-	L	H	H
CO2	L2	H	L	M	L	M	-	-	-	L	L	-	L	H	H
CO3	L3	M	M	M	M	L	-	-	-	L	M	-	M	H	H
CO4	L3	M	M	M	M	L	-	-	-	L	M	-	M	H	H
CO5	L3	M	M	M	M	L	-	-	-	L	M	-	M	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	CO3
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	

BCA 806: PROJECT

11. TEACHING-LEARNING PROCESS/ METHODOLOGY (TLM):

The teaching-learning process should be aimed at systematic exposition of basic concepts so as to acquire knowledge of physical sciences in a canonical manner. In this context, applications of physical science and linkage with the theory constitute a vital aspect of the teaching-learning process. The course offers many modes of learning and assessment methods. Students have great freedom of choice of course which they can study. The various components of teaching learning process are summarized in the following heads.

1. **Class room Lectures:** The most common method of imparting knowledge is through lectures.There are diverse modes of delivering lectures such as through blackboard, power point presentation and other technology aided means. A judicious mix of these means is a key aspect of teaching-learning process.

2. **Tutorials:** To reinforce learning, to monitor progress, and to provide a regular pattern ofstudy, tutorials are essential requirements. During these tutorials, difficulties faced by the students in understanding the lectures, are dealt with. Tutorials are also aimed at solving problems associated with the concepts discussed during the lectures.

3. **Practical:** To provide scientific visualization and obtaining results of Physical sciences inpractical sessions. These sessions provide vital insights into scientific concepts and drawlearner's attention towards limitations of scientific computations. During practical, scientific models arising in real life problems can also be simulated.

4. **Choice based learning/Open elective:** LOCF in this undergraduate programprovidesgreat flexibility both in terms of variety of courses and range of references in each course.

5. **Field based learning:** Students may enhance their knowledge through field based learningwhile understanding the practical importance.

6. **Textbooks learning:** A large number of books are included in the list of references of eachcourse for enrichment and enhancement of knowledge.

7. **E-learning:** Learner may also access electronic resources and educational websites for betterunderstanding and updating the concepts.

8. **Self-study materials:** Self-study material provided by the teachers is an integral part oflearning. It helps in bridging the gaps in the classroom teaching. It also provides scope for teachers to give additional information beyond classroom learning.

9. **Assignment/Problem solving:** Assignments at regular intervals involving applications oftheory are necessary to assimilate basic concepts of courses. Hence, it is incumbent on the part of a learner to complete open-ended projects assigned by the teacher.

10. **Internships:** The teaching-learning process needs to be further supported by other activitiesdevoted to subject-specific and interdisciplinary skills, summer and

winter internships. During these internships it is expected that a learner will interact with experts and write a report on a topic provided to the learner.

11. **Institute visits:** Institute visit by a learner is also a part of learning process. During suchvisits a learner has access to knowledge by attending academic activities such as seminars, colloquia, library consultation and discussion with faculty members. These activities provide guidance and direction for further study.

12. **Industrial visits:** Industrial visits offer an opportunity to observe applications of scientificconcepts. These visits also give an opportunity to realize the power of mathematical ideas and their translation in problem solving.

13. **Training programs:** Training programs organized by various agencies/institutesprovide an opportunity to learn various dimensions of courses.

12.   ASSESSMENT AND OUTCOME MEAUREMENT METHODS (AOMM):

A range of assessment methods which are appropriate to test the understanding of various concepts of courses will be used. Various learning outcomes will be assessed using time-bound examinations, problem solving, assignments and viva-voce examination. For various courses in this program, the following assessment methods shall be adopted:

i.   Scheduled/unscheduled tests
ii.   Problem solving sessions aligned with classroom lectures
iii.   Practical assignments
iv.   Regular chamber consultation with faculty members
v.   Mid semester examination and semester end comprehensive examination

Examination and Evaluation:

I.   The medium of instructions and examination shall be Bilingual.

II. Candidates shall be examined according to the scheme of examination and syllabus as approved by the BOS and Academic Council from time to time.

III. To pass each semester examination, a candidate must obtain at least 40% marks in each written paper, practical work semester examination.

IV. Each theory paper for the respective semester examination shall be set and evaluation of the answer books shall be done as per the University rules.

V. The assessment of External Evaluation i.e. End Term Semester Examination will be made out of 70 (Seventy) marks in theory Papers and Internal Evaluation of 30 (Thirty) marks.

Criterion for awarding Grading System:

Criterion for Awarding SGPA and CGPA: The criterion for awarding the Semester GradePoint Average (SGPA) and Cumulative Grade Point Average (CGPA) for BCA.Program shall be as follows:

a) The criterion for passing in a subject is that a student should secure minimum 40% marks in individual paper.

b) A student obtaining less than pass marks as specified above, in each subject (sum of internal and End-Term examinations) he will be declared fail in that subject and will have to re-appear in a End-Term examination of the course in subsequent odd / even semester end term examination, subject to maximum permissible period of n+4 semesters to complete the course.

c) The University has adopted Absolute Grading System for converting marks into grades. The formula of 10- point grading system for conversion of marks obtained into Letter Grades and converting Letter Grades to Grade Point is given below:

Table: Marks, Letter Grades and Grade Points

Marks	Letter Grade	Grade Points
91-100	O (Outstanding)	10
81-90	A+(Excellent)	9
71-80	A(Very Good)	8
61-70	B+(Good)	7
51-60	B(Above Average)	6
46-50	C(Average)	5
40-45	P (Pass)*	4
0-39	F(Fail)	0
-	AB (Absent)	0

*Pass Mark: 40% in individual paper

d) While converting the marks into Letter Grade, the rounding off marks mustbe considered.

e) A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

f) For noncredit courses "Satisfactory" or Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

Computation of SGPA and CGPA:

The university has adopted UGC recommended procedure for computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

a) The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the papers/ courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$\text{SGPA } (Si) = \Sigma \ (Ci \ x \ Gi) \ / \ \Sigma Ci$$

Where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course. The university shall issue Semester Grade Card to the student.

b) The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$\text{CGPA} = \Sigma \ (Ci \ x \ Si) \ / \ \Sigma \ Ci$$

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

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

Illustration of Computation of SGPA and CGPA and Format for Transcripts:

a) Computation of SGPA and CGPA

Illustration for SGPA

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course/Paper 1	3	A	8	3x8=24
Course/Paper 2	4	B+	7	4x7=28
Course/Paper 3	3	B	6	3x6=18
Course/Paper 4	3	O	10	3x10=30
Course/Paper 5	3	C	5	3x5=15
Course/Paper 6	4	B	6	4x6=24
	20			**139**

Thus, SGPA= 139/20= 6.95

b)Illustration for CGPA

Semester-1	Semester-2	Semester-3	Semester-4	Semester-5	Semester-6
Credit: 20	Credit: 22	Credit: 25	Credit: 26	Credit: 26	Credit: 25
SGPA:6.9	SGPA:7.8	SGPA:5.6	SGPA:6.0	SGPA:6.3	SGPA:8.0

Thus, CGPA=   20x6.9+22x7.8+25x5.6+26x6.0+26x6.3+25x8.0

-- = **6.73**

13.   **TEACHERS TRAINING (TT):**

Learning Outcomes Based Curriculum Framework (LOCF) Quality initiative of UGC based on Outcome Based Education (OBE) is being implemented by the University Grants Commission to enhance the Quality of Higher Education and that of Higher Education Learners and Teachers. Therefore, university arrange following activities for teachers training:

1.   Workshops for LOCF implementation.

2.   Seminar for LOCF implementation.

3.   FDP on LOCF.

4.   Outcome based higher education and understanding the learning objectives, learning outcomes, new approaches in the area of outcome measurement, preparing future ready teachers and students.

5.   Developing a battery of quality speakers/educators to become resource persons to play role for Training of Trainers (TOT).

14.   **KEY WORDS:**

LOCF, CBCS, Course Learning Outcomes, Employability, Graduate Attributes Communication Skills, Critical Thinking, and Descriptors.

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