Faculty of Engineering & Technology

Syllabus

For

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

(Program Code: ET0142)

(2022-23)

Approved by the Academic Council vide resolution no ……

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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 undergraduate program (BCA)

The overall aims of BCA program 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 Department admission statements. The program educational objectives of Bachelor of Computers are to produce Computer Graduate who takes the responsibility with following qualities:

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

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

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

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

PEO5. To have successful career as computer professional through lifelong learning in the 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 problems appearing 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)

Students graduating with the BCA degree 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 an entrepreneur 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.

- Computer Fundamentals (BCA 101)
- C Language (BCA 102)
- Mathematics (BCA 103)
- Basics of Internet Programming (BCA 104)
- Computer Fundamentals & PC Computing Lab (BCA 107)
- C language Lab (BCA 108)
- Internet Programming Lab (BCA 109)
- Digital Electronics (BCA 201)
- Computer Organization And Architecture (BCA 202)
- Oops using C++ (BCA 203)
- Data Structure & Algorithms (BCA 204)
- Linux Environment (BCA 205)
- Data Structure & Algorithms Lab (BCA 207)
- Linux Environment Lab (BCA 208)
- OOPs Lab(BCA 209)
- Cloud Computing(BCA 301)
- Database Management System (BCA 302)
- Python Programming (VB) (BCA 303)
- Software Engineering (BCA 305)
- Discrete Mathematics (BCA 306)
- DBMS Lab (BCA 308)
- Python Programming lab (BCA 309)
- Operating Systems (BCA 401)
- Machine Learning (BCA 402)

- Java Programming (BCA 403)
- Artificial Intelligence (BCA 404)
- Data Mining & Data Warehousing (BCA 405)
- Machine Learning Lab (BCA 407)
- Java Lab (BCA 408)
- Software Engineering Lab (BCA 409)
- Computer Networks (BCA 501)
- Compiler Design (BCA 502)
- Advanced Internet Programming (BCA 503)
- Advance Java (BCA 504)
- Computer Graphics (BCA 505)
- E-Commerce (BCA 506)
- Advance Internet Programming Lab (BCA 507)
- Advance Java Lab (BCA 508)
- Summer Project Seminar (BCA 509)
- Industrial Visit (BCA 510)
- Advance Computer Networks (BCA 601)
- Management Information System (BCA 602)
- Machine Learning (BCA 603)
- .NET/PHP Lab (BCA 606)
- Major Project (BCA 607)
- Seminar (BCA 608)

b) Elective Course:-

Elective course is a course which can be chosen from a pool of papers. It may be

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain
- Nurturing student's proficiency/skill.

An Elective Course may be 'Discipline Centric/Specific' & Generic Elective

(i) Discipline Centric/Specific Elective (DSE): An elective course offered under the main discipline/subject of study is referred to as Discipline Centric/Specific.

ELECTIVE COURSE (Discipline Centric)

- .NET Technology (BCA 604A)
- Fundamental of PHP (BCA 604B)
- Principles of Accounting (BCA 604C)

- Social Implementation of IT (BCA 605A)
- Mobile Computing (BCA 605B)

(ii) Generic/Open Elective (GE): An elective course chosen from an unrelateddiscipline/subject is called Generic/Open Elective. These electives will be focusing on those courses which add generic proficiency of students.

ELECTIVE COURSE (OPEN/GENERIC ELECTIVE)

- Intellectual Property Rights (BCA 604D)
- Cyber Ethics & Crime (BCA 605C)
- Entrepreneurship (BCA 605D)

c) Ability Enhancement Compulsory Courses (AECC):-

AECC courses are based upon the content that leads to knowledge enhancement, for example: English Communication, Environment Science/ Studies, etc.

- Communication Skills (BCA 105)
- Principles of Management (BCA 106)
- Anandam (BCA110/BCA211/BCA310/BCA410/BCA512/BCA610)
- Environmental Studies (BCA 206)
- Universal Human Values (BCA 210)
- Managerial Personality Development (BCA304)
- Technical Communication (BCA 305)
- Communication Skills- Scientific & Technical Writing (BCA 406)
- Communication Technical Lab (BCA 410)
- Professional Skills (Career & Team) (BCA 511)
- Leadership &Mgmt Skills (BCA 609)

d) Skill Enhancement Courses (SEC):-

SEC Courses provide value based and/or skill based knowledge and may content both Theory and Lab/Training/Field Work. The main purpose of these courses is to provide students life- skills in hands- on mode so as to increase their employability.

- Personality Development Lab (BCA 307)
- Managerial Personality Development (BCA 304)

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)

Examination Scheme-BCA

Semester – I

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	L	T	P	Credits
BCA 101	Computer Fundamentals	Core	30	70	100	3	1	-	4
BCA 102	C Language	Core	30	70	100	3	1	-	4
BCA 103	Mathematics	Core	30	70	100	3	1	-	4
BCA 104	Basics of Internet Programming	Core	30	70	100	3	1	-	4
BCA 105	Communication Skills	AECC	30	70	100	2	-	-	2
BCA 106	Principles of Management	AECC	30	70	100	3	1	-	4
PRACTICALS/VIVA-VOCE		**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 107	Computer Fundamentals & PC Computing Lab	Core	30	20	50	-	-	1	1
BCA 108	C language Lab	Core	30	20	50	-	-	1	1
BCA 109	Internet Programming Lab	Core	30	20	50	-	-	1	1
BCA 110	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**320**	**530**	**850**	**18**	**5**	**4**	**27**

Semester - II

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	L	T	P	Credits
BCA 201	Digital Electronics	Core	30	70	100	4	-	-	4
BCA 202	Computer Organization And Architecture	Core	30	70	100	3	1	-	4
BCA 203	**OOPS using C++**	Core	30	70	100	4	-	-	4
BCA 204	Data Structure & Algorithms	Core	30	70	100	3	1	-	4
BCA 205	Linux Environment	Core	30	70	100	3	1	-	4
BCA 206	Environmental Studies	AECC	30	70	100	4	-	-	4
BCA 207	Universal Human Values	AECC	30	70	100	2	-	-	2
Code	**Subject/Paper**	**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 208	Data Structure & Algorithms Lab	Core	30	20	50	-	-	1	1
BCA 209	Linux Environment Lab	Core	30	20	50	-	-	1	1
BCA 210	OOPS Using C++ Lab	Core	30	20	50	-	-	1	1
BCA 211	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**350**	**600**	**950**	**24**	**3**	**4**	**31**

SEMESTER: III

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	L	T	P	Credits
BCA 301	**Cloud Computing**	**Core**	**30**	**70**	100	3	1	-	4
BCA 302	Database Management System	Core	30	70	100	3	1	-	4
BCA 303	**Python Programming**	**Core**	**30**	70	100	3	1	-	4
BCA 304	Managerial Personality Development	AECC	30	70	100	4	-	-	4
BCA 305	**Software Engineering**	**Core**	30	70	100	3	1	-	4
BCA 306	Discrete Mathematics	Core	30	70	100	3	1	-	4
Code	**Subject/Paper**	**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 307	Personality Development Lab	Sec	30	20	50	-	-	1	1
BCA 308	DBMS Lab	Core	30	20	50	-	-	1	1
BCA 309	**Python Lab**	**Core**	**30**	20	50	-	-	1	1
BCA 310	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**320**	**530**	**850**	**20**	**5**	**4**	**29**

Semester-IV

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	L	T	P	Credits
BCA 401	Operating Systems	Core	30	70	100	3	1	-	4
BCA 402	Machine Learning	Core	30	70	100	3	1	-	4
BCA 403	Java Programming	Core	30	70	100	3	1	-	4
BCA 404	**Artificial Intelligence**	**Core**	30	70	100	4	-	-	4
BCA 405	Data Mining & Data Warehousing	Core	30	70	100	4	-	-	4
BCA 406	Communication Skills-Scientific & Technical Writing	AECC	30	70	100	3	1	-	4
Code	**Subject/Paper**	**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 407	Machine Learning Lab	Core	30	20	50	-	-	1	1
BCA 408	Java Lab	Core	30	20	50	-	-	1	1
BCA 409	Software Engineering Lab	Core	30	20	50	-	-	1	1
BCA 410	Communication Technical Lab	AECC	30	20	50	-	-	1	1
BCA 411	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**350**	**550**	**900**	**21**	**4**	**5**	**30**
4-6 weeks training will be held after fourth semester, viva will be conducted in fifth sem.									

Semester-V

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	L	T	P	Credits
BCA 501	Computer Networks	Core	30	70	100	3	1	-	4
BCA 502	**Deep Learning**	**Core**	30	70	100	4	-	-	4
BCA 503	Advance Java	Core	30	70	100	3	1	-	4
BCA 504	Computer Graphics	Core	30	70	100	3	1	-	4
BCA 505	E-Commerce	Core	30	70	100	4	-	-	4
BCA 506	Professional Skills (Career & Team)	AECC	30	70	100	2	-	-	2
Code	**Subject/Paper**	**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 507	Deep Learning Lab	Core	30	20	50	-	-	1	1
BCA 508	Advance Java Lab	Core	30	20	50	-	-	1	1
BCA 509	Summer Project Seminar	Core	30	20	50	-	-	1	1
BCA 510	Industrial Visit	Core	-	-	-	-	-	1	1
BCA 511	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**320**	**530**	**850**	**20**	**3**	**5**	**28**

Semester - VI

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	L	T	P	Credits
BCA 601	Advance Computer Networks	Core	30	70	100	3	1	-	4
BCA 602	Management Information System	Core	30	70	100	4	-	-	4
BCA 603	**Advanced Internet Programming**	Core	30	70	100	3	1	-	4
BCA 604A	.NET Technology	Elective	30	70	100	3	1	-	4
BCA 604B	Fundamental of PHP	Elective	30	70	100	3	1	-	4
BCA 604C	Principles of Accounting	Elective	30	70	100	3	1	-	4
BCA 604D	Intellectual Property Rights	Elective	30	70	100	3	1	-	4
BCA 605A	Social Implications of IT	Elective	30	70	100	3	1	-	4
BCA 605B	Mobile Computing	Elective	30	70	100	3	1	-	4
BCA 605C	Cyber Ethics & Crime	Elective	30	70	100	3	1	-	4
BCA 605D	Entrepreneurship	Elective	30	70	100	3	1	-	4
BCA 606	Leadership &Mgmt Skills	AECC	30	70	100	2	-	-	2
Code	**Subject/Paper**	**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 607	**Advanced Internet Programming Lab**	Core	30	20	50	-	-	1	1
BCA 608	.NET/PHP Lab	Core	30	20	50	-	-	1	1
BCA 609	Major Project	Core	100	50	150	-	-	2	2
BCA 610	Seminar	Core	30	20	50	-	-	1	1
BCA 611	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**420**	**580**	**1000**	**19**	**4**	**6**	**29**

Note:

- A student is required to obtain min. 40% marks in individual paper to pass.
- The total credit of BCA Programme is 174. However, the minimum credit required for award of degree shall be 166.
- 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	L	T	P	Credits
BCA 101	Computer Fundamentals	Core	30	70	100	3	1	-	4
BCA 102	C Language	Core	30	70	100	3	1	-	4
BCA 103	Mathematics	Core	30	70	100	3	1	-	4
BCA 104	Basics of Internet Programming	Core	30	70	100	3	1	-	4
BCA 105	Communication Skills	AECC	30	70	100	2	-	-	2
BCA 106	Principles of Management	AECC	30	70	100	3	1	-	4
PRACTICALS/VIVA-VOCE		**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 107	Computer Fundamentals & PC Computing Lab	Core	30	20	50	-	-	1	1
BCA 108	C language Lab	Core	30	20	50	-	-	1	1
BCA 109	Internet Programming Lab	Core	30	20	50	-	-	1	1
BCA 110	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**320**	**530**	**850**	**18**	**5**	**4**	**27**

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	P011	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 - C Language

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 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 - 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-105 - Communication Skills

Course Objectives:

1. To identify common communication problems that may be holding learners back
2. To identify what their non-verbal messages are communicating to others
3. To understand role of communication in teaching-learning process
4. To learn to communicate through the digital media
5. To understand the importance of empathetic listening
6. 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 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-106- Principles of Management

Course Objectives:

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

Course Contents

Unit I Introduction

Concept & functions of Management, evolution of management theories, scientific management, bureaucracy, behavioral approach, Quantitative approach and systems approach

Decision Making – Meaning and Importance, Forms, Techniques and process of decision making

Unit II Planning and Organizing

Planning – meaning and importance of planning. Types of plans, planning process. Organizing – Meaning and principles, Types of Organization. Span of control- meaning and importance. Departmentalization.Authority- Centralization and decentralization of Authority.

Unit III Staffing

Meaning, job analysis, recruitment, selection, training- importance and types of training.performance appraisals- meaning and purpose, compensation- meaning and importance.

Unit IV Directing

Direction - Meaning, Requirement of effective direction, Communication - Types & Importance. Motivation - meaning, Theories of motivation - Maslow, Herzberg, Adam's Equity theory. Leadership – meaning, types of Leadership

Unit V Management Control

Control : Meaning, Needs, Principles, Process and Techniques of management control, types of control, essentials of effective control system. Co-ordination : Meaning, Types and Principles of co-ordination

Text Books:

1. P.C. Tripathi and P.N. Reddy**, Principles & Practices of Management,** Tata McGrawHill.
2. L. M. Prasad –**Principles & Practices of Management,** Sultan Chand and Sons, New Delhi.
3. Gupta, C.B.; **Management Concepts and Practices**, Sultan Chand and Sons, New Delhi.

Course Outcomes:

CO	Statement
	After completion of the course the students will be able to
CO1	Define application of management concepts to understand the major internal features of a business system and the environment in which it operates.
CO2	Know and explain the managerial actions of planning, organizing and controlling with an ethical look.
CO3	Demonstrate critical and analytical thinking when presented with managerial problems and express their views and opinions on managerial issues
CO4	Understand and analyze the HR requirement in the organization
CO5	Analyze different motivational theories and choose best effective motivational strategies for the organization. Adapt the best communication strategies

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	L1	**H**	**H**	**L**	**M**	**M**	**H**	**H**	**H**	**-**	**M**	**M**	**-**	**H**	**M**
CO2	L2	**M**	**H**	**M**	**M**	**M**	**M**	**M**	**M**	**-**	**H**	**M**	**-**	**H**	**M**
CO3	L3	**M**	**H**	**L**	**M**	**M**	**M**	**M**	**H**	**-**	**M**	**M**	**-**	**H**	**M**
CO4	L4	**M**	**H**	**L**	**H**	**M**	**H**	**M**	**M**	**-**	**L**	**L**	**-**	**H**	**M**
CO5	L4	**H**	**H**	**M**	**H**	**H**	**H**	**M**	**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	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3,CO4,CO5
CD4	Self- learning advice using internets	CO1,CO2
CD5	Industrial visit	-

BCA-107 - Computer Fundamental & PC Computing 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	

BCA-108 - C Language 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:

- Addition of Matrices.
- 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-109 - 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	

BCA 110: ANANDAM

Objectives:

- To instil the joy of giving in young people, turning them into responsible citizens to build up a better society.
- To inculcate the habit of service in students across the University.
- A compulsory course of 2 credits per semester to be included in each program of University.
- Students to be expected to engage in individual and group acts of service and goodness.

Action Plan:

Students will be expected to

- Do at least one act of individual service each day
- Record this act of service in a dedicated Register / Personal Diary
- Share this Register / Personal Diary day in the Anandam Class scheduled per week. The class interaction will include Personal Diary check, Showing of Community based motivation videos, Community based presentations by students, Role playing etc.
- Undertake one group service project for 64 hours every semester (outside college hours)
- Upload the report on the group project on the Anandam platform
- Participate in a sharing and presentation on the group service in the discussion sessions held once in week
- There will be some suggested projects and organizations that students can work with. Students can also suggest their own projects which others can join

Each student will finish the year with a portfolio of giving. This will include their Register / Personal Diaries and their reports on group service projects.

BCA- II SEMESTER

Semester - II

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	L	T	P	Credits
BCA 201	Digital Electronics	Core	30	70	100	4	-	-	4
BCA 202	Computer Organization And Architecture	Core	30	70	100	3	1	-	4
BCA 203	**OOPS using C++**	Core	30	70	100	4	-	-	4
BCA 204	Data Structure & Algorithms	Core	30	70	100	3	1	-	4
BCA 205	Linux Environment	Core	30	70	100	3	1	-	4
BCA 206	Environmental Studies	AECC	30	70	100	4	-	-	4
BCA 207	Universal Human Values	AECC	30	70	100	2	-	-	2
Code	**Subject/Paper**	**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 208	Data Structure & Algorithms Lab	Core	30	20	50	-	-	1	1
BCA 209	Linux Environment Lab	Core	30	20	50	-	-	1	1
BCA 210	OOPS Using C++ Lab	Core	30	20	50	-	-	1	1
BCA 211	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**350**	**600**	**950**	**24**	**3**	**4**	**31**

BCA-201 - Digital Electronics

Course Objective:

- To acquire the basic knowledge of digital logics and application of knowledge to understand digital electronics circuits.
- Understand the various types of Digital Structures and designs for making a System.
- Apply modern computational, analytical, tools and techniques to face the challenges in real environment.

Course Contents:

Unit – I **Number System & Codes** : Introduction, Types of Number Systems - Binary, Octal, Hexadecimal ,Signed & Unsigned Binary numbers, Binary Arithmetic – Addition, Subtraction, Multiplication, Division, Codes – BCD, EXCESS-3, Gray, Hexadecimal, Octal, ASCII, EBCDIC, Error Detection and Correction codes.

Unit – II **Logic Gates & Boolean Algebra :**Digital Signals, Basic Digital Circuits , Boolean algebra & theorems. **Gate-Level Minimization :** Standard forms – SOP & POS, Karnaugh Map – 2, 3 & 4 variables , Simplification using K maps, Minterms&Maxterms, Don't care conditions. **Combinational Logic Design :**Half Adder, Full Adder, Half Subtractor, Full Subtractor Multiplexer / Encoder, Demultiplexer / Decoder, Comparator, Parity Generator / Checkers, Code Converters. **Sequential Logic**

Unit – III **Flip Flops:** Introduction, Types of FF - Clocked S-R FF, J-K FF, D-type FF, T type FF, Master Slave JKFF, Edge triggered flip flops, Excitation Tables of Flip Flops.

Unit – IV **Registers :**Introduction, Sequential Circuits, Shift Registers, Serial Input Serial Output, Serial Input Parallel Output, Parallel Output, Parallel Input Serial Output, Bi-directional Shift Registers, Universal Shift Register.

Counters: Introduction, Types – Asynchronous Counter or Ripple Counters, Synchronous Counters, Counter Design.

Unit – V- **Introduction to Digital Logic Families:** Introduction, Characteristics of Digital IC's, Introduction about TTL & CMOS Logic, Tri – State Logic.

Text books:

1. M.Morris Mano ; "Digital Design" ; Prentice–Hall of India
2. Jain R.P. ; "Modern Digital Electronics" ; Tata McGraw-Hill

Reference books:

1. Ghoshal, D. Mohan, Dharminder Kumar, "Digital Elecronics", Galgotia Book Source.
2. Malvino Leech ; "Digital CompuerElecronics" ; Tata McGraw-Hill
3. Tokheim ; "Digital Electronics Principles & Applications" ; Tata McGraw-Hill

Course Outcome:

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

CO1.	Convert different type of codes and number systems which are used in digital transmission and computer systems.
CO2.	Apply the codes and number systems converting circuits and Compare different types of logic families which are the basic unit of different types of logic gates in the domain of economy, performance and efficiency.
CO3.	Analyze different types of digital electronic circuit using various mapping and logical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematical methods.
CO4.	Describe different types of with and without memory element digital electronic circuits for particular operation, within the real time of economic, performance, efficiency, user friendly and environmental constraints.
CO5.	Determine the nomenclature and technology in the area of various memory devices usedand apply the memory devices in different types of digital circuits for real world 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	P011	PO12	PSO1	PSO2
CO1	L2	H	L	L	M	-	-	-	-	-	H	-	L	L	M
CO2	L3	H	L	L	L	-	-	-	-	-	H	-	M	M	L
CO3	L4	M	M	M	M	-	-	-	L	-	M	-	-	H	M
CO4	L1	H	M	M	H	L	-	-	L	-	H	-	H	H	L
CO5	L3	M	L	L	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, 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- 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:	Apply 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**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
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-203 Object Oriented Programming using 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-204: Data Structure & Algorithms

Course Objectives:

- Learn efficient storage mechanisms of data for an easy access, design and implementation of various basic and advanced data structures, introduce various techniques for representation of the data in the real world.
- Develop application using data structures, learn the concept of protection and management of data and improve the logical ability.
- Choose appropriate data structure as applied to specified problem definition, handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.

Course Contents:

Unit – I **Introduction:** Data Structures, data structure operations, complexity, Asymptotic Notation, Time/Space trade-off.

Linear Lists: Arrays, address calculation in single and multidimensional arrays, operations on array, sequential search, Binary Search and their complexity analysis.

Unit – II **Linked lists and its operations:** linked list, representation of link list in memory, traversing a link list, insertion into a link list, deletion from a link list, header link list, two way link lists.

Unit – III **Trees:** Definition of tree, Binary tree and related terms, Application of binary tree, Tree Traversals, Threaded tree, Binary Search Tree, heap , heap sort, General trees.

Unit – IV **Graph:** introduction, sequentional representation of Graphs, adjacency matrix, path matrix, operations on graphs ,traversing a Graph, Warshall'salgorithm.

Unit – V **Sorting Techniques :** Selection, Insertion, Bubble, Merge, Quick, Radix sort, searching and hashing.

Textbooks:

1. Schaum Series, "Introduction *to Data Structures*", TMH.
2. R.B. Patel, "*Expert Data Structures with C*", Second Edition, Khanna Book publishing Co (P) Ltd.

References:

1. Tenenbaum, "*Data Structure using C++*", PHI.
2. Chattopadhyay S., Dastidar d G.andChattopadhyayMatangini., "*Data Structure through C language*", BPB publications.

Course Outcomes

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

CO1:	Understand insert and delete for different data structures.
CO2:	Calculate and measure efficiency of code
CO3:	Define some interesting algorithms like Huffman, Quick Sort, and Shortest Path etc.
CO4:	Define Graph and its algorithm
CO5:	Understand programming skills.

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	M	L
CO2	L3	L	L	L	M	-	-	-	-	-	L	-	L	M	L
CO3	L1	H	M	M	H	-	-	-	L	L	H	L	M	H	M
CO4	L1	L	L	L	M	-	-	-	-	-	L	-	L	H	L
CO5	L2	H	M	M	M	-	-	-	M	M	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-205 Linux Environment

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, Directory Structure, 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-206 Environment Studies

Course Objective:

- The Environmental Studies major prepares students for careers as leaders in understanding and addressing complex environmental issues from a problem-oriented, interdisciplinary perspective and Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.

Course Contents:

Unit-1 **Ecosystem and Biodiversity:** Components and types of ecosystem, Structure and functions of Ecosystem, Values, Type and levels of Biodiversity, Causes of extension, and Conservation methods of biodiversity.

Unit- 2 **Air Pollution:** Definition, different types ofSources, effects on biotic and abiotic components and Control methods of air pollution.

Unit- 3 **Water pollution:** Definition, different types ofSources, effects on biotic and abiotic components and treatment technologies of water pollution.

Unit- 4 **Noise Pollution:**Introduction of noise pollution, differentSources, effects on abiotic and biotic environment and Control measures.

Unit-5 **Non Conventional energy sources:** Introduction, Renewable Sources of Energy: Solar energy, wind energy, Energy from ocean, energy from biomass, geothermal energy and Nuclear Energy.

Recommended Reference Books:

1. Brunner R.C.,Hazardous Waste Incineration, McGraw Hill Inc. 1989.
2. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
3. Cunningham, W.P, Cooper, T.H. Gorhani, E & Hepworth, M.T. , EnvironmentalEncycolopedia, Jaico Publishing House, Mubmbi,2001.
4. De. A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Down to Earth, Centre for Science and Environment (R)
6. Gleick, H.P.Water in crisis, Pacific Institute for Studies in Dev., Environment &Security.StockholmEnv.Institute.Oxford Univ. Press.
7. Gilpin, Alan. Environmental Impact Assessment(EIA), cutting egde for the 21th century. Cambridge university Press.

Course outcomes

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

CO1:	Describe concepts and methods from ecological and physical sciences and their application in environmental problem solving. Ecosystem Links between environmental components and their role.
CO2:	Define the Basic Structure of atmosphere and their functions Current problems related issues Students will apply knowledge of the sciences within an interdisciplinary context in solving environmental issues such as environmental health, food and agriculture, energy, waste and pollution, climate change, management, and loss of biodiversity.
CO3:	Discuss the Basic knowledge about water recourses, current problems related issues, water born diseases, technologies of water treatment.
CO4:	Apply and define the Level of sound and their units, sources and effects of noise pollution, control measures.
CO5:	Describe the Concept of non Conventional energy resources, types and various applications of renewable resources and current potentials of energy resources.

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	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-207: Universal Human Values

Objectives :

The present course deals with meaning, purpose, and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realize one's potentials.

Course contents

Unit I: ***Love & Compassion***

Introduction: What is love? Forms of love—for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living, Love and compassion and inter-relatedness, Love, compassion, empathy, sympathy and non-violence, Individuals who are remembered in history for practicing compassion and love. Narratives and anecdotes from history, literature including local folklore , Practicing love and compassion:What will learners learn gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?, Sharing learner's individual and/or group experience(s)

Simulated Situations

Case studies

Unit II: ***Truth***

Introduction: What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others), Individuals who are remembered in history for practicing this value, Narratives and anecdotes from history, literature including local folklore, Practicing Truth:What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?, Learners' individual and/or group experience(s)

Simulated situations

Case studies

Unit III: ***Non-Violence***

Introduction: What is non-violence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non-violence, Ahimsa as non-violence and non-killing, Individuals and organisations that are known for their commitment to nonviolence, Narratives and anecdotes about non-violence from history, and literature including local folklore, Practicing non-violence:What will learners learn/gain if they practice nonviolence? What will learners lose if they don't practice it? , Sharing learner's individual and/or group experience(s) about non-violence,

Simulated situations

Case studies

Unit IV: ***Righteousness& Peace***

Introduction: What is righteousness? ,Righteousness and *dharma*, Righteousness and Propriety, Individuals who are remembered in history for practicing righteousness,

Narratives and anecdotes from history, literature including local folklore ,racticing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it?, Sharing learners' individual and/or group experience(s), Simulated situations, Case studies ,Introduction: What is peace? Its need, relation with harmony and balance ,Individuals and organisations that are known for their commitment to peace, Narratives and Anecdotes about peace from history, and literature including local folklore, Practicing peace:What will learners learn/gain if they practice peace? What will learners lose if they don't practice it? ,Sharing learner's individual and/or group experience(s) about peace ,Simulated situations,Case studies,

Unit V: ***Service &Renunciation (Sacrifice)***

Introduction: What is service? Forms of service, for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.Individuals who are remembered in history for practicing this value.Narratives and anecdotes dealing with instances of service from history, literature including local folklore.

Practicing service: What will learners learn/gain gain if they practice service? What will learners lose if they don't practice it? Sharing learners' individual and/or group experience(s) regarding service.Simulatedsituations.Case studies Introduction: What is renunciation? Renunciation and sacrifice.Self-restrain and Ways of overcoming greed. Renunciation with action as true renunciation

Individuals who are remembered in history for practicing this value., Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation., Practicing renunciation and sacrifice:What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it? , Sharing learners' individual and/or group experience(s),

Simulated situations

Case studies

Text Books:

1. MookerjiRadhaKumud, Ancient Indian Education,
2. MotilalBanarasidassSaraswati Swami Satyananda,
3. Asana Pranayama Mudra Bandha, Bihar School of yoga Joshi Kireet, Education for Character Development, Dharma Hinduja Center of Indic Studies Joshi Rokeach (1973).
4. The Nature of Human Values. New York: The Free Press Ghosh, Sri Aurobindo. 1998. The Foundations of Indian Culture. Pondicherry: Sri Aurobindo

Course Outcomes:

CO	Statement
	After the completion of this course, students will be able to:
CO1	Describe about universal human values and understand the importance of values in individual, social circles, career path, and national life

CO2	Understand from case studies of lives of great and successful people who followed and practised human values
CO3	Show Adaptself-actualisation
CO4	Define conscious practitioners of human values.
CO5	Apply their potential as human beings and conduct themselves properly in the ways of the world.

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	PO10	PO11	PO12	PSO 1	PSO 2
CO1	L2	**L**	**L**	**-**	**M**	**L**	**H**	**H**	**M**	**-**	**H**	**-**	**-**	**L**	**-**
CO2	L2	**L**	**L**	**-**	**M**	**L**	**H**	**H**	**M**	**-**	**H**	**-**	**-**	**L**	**-**
CO3	L3	**L**	**L**	**-**	**M**	**L**	**H**	**H**	**M**	**-**	**H**	**-**	**-**	**L**	**-**
CO4	L1	**L**	**L**	**-**	**M**	**L**	**H**	**H**	**M**	**-**	**H**	**-**	**-**	**L**	**-**
CO5	L3	**L**	**L**	**-**	**M**	**L**	**H**	**H**	**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, CO5
CD3	Seminars	CO3
CD4	Self- learning advice using internets	CO4
CD5	Industrial visit	-

BCA-208 Data Structures& Algorithms Lab

Course Objective:

- The course is designed to develop skills to design and analyze simple linear and non linear data structures.
- It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem.
- It enables them to gain knowledge in practical applications of data structures.

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, a student will be able to understand

CO1:	Apply and Design and analyze the time and space efficiency of the data structure
CO2:	Understand Be capable to identity the appropriate data structure for given problem
CO3:	Explain the applications of data structures
CO4:	Define identity the sorting operation data structure
CO5:	Apply an operation on BST

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	L3	H	M	M	M	L	-	-	L	L	H	-	M	H	H
CO2	L2	M	L	L	M	-	-	-	-	-	M	-	M	M	M
CO3	L2	H	M	M	H	M	-	-	M	M	H	-	L	L	M
CO4	L1	M	L	L	M	-	-	-	-	-	M	-	M	M	M
CO5	L3	H	M	M	H	M	-	-	M	M	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
CD5	Industrial visit	

BCA-209 Linux Environment Lab

Course Objectives:

- To understand the basic concepts, design and structure of the Linux operating system.
- To implement various system calls.
- To acquire skills in Linux Shell programming.
- To learn basics of Linux system administration.

List of experiments

1. Write a shell script to ask your name, program name and enrollment number and print it on the screen.
2. Write a shell script to find the sum, the average and the product of the four integers entered
3. Write a shell program to exchange the values of two variables.
4. Find the lines containing a number in a file
5. Write a shell program to reverse the digits of five digit integer
6. Write a shell script to find the largest among the 3 given numbers
7. Write a shell program to search for a given number from the list of numbers provided using binary search method
8. Write a shell script to display the digits which are in odd position in a given 5 digit number
9. Write a shell program to concatenate two strings and find the length of the resultant string
10. Write a shell program to find the position of substring in given string
11. Write a shell program to display the alternate digits in a given 7 digit number starting from the first digit
12. Write a shell program to find the gcd for the 2 given numbers
13. Write a shell program to check whether a given string is palindrome or not.
14. Write a shell script to find the smallest of three numbers
15. Write a shell program to add, subtract and multiply the 2 given numbers passed as command line arguments

Course Outcomes:

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

CO1:	Learn UNIX structure, commands, and utilities.
CO2:	Describe and understand the UNIX file system.
CO3:	Solve shell scripts problems in order to perform shell programming.
CO4:	Acquire knowledge about text processing utilities, process management and system operation of UNIX.
CO5:	Apply operation on command line arguments

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	L	L	-	-	-	-	M	-	H	M	L
CO2	L2	M	L	L	M	-	-	-	-	-	M	-	M	M	L
CO3	L4	H	M	M	H	M	-	-	M	L	H	-	H	H	M
CO4	L2	M	L	L	M	L	-	-	-	-	M	-	M	H	L
CO5	L3	M	L	L	M	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	

BCA-210 OOPS Lab Using C++

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**	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	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 211: ANANDAM

Objectives:

- To instil the joy of giving in young people, turning them into responsible citizens to build up a better society.
- To inculcate the habit of service in students across the University.
- A compulsory course of 2 credits per semester to be included in each program of University.
- Students to be expected to engage in individual and group acts of service and goodness.

Action Plan:

Students will be expected to

- Do at least one act of individual service each day
- Record this act of service in a dedicated Register / Personal Diary
- Share this Register / Personal Diary day in the Anandam Class scheduled per week. The class interaction will include Personal Diary check, Showing of Community based motivation videos, Community based presentations by students, Role playing etc.
- Undertake one group service project for 64 hours every semester (outside college hours)
- Upload the report on the group project on the Anandam platform
- Participate in a sharing and presentation on the group service in the discussion sessions held once in week
- There will be some suggested projects and organizations that students can work with. Students can also suggest their own projects which others can join

Each student will finish the year with a portfolio of giving. This will include their Register / Personal Diaries and their reports on group service projects.

BCA- III SEMESTER

SEMESTER: III

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	L	T	P	Credits
BCA 301	**Cloud Computing**	**Core**	**30**	**70**	100	3	1	-	4
BCA 302	Database Management System	Core	30	70	100	3	1	-	4
BCA 303	**Python Programming**	**Core**	**30**	70	100	3	1	-	4
BCA 304	Managerial Personality Development	AECC	30	70	100	4	-	-	4
BCA 305	**Software Engineering**	**Core**	30	70	100	3	1	-	4
BCA 306	Discrete Mathematics	Core	30	70	100	3	1	-	4
Code	**Subject/Paper**	**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 307	Personality Development Lab	Sec	30	20	50	-	-	1	1
BCA 308	DBMS Lab	Core	30	20	50	-	-	1	1
BCA 309	**Python Lab**	**Core**	**30**	20	50	-	-	1	1
BCA 310	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**320**	**530**	**850**	**20**	**5**	**4**	**29**

BCA 301: 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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
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

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 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: 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-304 Managerial Personality Development

Course Objective:

- Projecting the Right First Impression.
- Polishing manners to behave appropriately in social and professional circles.
- Enhancing the ability to handle casual and formal situations in terms of personal grooming, dining and entertaining etiquette.
- Developing and maintaining a positive attitude and being assertive.
- Mastering Cross Cultural Etiquette.
- Handling difficult situations with grace, style, and professionalism.
- Grooming for Success.
- Body Language, Poise, and Eye Contact.
- Pronunciation, Voice Modulation, and Diction.
- Self-Esteem and Confidence.

Course Contents:

Unit–I How to give a good Self-Introduction? Defining a good personality, Importance of Inter-personal skills, Developing self-confidence, Positive thinking.

Unit–II Basic Etiquettes: Meeting & Greeting Skills, Mobile Etiquettes, Fax Manners, E-mail Manners & Dining Etiquettes.

Unit–III Stress Management, Importance of Time Management, Wardrobe Management, How to handle a difficult boss & a difficult clients.

Unit–IV Public Speaking, Presentation Skills, Importance of Voice Modulation & Body Language.

Unit–V Basic Letter Writing, Interview Skills, GD tips, Mock GD & PI.

Text books:

1. Mcgrath . E.H., “Basic Managerial Skills for all” , Fourth Edition, , Prentice Hall of India Pvt. Ltd., New Delhi,1998.
2. Wood .F.T ., “Remedial English Grammer for foreign students”., , Mcmillan, New Delhi.

Reference books:

1. Steve Smith ., “Be your Best, Ed”., Quest.
2. Bunch .Meribeth ., “Creating Confidence” .,Kogan Page.

Course Outcomes

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

CO1:	Define and maintain a Reflection.
CO2:	Explain and articulate a personal philosophy of meeting & greeting.
CO3:	Apply the exact mean of management in so many ways like time, wardrobe& stress.
CO4:	Define and Learn about- how to represent, effective skills & body language.
CO5:	Explain the process of knowledge in the form of GD and interview.

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

BCA-305: Software Engineering

Course Objective:

- Introduce software engineering and to explain its importance in building large programs.
- Understand the process of developing new technology and the role of experimentation set out the answers to key questions about software engineering.
- Introduce ethical and professional issues and to explain why they are of concern to software engineers

Course Contents:

Unit–I **Software Engineering**: Introduction and Definition of Software Engineering. Software Crisis, Software Processes & Characteristics.

Software Process Models: Software development life cycle (SWDLC), Software development life cycle models:-Waterfall, Prototype, Evolutionary, RAD,and Spiral Models

Unit–II **Software Requirements analysis & specifications**: Requirement analysis tasks, Analysis principles. Requirement elicitation techniques like FAST, QFD, Requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

Unit–III **Software Project Management Concepts**: The Management spectrum, The People, The Problem, The Process, The Project.

Software Project Planning: Size Estimation like lines of Code & Function Count, Cost Estimation Models, COCOMO, Risk Analysis.

Unit–IV **Software Design**: Design fundamentals, Effective modular design: Data architectural and procedural design, Design documentation. Function Oriented Design, Object Oriented Design.

Unit–V **Software Testing:** Testing Fundamental, Characteristics of Testable Software,Test Characteristics, Testing Techniques:-Black-box testing,White-box testing. Testing Strategies:-Unit Testing, Integration and System Testing.

Textbooks/reference books:

1. R. S. Pressman, “Software Engineering – A practitioner’s approach”, McGraw Hill Int. Ed.
2. I. Sommerville, “Software Engineering”, Addison Wesley, 2004
3. Rajib Mall, “Fundamental of Software Engineering”, 3rd Edition, PHI Learning Private Limited
4. K. K. Aggarwal&Yogesh Singh, “Software Engineering”, 2nd Ed., New Age International, 2005.
5. James Peter, W. Pedrycz, “Software Engineering: An Engineering Approach”, John Wiley & Sons.
6. PankajJalote, “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 the importance of the stages in the software life cycle.
CO2:	Understand the various process models.
CO3:	Apply methods and the importance and organization of SRS.
CO4:	Discuss software by applying the software engineering principles.
CO5:	Define Software testing, documentation and maintenance.

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	H	L
CO2	L2	M	L	L	M	-	-	-	-	-	M	-	M	M	L
CO3	L3	L	M	M	H	L	-	-	-	-	L	-	L	H	M
CO4	L2	M	M	M	H	M	-	-	L	-	M	-	M	H	M
CO5	L1	H	M	M	M	M	-	-	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-306 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	-----

BCA-307 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	--

BCA-308 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

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	L	-	-	-	-	M	-	M	H	L
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	

BCA 309: Python Programming 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 between Objectives and Outcomes

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	L2	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	-

BCA310: ANANDAM

Objectives:

- To instil the joy of giving in young people, turning them into responsible citizens to build up a better society.
- To inculcate the habit of service in students across the University.
- A compulsory course of 2 credits per semester to be included in each program of University.
- Students to be expected to engage in individual and group acts of service and goodness.

Action Plan:

Students will be expected to

- Do at least one act of individual service each day
- Record this act of service in a dedicated Register / Personal Diary
- Share this Register / Personal Diary day in the Anandam Class scheduled per week. The class interaction will include Personal Diary check, Showing of Community based motivation videos, Community based presentations by students, Role playing etc.
- Undertake one group service project for 64 hours every semester (outside college hours)
- Upload the report on the group project on the Anandam platform
- Participate in a sharing and presentation on the group service in the discussion sessions held once in week
- There will be some suggested projects and organizations that students can work with. Students can also suggest their own projects which others can join

Each student will finish the year with a portfolio of giving. This will include their Register / Personal Diaries and their reports on group service projects.

BCA- IV SEMESTER

Semester-IV

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	L	T	P	Credits
BCA 401	Operating Systems	Core	30	70	100	3	1	-	4
BCA 402	Machine Learning	Core	30	70	100	3	1	-	4
BCA 403	Java Programming	Core	30	70	100	3	1	-	4
BCA 404	**Artificial Intelligence**	**Core**	30	70	100	4	-	-	4
BCA 405	Data Mining & Data Warehousing	Core	30	70	100	4	-	-	4
BCA 406	Communication Skills-Scientific & Technical Writing	AECC	30	70	100	3	1	-	4
Code	**Subject/Paper**	**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 407	Machine Learning Lab	Core	30	20	50	-	-	1	1
BCA 408	Java Lab	Core	30	20	50	-	-	1	1
BCA 409	Software Engineering Lab	Core	30	20	50	-	-	1	1
BCA 410	Communication Technical Lab	AECC	30	20	50	-	-	1	1
BCA 411	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**350**	**550**	**900**	**21**	**4**	**5**	**30**
4-6 weeks training will be held after fourth semester, viva will be conducted in fifth sem.									

BCA-401 Operating Systems

Course Objectives:

- Understand the services provided by and the design of an operating system.
- Understand the structure and organization of the file system, understand what a process is and how processes are synchronized and scheduled.
- Understand different approaches to memory management. Students should be able to use system calls for managing processes, memory and the file system. Students should understand the data structures and algorithms used to implement an OS.

Course Contents:

Unit – I **Basic Concepts:** Basic elements of a computer system-Processor ,Main Memory,I/O Modules , System Bus Instruction Execution, Definition of Operating System, Functions of Operating System, Introduction to Batch Systems, Multi programmed batch systems, Time-sharing system, Personal Computer System, Parallel system, Distributed system, Real time systems.

Unit – II **Operating system structures:** System components, operating system services, system calls, system programs, System structures, Virtual machines.

Unit – III **Processes:** Process Concept, Process Scheduling, Operation on ProcessesCPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling,

Process Synchronization: Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization

Unit – IV **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

Unit – V **Memory Management:** Background, Logical versus Physical Address space, swapping, Contiguous allocation, Paging, Segmentation

Virtual Memory: Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing, Other Considerations.

Textbooks:

1. Operating System Concepts,PearsonEducation,Silbersachatz and Galvin
2. Operating Systems,PHI,Tannenbaum

References:

1. An Introduction to Operating System Design,Addison Wesley Pub.Co.,H.M. Deital
2. Operating Systems,Prentice Hall of India.,W. Stallings
3. Operating Systems, TMH, Godbole

Course Outcomes

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

CO1:	Apply the basic working process of an operating system.
CO2:	Understand the Structure of an operating system.
CO3:	Describe the importance of process and scheduling.
CO4:	Understand the deadlock detection and recovery techniques.
CO5:	Understand the issues in synchronization and memory management.

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	M	L
CO2	L2	M	L	L	M	-	-	-	-	-	M	-	M	M	M
CO3	L1	L	M	M	H	-	-	-	-	-	L	-	M	H	L
CO4	L2	L	L	L	L	-	-	-	-	-	L	-	L	H	L
CO5	L2	M	M	M	H	-	-	-	-	-	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, CO5
CD5	Industrial visit	

BCA 402: 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-403 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, accesspecifiers, 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-404 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	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	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-405 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 warehousing and 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-406 Communication Skills- Scientific & Technical Writing

Course objective:

- Students will learn to recognize and respond appropriately to specific communication tasks in different contexts;
- Students will learn how to search for, assemble, record, analyze, evaluate/validate, and present information needed to accomplish a given task.
- Students will learn to revise and edit documents to meet the standards expected of professionals in the field.
- Students' participation in course based projects that help solve community problems reconnects students' academic lives with their communities.
- Communication tasks which students perform as a team occur in a real world context of a term long client based open ended investigative project.
- To increase participant awareness and application of tools and exercises available to them to better present their research and knowledge in written form.

Course Contents:

Unit–I Basics of Communication Skills Vis-& - Vis Scientific and Technical organization, Flow of Communication in various scientific and technical organizations: upward, downward, lateral.

Unit–II Communication networks in the scientific and technical organizations, History of various scientific and technical developments.

Unit–III Awareness of general and applied scientific and technical events, popularization of scientific and technical writings,

Unit–IV Precautionary measures in scientific and technical writings, Media coverage of scientific and technical writings.

Unit–V Writing science feature, article, editorial, Special article, interviewing a scientist, facing a press conference by a scientist, Writing a Press Release on the subject relating to science and technology, Delivering a public speech on the matter relating to Science and Technology.

Textbooks/reference books:

1. Sinha K.K., Business communication, Kalyani Publications.
2. Bahl .Sushil ,Business Communication Today, Sage Publication.
3. Pal .Rajendra, .Korlahalli .J.S, Essentials of Business Communication, Sultan Chand &Sons

Course Outcomes

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

CO1	Understand how to apply technical information and knowledge in practical documents for a variety of a.) Professional audiences (including peers and colleagues or management) and b) public audiences.
CO2	Recognize, explain, and use the rhetorical strategies and the formal elements of these specific genres of technical communication: technical abstracts, data based research reports, instructional manuals, technical descriptions, web pages, wikis, and correspondence.
CO3	Apply actively in writing activities (individually and in collaboration) that model effective scientific and technical communication in the workplace.
CO4	Recognize, explain, and use the rhetorical strategies and the formal elements of these specific genres of technical communication: technical abstracts, data based research reports, instructional manuals, technical descriptions, web pages, wikis, and correspondence. Revise and edit effectively in all assignments, including informal media (such as email to the instructor).
CO5	Define Collect, analyze, document, and report research clearly, concisely, logically, and ethically; understand the standards for legitimate interpretations of research data within scientific and technical communities.

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	H	L
CO2	L2	L	M	M	H	-	-	-	-	-	L	-	M	M	M
CO3	L3	H	H	H	H	H	-	-	M	M	H	-	H	M	M
CO4	L2	M	M	M	H	-	-	-	L	-	M	-	H	H	L
CO5	L1	M	M	M	M	L	-	-	L	L	M	-	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 407: Machine Learning Lab

Course Objectives:

- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

List of Experiments:

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering

Performance analysis of Classification Algorithms on a specific dataset

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

List of Experiments:

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. 10 Perform Estimation of effort using FP Estimation for chosen system.
12. 11 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: Communication Technical Lab

Course Objectives

- To develop soft skill.
- To study and understand current trends in Information Technology and prepare presentation material.
- To improve oral communication skills through presentation.
- To prepare original technical write up on the presentation.

Objective I: Prepare an article on "Computers and their relevance in Indian Society".

Objective II: Practice Interview Techniques

Objective III: Practice the art of preparing a resume.

Objective IV: Seminar:

Practice the art of giving presentations on various subjects

CourseOutcomes

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

CO1	Understand the proficiency in English
CO2	Define in presentation skill
CO3	Describe in analytical and reasoning ability
CO4	Apply steps in technical writing
CO5	Analyze presentation skills

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	H	H	H	-	-	-	-	-	L	-	M	H	M
CO2	L1	M	H	H	H	-	-	-	-	-	M	-	H	M	M
CO3	L1	M	H	H	H	-	-	-	-	-	M	-	M	M	L
CO4	L3	M	H	H	H	-	-	-	-	-	M	-	M	H	L
CO5	L4	M	H	H	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	CO1,CO2, CO3, CO4
CD4	Self- learning advice using internets	CO1,CO2, CO3, CO4
CD5	Industrial visit	

BCA 411: ANANDAM

Objectives:

- To instil the joy of giving in young people, turning them into responsible citizens to build up a better society.
- To inculcate the habit of service in students across the University.
- A compulsory course of 2 credits per semester to be included in each program of University.
- Students to be expected to engage in individual and group acts of service and goodness.

Action Plan:

Students will be expected to

- Do at least one act of individual service each day
- Record this act of service in a dedicated Register / Personal Diary
- Share this Register / Personal Diary day in the Anandam Class scheduled per week. The class interaction will include Personal Diary check, Showing of Community based motivation videos, Community based presentations by students, Role playing etc.
- Undertake one group service project for 64 hours every semester (outside college hours)
- Upload the report on the group project on the Anandam platform
- Participate in a sharing and presentation on the group service in the discussion sessions held once in week
- There will be some suggested projects and organizations that students can work with. Students can also suggest their own projects which others can join

Each student will finish the year with a portfolio of giving. This will include their Register / Personal Diaries and their reports on group service projects.

BCA- V SEMESTER

Semester-V

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	L	T	P	Credits
BCA 501	Computer Networks	Core	30	70	100	3	1	-	4
BCA 502	**Deep Learning**	**Core**	30	70	100	4	-	-	4
BCA 503	Advance Java	Core	30	70	100	3	1	-	4
BCA 504	Computer Graphics	Core	30	70	100	3	1	-	4
BCA 505	E-Commerce	Core	30	70	100	4	-	-	4
BCA 506	Professional Skills (Career & Team)	AECC	30	70	100	2	-	-	2
Code	**Subject/Paper**	**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 507	Deep Learning Lab	Core	30	20	50	-	-	1	1
BCA 508	Advance Java Lab	Core	30	20	50	-	-	1	1
BCA 509	Summer Project Seminar	Core	30	20	50	-	-	1	1
BCA 510	Industrial Visit	Core	-	-	-	-	-	1	1
BCA 511	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**320**	**530**	**850**	**20**	**3**	**5**	**28**

BCA-501 Computer Network

Course Objectives:

- Explain the importance of data communications and the Internet in supporting business communications and daily activities; explain how communication works in data networks and the Internet.
- Recognize the different internetworking devices and their functions.
- Explain the role of protocols in networking and analyze the services and features of the various layers of data networks.

Course Contents:

Unit–I **Introduction:** History and Development of Computer Networks, Advantage of Computer Networks, Topologies, Network Hardware, Network Software, OSI and TCP.IP reference models.LAN, WAN & MAN.

Unit–II **Physical Layer:** Theoretical basis for data communication, transmission media, type of transmission. Medium Access Sub layer: Channel allocation Problem in Multiple access protocols. Local Area Networks: Introduction, Primary attributes of LAN, IEEE LAN standards: 802.3, 802.4, 802.5, 802.6, (MAN), FDDI.

Unit–III **Data Link Layer:** Data link control protocols: Line discipline, flow control, error control, synchronous and asynchronous protocols, character and bit oriented protocols, Link access procedures. Design Issues, Routing algorithms, Congestion Control algorithms, Internetworking.

Unit–IV **Transport Layer:** Transport layer functions, connection management, functions of session layers, presentation layer and application layer.The transport service, Elements of transport protocols.

Unit–V **Application Layer:** Services of Application Layer, Network Security, DNS, E-mail, SNMP, USENET, Worldwide Web, Multimedia, IP Spotting Introduction of ISDN and ATM.

Text Books/Reference Books

1. Andrew S.Tanenbaum, "Computer Networks", 4th Edition, Prentice Hall of India publishingPvt. Ltd.,
2. Uyless Black, "Computer Networks Protocols, Standards and Interfaces, 2nd Edition, Prentice Hall of India publishing Pvt. Ltd.

Course Outcomes

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

CO1:	Explain the importance of data communications and the Internet in supporting business Communications and daily activities.
CO2:	Explain how communication works in data networks and the Internet.
CO3:	Define different internetworking devices and their functions.
CO4:	Explain the role of protocols in networking.
CO5:	Analyze the services and features of the various layers of data networks.

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	-	-	H	L
CO2	L2	M	M	H	H	L	-	M	-	-	M	-	L	M	M
CO3	L1	H	L	L	M	L	-	-	-	-	H	-	-	M	L
CO4	L2	M	M	H	H	-	-	-	-	-	M	-	L	H	M
CO5	L4	H	L	L	M	H	-	L	-	-	H	-	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, CO5
CD5	Industrial visit	-

BCA 502: Deep Learning

Course Objective:

- To introduce to students, different deep neural network architectures, training strategies/algorithms, possible challenges, tools and techniques available in designing and deploying solutions to different practical/ Engineering problems.

Course Contents:

Unit I: **Neural Networks basics** – Linear Separable Problems and Perception – Multi layer neural networks and Back Propagation, Practical aspects of Deep Learning: Train/ Dev / Test sets, Bias/variance, Vanishing/exploding gradients, Gradient checking, Hyper Parameter Tuning.

Unit II: **Convolution Neural Networks** – Basics and Evolution of Popular CNN architectures – Transfer Learning–Applications : Object Detection and Localization, Face Recognition, Neural Style Transfer

Unit III: **Recurrent Neural Networks** – GRU – LSTM – NLP – Word Embeddings – Transfer Learning – Attention Models – Applications: Sentiment Analysis, Speech Recognition, Action Recognition. Restricted Boltzmann Machine –

Unit IV: **Deep Belief Network** – Auto Encoders – Applications: Semi-Supervised classification, Noise Reduction, Non-linear Dimensionality Reduction. Goal Oriented Decision Making – Policy and Target Networks – Deep Quality Network for Reinforcement Learning. Introduction to GAN – Encoder/Decoder, Generator/Discriminator architectures.

Unit V: **Challenges in NN training** – Data Augmentation – Hyper parameter Settings – Transfer Learning– Developing and Deploying ML Models

Text Book / References

1. Ian Goodfellow, YoshuaBengio and Aeron Courville," Deep Learning", MIT Press, First Edition, 2016.
2. Adam Gibson and Josh Patterson," Deep Learning, A practitioner's approach", O'Reilly, FirstEdition, 2017.

Course Outcomes:

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

CO1:	Be able to design, train, deploy neural networks for solving different practical/engineering problems and analyze and report its efficacy
CO2:	Have a good level of knowledge (Both Conceptual and Mathematical) on different neural network settings to pursue Research in this Field
CO3:	Build skills in using established ML Tools/libraries and in building self-learning skills in the field
CO4:	Understand Deep Network and its methodology
CO5:	Develop neural Network 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 Outcome	Bloom level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	H	M	L	M	L	-	-	-	-	M	-	L	M	M
CO2	L2	H	M	L	M	L	-	L	-	-	M	-	L	M	M
CO3	L2	H	L	L	L	M	-	-	-	-	L	-	L	M	M
CO4	L2	H	L	L	L	L	-	L	-	-	L	-	L	M	M
CO5	L2	M	L	L	L	-	-	-	-	-	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,
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	CO1, CO2, CO3, CO4, CO5

BCA-502 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 between Objectives and Outcomes

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-503: Advance Java

Course Objectives:

- Objective of this course is to provide the ability to design console based, GUI based and web based applications.
- Students will also be able to understand integrated development 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-504: 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-505: 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**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
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-506: Professional Skills (Career & Team)

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) in identified 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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	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 507: Deep Learning Lab

Course Objective:

- Student will understand Deep learning Techniques and their principles.
- The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs, course will cover details of neural networks, Convolutional neural network and its applications, Neural language processing RNN, LSTM, GRU, DBM- Image Segmentation.

List of Experiments:

1. Implement Simple Programs like vector addition in TensorFlow.
2. Implement a simple problem like regression model in Keras.
3. Implement a perceptron in TensorFlow/Keras Environment.
4. Implement a Feed-Forward Network in TensorFlow/Keras.
5. Implement an Image Classifier using CNN in TensorFlow/Keras.
6. Implement a Transfer Learning concept in Image Classification.
7. Implement an Autoencoder in TensorFlow/Keras.
8. Implement a Simple LSTM using TensorFlow/Keras.
9. Implement an Opinion Mining in Recurrent Neural network.
10. Implement an Object Detection using CNN.

Course Outcomes:

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

CO1:	Understand the role of deep learning in machine learning applications and get familiar with the use of TensorFlow/Keras in deep learning applications (Understanding)
CO2:	Compare Various deep learning Algorithms used for Classification, Segmentation and detection. (Evaluate)
CO3:	Apply various concepts related with Deep Learning to solve Problems.
CO4:	Analyze different deep learning models in Image related projects.
CO5:	Compare Deep learning 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 Outcome	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	H	M	L	M	L	L	-	-	L	M	-	L	L	M
CO2	L4	H	M	L	M	L	L	-	-	-	M	-	L	L	M
CO3	L1	H	M	L	M	L	L	-	-	L	M	-	L	L	L
CO4	L2	H	H	M	H	L	L	-	-	L	H	-	M	M	M
CO5	L2	H	M	M	M	L	L	-	-	L	M	-	M	L	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
CD4	Self- learning advice using internets	CO1,CO2, CO3, CO4
CD5	Industrial visit	CO5

BCA-508: 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 509: Summer Project Seminar

Course Objectives:

- To create a communication style for individual & team building.
- To Use values in improving one‟s own professionalism.
- To develop the higher cognitive abilities that is analysis, synthesis and evaluation.
- To Ability to identify, formulate and present model problems.

Course Outcomes:

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

CO1:	Personalize and create a communication style for individual & team building.
CO2:	Use values in improving one‟s own professionalism
CO3:	Classify the higher cognitive abilities that are analysis, synthesis and evaluation.
CO4:	Understand formulate and present model problems.
CO5:	Analyze and formulate and present model problems.

Table: Mapping of Course Outcomes with Program Outcomes

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

H-High, M-Moderate, L-Low, ‘-’for Nocorrelation

BCA 510: Industrial Visit

Course Objectives:

- To

BCA 511: ANANDAM

Objectives:

- To instil the joy of giving in young people, turning them into responsible citizens to build up a better society.
- To inculcate the habit of service in students across the University.
- A compulsory course of 2 credits per semester to be included in each program of University.
- Students to be expected to engage in individual and group acts of service and goodness.

Action Plan:

Students will be expected to

- Do at least one act of individual service each day
- Record this act of service in a dedicated Register / Personal Diary
- Share this Register / Personal Diary day in the Anandam Class scheduled per week. The class interaction will include Personal Diary check, Showing of Community based motivation videos, Community based presentations by students, Role playing etc.
- Undertake one group service project for 64 hours every semester (outside college hours)
- Upload the report on the group project on the Anandam platform
- Participate in a sharing and presentation on the group service in the discussion sessions held once in week
- There will be some suggested projects and organizations that students can work with. Students can also suggest their own projects which others can join

Each student will finish the year with a portfolio of giving. This will include their Register / Personal Diaries and their reports on group service projects.

BCA- VI SEMESTER

Semester – VI

Code	Subject/Paper	Type	Internal Marks	External Marks	Total	L	T	P	Credits
BCA 601	Advance Computer Networks	Core	30	70	100	3	1	-	4
BCA 602	Management Information System	Core	30	70	100	4	-	-	4
BCA 603	**Advanced Internet Programming**	Core	30	70	100	3	1	-	4
BCA 604A	.NET Technology	Elective	30	70	100	3	1	-	4
BCA 604B	Fundamental of PHP	Elective	30	70	100	3	1	-	4
BCA 604C	Principles of Accounting	Elective	30	70	100	3	1	-	4
BCA 604D	Intellectual Property Rights	Elective	30	70	100	3	1	-	4
BCA 605A	Social Implications of IT	Elective	30	70	100	3	1	-	4
BCA 605B	Mobile Computing	Elective	30	70	100	3	1	-	4
BCA 605C	Cyber Ethics & Crime	Elective	30	70	100	3	1	-	4
BCA 605D	Entrepreneurship	Elective	30	70	100	3	1	-	4
BCA 606	Leadership &Mgmt Skills	AECC	30	70	100	2	-	-	2
Code	**Subject/Paper**	**Type**	**Internal Marks**	**External Marks**	**Total**	**L**	**T**	**P**	**Credits**
BCA 607	**Advanced Internet Programming Lab**	Core	30	20	50	-	-	1	1
BCA 608	.NET/PHP Lab	Core	30	20	50	-	-	1	1
BCA 609	Major Project	Core	100	50	150	-	-	2	2
BCA 610	Seminar	Core	30	20	50	-	-	1	1
BCA 611	ANANDAM	AECC	50	50	100	1	-	1	2
TOTAL			**420**	**580**	**1000**	**19**	**4**	**6**	**29**

BCA-601 Advance Computer Network

Course Objectives:

- Thecourseisaimedatprovidingbasicunderstandingof Computernetworksstarting with OSI Reference Model, Protocols at different layers with special emphasis on IP, TCP & UDP and Routing algorithms.
- Some of the major topics which are included in this course are CSMA/CD, TCP/IP implementation, 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–V 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-602 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	P011	PO12	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 603: 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-604A: .Net Technology

Course Objective:

- Get the Knowledge about different Object Oriented Features and to understand disconnected architecture of .Net.
- To acquire knowledge on the usage of recent platforms in developing web applications.
- Learn Visual Basic .NET to create graphical user interface applications.

Course Contents:

Unit–I An overview of the .NET framework ,.Net Architecture, components of Framework: (CLR), CTS, CLS, the .NET Framework class library (FCL), Know the role of the Common Intermediate Language (CIL), Platform independent .NET., Languages supported by .NET will also be discussed. An introduction to Visual Studio .NET, Namespaces

Unit–II What is C#, why C#, characteristics of C#, rules for writing, declaration and initializing variables, scope of the variables, converting variable types., Statements and Expressions, Operators, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations. C# - Types, Reference Types, Value Types, Boxing.

Unit–III Classes and Objects: Constructors .Reference Types ,Object Oriented Programming Access Modifiers,, Inheritance, operator overloading, function overloading, method overriding, constructor invocation in inheritance, Polymorphism, sealed class, sealed method, virtual method, Abstract class and method, Interfaces, Parameter passing making, null able types, content data, read only fields, static constructor, static class, method and properties in class.

Unit – IV Errors and Exceptions: Handling errors and throwing exceptions The Root object class. Date Time and Time Span Class, overriding object class method, Delegates, Events, System. collection, System I.O name space: Directory Info Class, File Info Class, streams

Unit – V Application Development on .NET: Building Windows Applications, Introduction to ADO.Net Connected Architecture , Disconnected Architecture , Windows Form :Introduction to Windows Form, Form Controls ,User Define Controls ,Accessing Data with ADO.NET. Updating retrieving and deleting data using LINQ to SQL

Text books/ reference books:

1. C# 4.0 in Nut shell by O' Reilly
2. Beginning Visual C# by Rocks Publicatio

Course Outcomes

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

CO1:	Explain and compare major elements of the .NET Framework and explain how C# fits into the .NET platform.
CO2:	Solve of a C# application and be able to document, debug, compile, and run a simple application.
CO3:	Describe methods (functions and subroutines) that can return values and take parameters.
CO4:	Understand the use of common objects and reference types.
CO5:	Demonstrate ability to create a C# Windows and web application using Visual Studio.

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	-	-	H	-	H	-	H	M	L
CO2	L3	M	M	M	M	-	-	-	-	-	M	-	M	M	M
CO3	L1	L	H	H	H	H	-	-	M	-	L	-	L	H	L
CO4	L2	M	L	L	M	-	-	-	-	-	M	-	M	H	L
CO5	L3	M	H	H	H	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, 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-604B: 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 web server.
CO2:	Apply containing several fields and be able to process the data provided on the form by a user in a PHP-based script.
CO3:	Understand basic PHP syntax for variable use, and standard language constructs, such as conditionals 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 the server 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
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 604C: Principles of Accounting

Course Objectives:

- To understand the concept and role of accounting in financial reporting in modern economy
- To develop the understanding of basic accounting concepts and techniques of and accounting system. Principles and procedures underlying the accounting process
- To provide an understanding, importance of accounting; preparation of final accounts for profit making organization
- To identify errors in the preparation of accounts.
- To use various software in preparation of Accounts.

Course Contents:

Unit1 I Accounting: Definition, Need for Accounting, Learning Objectives, Functions of Accounting,**Basic Components of Financial Statements**-Account classes, Account groups, Accounts, Subsidiary accounts, Basic accounting equation.

Unit II **Branches of Accounting**-Financial Accounting, Cost Accounting and Management Accounting. Systems of Book Keeping, Journal, Rules of Debit and Credit, Journal Entries, Ledger Posting, Trial Balance, Revenue & Capital Expenditure, Cash Book and other Subsidiary Books.

Unit-III **Journalizing Transactions Related to Expenses**- Cost accounting accounts, Cost accounting records, Transferring cost accounting records to financial accounting by using transfer accounts.

Unit-IV Rectification of Errors, Depreciation Accounting, Preparation of Final Accounts with and without adjustment including Manufacturing Accounts.

Unit-V Computer Accounting: Accounting Package, Tally Micro Studies. Bank Reconciliation Statement: Advantages of Keeping Bank Account Cause of Difference, Meaning and Objective of Reconciliation, Technique for Preparation.

Text books/ reference books:

1. Grewal . T.S ; Double Entry Keeping ; 21st Edition ; Sultan chand Publications ; 2006
2. Tulsian .P.C ; Financial Accounting ; Pearson Education.
3. Sharma &Bhardwaj; Book keeping & Accounting, RBD; Jaipur.
4. Sharma, Shah &Agarwal; Financial Accounting, Shiv Book Depo; Jaipur.
5. Agarwal, Shah, Goyal& Sharma; Fundamentals of Accounting, Vol. I, NBH; New Delhi.
6. Maheshwari S.N & S.K. Maheshwari ; An Introduction to Accountancy ; Eighth Edition ; Vikas Publishing Company 2003.
7. Monga J.R; Girishahuja; Financial Accounting; Eighteenth edition; Mayoor Paper Backs; 2003

Course Outcomes:

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

CO1.	Demonstrate the role of accounting in business in economic world.
CO2.	Define the principles of accounting and book keeping
CO3.	Apply accounting rules in determining financial results and preparation of financial statement.
CO4.	Define an errors caused during preparation of Final accounts.
CO5.	Use software in preparation of Financial Statements

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	L1	L	L	L	M	-	-	-	-	-	L	-	L	M	L
CO3	L3	L	L	L	L	-	-	-	-	M	L	-	L	M	M
CO4	L4	M	M	M	M	-	-	-	-	-	M	-	M	H	L
CO5	L3	H	L	L	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, 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 604D: Intellectual Property Rights

Course Objectives:

- To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- To disseminate knowledge on patents, patent regime in India and abroad and registration aspects
- To disseminate knowledge eon copyrights and its related rights and registration aspects
- To disseminate knowledge on trademarks and registration aspects
- To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects
- To aware about current trends in IPR and Govt. steps in fostering IPR

Course Contents:

Unit1 I **Copyright-I**

a. Nature and Meaning
b. Scope of protection

Unit II **Copyright-II**

a. Procedure for protection
b. Enforcement and Remedies

Unit-III **Patents**

a. Nature and Meaning
b. Scope of protection
c. Procedure for protection
d. Enforcement and Remedies

Unit-IV **Trademarks**

a. Nature and Meaning
b. Scope of protection
c. Procedure for protection
d. Enforcement and Remedies

Unit-V **Designs**

a. Nature and Meaning
b. Scope of protection
c. Procedure for protection
d. Enforcement and Remedies

Suggested Readings:

1. R. Anita Rao&BhanojiRao: Intellectual Property A Primer
2. Nair and Kumar: Intellectual Property Rights (N. Delhi: Allied, 1994);
3. Narayanan, P.: Patent Law (Kolkata: Eastern Law House, 998)
4. N.S. GopalKrishman& T.G. Agitha: Principal of Intellectual Property
5. Cornish, W. R. :*Intellectual Property* (London: Sweet & Maxwell, 1996);
6. Robert A. Gorman and Jane C. Ginsburg: Copyright: Cases and Materials (New York: Foundation Press, 2002).
7. Stewart, S.M.: International Copyright and Neighbouring Rights (London: Butterworth's, 1983)Recommended Cases:

Course Outcomes

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

CO1.	Understand The students once they complete their academic projects, shall get an adequate knowledge on patent and copyright for their innovative research works
CO2.	Analyze and research career, information in patent documents provide useful insight on novelty of their idea from state-of-the art search. This provide further way for developing their idea or innovations
CO3.	Use the way for the students to catch up Intellectual Property(IP) as an career option R&D IP Counsel, Government Jobs –Patent Examiner, Private Jobs, Patent agent and Trademark agent, Entrepreneur
CO4.	Apply During their research career, information in patent documents provide useful insight on novelty of their idea from state-of-the art search. This provide further way for developing their idea or innovations
CO5.	Describe the way for the students to catch up Intellectual Property(IP) as an career option R&D IP Counsel, Government Jobs –Patent Examiner, Private Jobs, Patent agent and Trademark agent, Entrepreneur

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	PO 10	P0 11	PO 12	PSO1	PSO2
CO1	L2	H	L	L	M	-	-	-	M	M	H	-	M	H	L
CO2	L3	H	M	M	H	-	-	-	L	-	H	-	L	M	M
CO3	L3	H	M	M	M	-	-	L	M	L	H	-	M	M	L
CO4	L3	H	M	M	H	-	-	-	L	-	H	-	L	M	M
CO5	L2	H	M	M	M	-	-	L	M	L	H	-	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
CD3	Seminars	---
CD4	Self- learning advice using internets	CO1,CO2, CO3
CD5	Industrial visit	---

BCA605A: Social Implications of IT

Course Objective:

- Acquaint student with contemporary and possible future moral problems that arise due to Computerization.
- Give a deeper understanding of nature of moral choices.
- Help to understand social, economic, legal and cognitive effects of technology.
- To identify ethical conflicts and think through the implications of possible solutions to Ethical conflicts

Course Contents:

Unit-I **Introduction:** Importance of social dimensions of science and technology, concept of demystification, definition of the term IT,Its advantages and disadvantages, trends in IT, IT and quality of life.

Unit-II **Future trends of IT**: AI, Robots, Neural Networks, Fuzzy logic, Virtual Reality, Developments in hardware and software, economic role of IT (Banking and Finance, Stock market), IT and Manufacturing, IT in Retail Marketing, Presentation on future trends.

Unit-III Social and Technical choice reshaping the people, concept of digital factors affecting nature, initiative to bridge digital divide, debate on digital divide.

Unit-IV IT in office automation, concept of Intelligent house hold, IT role in learning and education, focus on alternative ways in which IT professionals, IT and home automation.

Unit-V Privacy and surveillance in everyday life, impact of IT on culture, ethical issue of IT, concept of software piracy.

Text Books/Reference Books

1. Dutton, W.H. “Society on the line: Information politics in digital age” , Oxford University Press, 1999.
2. Castell M., “ The Internet Galaxy” Oxford University Press,
3. Teich, A.H., “Technology and the future”, 8th edition, Network St. Martin Press.

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:	Define and Learn about the best ethical practices and models.
CO3:	Demonstrate a sound methodology in resolving ethical conflicts and crisis.
CO4:	Understand about the issues directly related to information technology environment and professionals.
CO5:	Understand about the issues directly related to information technology environment and professionals

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	-	-	-	M	M	M	-	M	H	L
CO2	L2	M	L	L	M	-	-	-	L	-	M	-	M	M	M
CO3	L3	H	H	H	H	-	-	-	M	L	H	M	H	M	L
CO4	L2	L	L	L	M	-	-	-	L	L	H	L	H	H	M
CO5	L2	L	L	L	M	-	-	-	L	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
CD5	Industrial visit	-------

BCA 605B: Mobile Computing

Course Objectives:

- To understand the various terminology, principles, devices, schemes, concepts, generations, and different methodologies used in Mobile and Wireless Communication Networks.
- To introduce the student to the major concepts involved in Wireless LAN (IEEE 802.11), and Bluetooth.
- To study the operation of basic cellular system and performance criterion, hand off mechanism, 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–III` 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:	Understanding of different generations, terminologies, systems, operations and design 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 605C: 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	------

BCA605D: Entrepreneurship

Course Objectives:

- To simulate the real life activities of entrepreneurs in the startup age of a new venture.
- To provide the skills to start and build enterprise, implement it successfully
- To inculcate skills to manage the transition of a start up to a full-fledged business entity.

Course Contents:

Unit–I **Introduction to Entrepreneurship:** Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies. Entrepreneurial growth and development.

Unit–II **Creativity and Innovation:** Creativity and Innovation: Concepts Shifting Composition of the Economy Purposeful Innovation & the 7 Sources of Innovative Opportunity The Innovation Process.

Innovative Strategies : Strategies that aim at introducing an innovation. Innovation &entrepreneurship: Can they work together? Planning-incompatible with Innovation &entrepreneurship.

Unit–III **Entrepreneurial Motivation:** Need for continuous learning & relearning Acquiring Technological Innovation Entrepreneurial motivation (nAch story) Achievement Motivation in Real life. Case Study.

Unit–IV **International Entrepreneurship:** Concepts and Nature of International Entrepreneurship. The changing International environment. Ethics and International Entrepreneurship. Strategic Issues in International Entrepreneurship.

Unit – V **Problem Identification and Problem Solving:** Problem Identification. Problem solving. Innovation and Diversification

Course Outcome:

After completion of this course, students will be able to:

CO1.	Understand the characteristics of an entrepreneur as well their role in the economic development of the country.
CO2.	Analyze & develop business plan , foreseeing the entry barriers to the industry
CO3.	Identify stages of growth in entrepreneurial ventures along with changing face of family business in India
CO4.	Define the Concepts and Nature of International Entrepreneurship.
CO5.	Analyze Problem identification and Problem solving methods

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	-	-	-	M	M	L	-	L	M	M
CO2	L3	M	M	M	H	-	-	-	L	L	M	-	M	M	L
CO3	L2	L	L	L	M	-	-	-	M	L	L	-	L	H	M
CO4	L1	M	M	M	H	-	-	-	L	L	M	-	M	M	L
CO5	L3	L	L	L	M	-	-	-	M	L	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	CO1,CO2, CO3. CO4,CO5
CD3	Seminars	----
CD4	Self- learning advice using internets	CO1,CO2, CO3, CO5
CD5	Industrial visit	-----

BCA 606: 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 and abili 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, self managem 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	PO 10	PO 11	PO 12	PSO 1	PSO 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 607: 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 but-tons.
    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 608: .Net Lab

Course Objectives:

- To learn programming in C# and dot NET framework.
- To develop web applications using C# and dot NET framework.

List of Experiments :-.Net Lab

Q.1 Write aC# Program to Get a Number and Display the Number with its Reverse

Q.2 Write C# Program Counts number of Vowels and consonants from a given String.

Q.3 Write a C# Program Demonstrates Jagged Arrays.

Q.4 Write a Program in C# to multiply two matrices of size 3*3.

Q.5 Write a Program to implement Add, Less and multiply operation for Money, design Money class.

Q.6 Write a program in C# to implement operator over loading to overload;- '+' , '-' , '*' and/ operators.

Q.7. C# Program Demonstrates Properties of the Class. Here it demonstrates how properties are declared and used.

Q.8 Write a C# program to keep records and perform statistical analysis for a class of 20 students. The information of each student contains ID, Name, Sex, quizzes Scores (2 quizzes per semester), mid-term score, final score, and total score. The program will prompt the user to choose the operation of records from a menu

Q.9 Write a program to implement constructor invocation in multilevel inheritance.

Q.10 Write a C# Program Demonstrates IndexOutOfRange Exception.

Q.11 Write a program to implement delegates with multicasting for three methods of arithmetic operation i.e. sum, divide and multiplication of tow integers.

Q.12 Write a program to create a data file that contains roll no, Name and marks of student. The program should read values until -1 is entered as a roll no. And then write code to read and display contents of student data.

Q.13 Write a program to store name of product with price and display them using SortedList.

Q.14. Write a program to implement abstract class and inheritance.

Q.15 Write a GUI program to create a simple Text Editor. Your editor has the following basic functions:

-A user can choose a file to open

-A user can save the text to the existing file.

-A user can save the text in a new file name.

Q.16 Create a Form that receives the user name, address, date, nationality, country preferred for working and skill sets from the user and stores . The country preferred data should appear in a dropdown list whereas; others should be entered in a textbox. Validate all the controls. The date should appear between "1/1/1900" and "1/1/2090". When submit the values the whole entries should be displayed on a label and ask for user to confirm by **Write a simple Windows Forms MessageBox statement.**

Q.17 Create a phoneBook application Oledb data provider. The application contain the following feature:

- Add a new record to phone book
- Delete a record
- Update the th number
- Display phone number of a person

Course Outcomes:

After completion of this course student should be able to

CO1.	Apply console application and windows application.
CO2.	Solve the web application.
CO3:	Understand about the issues directly related to information technology environment.
CO4.	Design web application.
CO5:	Describe class and Inheritance

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	H	H	H	H	M	-	-	M	-	H	-	H	H	L
CO2	L4	M	H	H	H	H	-	-	H	-	H	-	H	M	M
CO3	L2	L	L	L	L	M	-	-	M	-	M	-	M	H	L
CO4	L6	M	H	H	H	H	-	-	H	-	H	-	H	M	M
CO5	L2	L	L	L	L	M	-	-	M	-	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	

BCA 608: 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, database driven 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) User Name (should contains alphabets and the length should not be less than 6 characters)

b) User Password (should not be less than 6 characters)

c) User Email (should not contain invalid addresses)

d) User City (should select city from drop down)

e) User Gender (Should select gender)

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 My SQL 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 609: 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:	Capability to acquire and apply fundamental principles of engineering.
CO2:	Determine the steps Be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills.
CO3:	Identify, formulate and model problems and find engineering solution based on a systems approach.
CO4:	Apply and enthusiasm for self-improvement through continuous professional development and life-long learning.
CO5:	Describe Learning Management

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcome	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	L3	M	M	H	L	M	-	-	-	-	M	-	L	M	M
CO2	L5	M	L	H	L	M	-	-	-	-	L	-	L	M	M
CO3	L3	M	M	H	L	M	-	-	-	-	M	-	L	M	M
CO4	L3	M	M	H	L	M	-	-	-	-	M	-	L	M	M
CO5	L2	M	M	H	L	M	-	-	-	-	M	-	L	M	M

H-High, M-Moderate, L-Low,'-' for Nocorrelation

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 610: Seminar

Course Objectives:

- To Awareness of how to use values in improving your own professionalism.
- To Learning about personal and communication styles for team building.
- To identify, formulate and present model problems.
- To Learning management of values.

Course Outcomes:

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

CO1:	Understand Capability to acquire and apply fundamental principles of engineering.
CO2:	Describe the process to Become master in one's specialized technology
CO3:	Analyze to Become updated with all the latest changes in technological world.
CO4:	Ability to identify, formulate and model problems and find engineering solution based on a systems approach.
CO5:	Describe Problems related to real applications.

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcome	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	M	H	L	H	L	-	-	-	-	L	-	L	M	M
CO2	L1	M	L	H	H	L	-	-	-	-	L	-	M	H	M
CO3	L3	M	H	M	M	L	-	-	-	-	L	-	M	M	M
CO4	L2	M	M	M	M	L	-	-	-	-	M	-	L	M	H
CO5	L2	M	M	M	M	L	-	-	-	-	M	-	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	CO1,CO2, CO3, CO4,CO5
CD3	Seminars	----------
CD4	Self- learning advice using internets	CO1,CO2, CO3, CO4,CO5
CD5	Industrial visit	

BCA 611: ANANDAM

Objectives:

- To instil the joy of giving in young people, turning them into responsible citizens to build up a better society.
- To inculcate the habit of service in students across the University.
- A compulsory course of 2 credits per semester to be included in each program of University.
- Students to be expected to engage in individual and group acts of service and goodness.

Action Plan:

Students will be expected to

- Do at least one act of individual service each day
- Record this act of service in a dedicated Register / Personal Diary
- Share this Register / Personal Diary day in the Anandam Class scheduled per week. The class interaction will include Personal Diary check, Showing of Community based motivation videos, Community based presentations by students, Role playing etc.
- Undertake one group service project for 64 hours every semester (outside college hours)
- Upload the report on the group project on the Anandam platform
- Participate in a sharing and presentation on the group service in the discussion sessions held once in week
- There will be some suggested projects and organizations that students can work with. Students can also suggest their own projects which others can join

Each student will finish the year with a portfolio of giving. This will include their Register / Personal Diaries and their reports on group service projects.

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 of study, 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 in practical sessions. These sessions provide vital insights into scientific concepts and draw learner'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 program provides great 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 learning while understanding the practical importance.
6. **Textbooks learning:** A large number of books are included in the list of references of each course for enrichment and enhancement of knowledge.
7. **E-learning:** Learner may also access electronic resources and educational websites for better understanding and updating the concepts.
8. **Self-study materials:** Self-study material provided by the teachers is an integral part of learning. 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 of theory 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 activities devoted 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 such visits 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 scientific concepts. 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/institutes provide 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 Grade Point 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.

SGPA (Si) = Σ (Ci x Gi) / ΣCi

Where Ci is the number of credits of the i^{th} course and Gi is the grade point scored by the student in the i^{th} 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.

CGPA = Σ (Ci x Si) / Σ 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 = $\frac{20x6.9+22x7.8+25x5.6+26x6.0+26x6.3+25x8.0}{}$ = **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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Bloom Levels

Level of Taxonomy	Definition	Action Verbs	
Creating L6	Generating new ideas, products, or ways of viewing things Designing, constructing, planning, producing, inventing	Act Arrange Assemble Combine Compose Construct Create Design Develop Devise Formulate	Generate Improve Infer Invent Imagine Plan Predict Prepare Revise Show Write
Evaluating L5	Justifying a decision or course of action Checking, hypothesizing, critiquing, experimenting, judging	Argue Assess Choose Compare Conclude Criticize Debate Decide Defend	Determine Evaluate Justify Prioritize Rate Recommend Support Tell why Value
Analyzing L4	Breaking information into parts to explore understandings and relationships Comparing, organizing, deconstructing, interrogating, finding	Calculate Categorize Classify Compare Contrast Diagram Differentiate Discover Distinguish Examine Experiment	Group Interpret Investigate Order Organize Question Relate Research Sequence Solve Survey
Applying L3	Using information in another familiar situation Implementing, carrying out, using, executing	Adapt Apply Calculate Change Compute Demonstrate Dramatize Draw	List Make Manipulate Practice Produce Sequence Show Solve

		Experiment Illustrate	Teach Use
Understanding L2	Explaining ideas or concepts Interpreting, summarizing, paraphrasing, classifying, explaining	Ask Calculate Convert Describe Discuss Explain Give examples Identify Locate	Observe Recognize Report Research Retell Review Summarize Tell
Remembering L1	Recalling information Recognizing, listing, describing, retrieving, naming, finding	Choose Cite Define Describe Give example Group Know Label List Listen Locate	Match Memorize Name Quote Recall Recite Record Repeat Select Underline