Ordinance No. (V-3A)

Bachelor of Computer Application

(BCA)

(Approved by Academic Council from 2018-2019)

Faculty of Science

SWAMI VIVEKANAND SUBHARTI UNIVERSITY

MEERUT

Ordinance No. (V-3A)

GENERAL

- This ordinance may be called **"Ordinance Relating to Bachelor in Computer Application"** Course**.**
- It shall come into force from academic session 2018-19.
- This supersedes the previous Ordinance relating to **Bachelor in Computer Application [V- 3A].**

1. INTRODUCTION

Keral Verma Subharti College of Science has been established in 2013 under Swami Vivekanand Subharti University, Meerut with the vision **to impart quality education through Time-tested Traditions blended with latest innovations to transform Youth into Human resource that is responsive to Societal, Environment and Cultural Responsibilities.**

Mission to Create State-of-art Infrastructure, engage Dynamic and Dedicated Faculty and Inculcate Scholarly pursuits and Human Values in the Young Minds and imbibe in them with qualities of Head and Heart, so that they emerge as assets to national Pride and Challenges to International Benchmark**.**

BACHELOR IN COMPUTER APPLICATION (BCA)

1. PROGRAMME OBJECTIVES:

- **Broadly Educated and Versatile**. Able to draw upon foundational knowledge, learn, adapt and successfully bring to bear analytical and computational approaches on changing societal and technological challenges.
- **Inspiring and Collaborative**. Is a leader and a responsible citizen whose strengths come from an ability to draw on and contribute to diverse teams, expertise, and experiences.
- **Innovative.** Drives scientific and societal advancement through technological innovation and entrepreneurship.

- **Engaged.** Is and remains engaged with the University of Colorado, the state of Colorado, and technical and scientific professional communities**.**

2. PROGRAMME OUTCOME:

After successful completion of the programme, an individual will be able to:

- An ability to apply knowledge of computing and mathematics appropriate to the discipline.
- An ability to identify, formulate, and develop solutions to computational challenges.
- An ability to design, implement, and evaluate a computational system to meet desired needs within realistic constraints.
- An ability to function effectively on teams to accomplish shared computing design, evaluation, or implementation goals.
- An understanding of professional, ethical, legal, security, and social issues and responsibilities for the computing profession.
- An ability to communicate and engage effectively with diverse stakeholders.
- An ability to analyze impacts of computing on individuals, organizations, and society.
- Recognition of the need for and ability to engage in continuing professional development.

2. RULES AND REGULATIONS FOR ADMISSION IN BACHELOR IN COMPUTER APPLICATION

2.1 For admission to B.C.A. course, an applicant should have passed the 10+2/ Intermediate Examination or an equivalent examination from a recognized Board / University with minimum 45% marks in aggregate.

2.2. There shall be relaxation of 5% marks for SC/ST categories candidates.

2.3. The entire program has to be completed within a maximum of six years from the date of original admission in the program.

3. CURRICULUM/ STRUCTURE OF PROGRAMME OF BCA(BACHELOR IN COMPUTER APPLICATION)

3.1 The program shall be spread over three academic years, spread over six semesters comprising actual teaching for a minimum of 90 days in each semester.

3.2 The program focuses on the following aspects:

a) Competency

b) Entrepreneurship

c) Skill Enhancement

d) Value Added Courses

e) Extracurricular activities

3.3 Choice Based Credit System (CBCS):

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

The curriculum offers a total of 47 courses including Project Work out of which the student has to complete 37 courses and the total number of credits required for the award of B.Sc (CS) degree is 140 credits. The courses are divided into 3 categories, i.e. Core courses, Elective Courses, Ability Enhancement Courses and Skills Enhancement Courses.

1. Core Course: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. The numbers of core course during the program are 12 (First semester to Fourth Semester).

2. Elective Course: Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

3. Ability Enhancement Courses: The Ability Enhancement (AE) Courses may be of two kinds: AE Compulsory Course (AECC) and Skill Enhancement Courses (SEC). AECC courses (two) are the courses based upon the content that leads to knowledge enhancement. They [(i) Environmental Science, (ii) English/MIL Communication] are *mandatory* for all disciplines. SEC courses (minimum two) are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

All core courses may have a practical component, along with theory. Ability Enhancement courses are theory based and Skills Enhancement courses have theory with the practical component if required. However external practical evaluation is offered only for compulsory subjects and elective also.

3.4 The academic calendar shall be as follows:-

Ist , IIIrd & V th Semester	Session - 1st Aug. to 30th Nov Exam - 1st Dec. to 15th Dec
IInd , IVth , & VI th Semester	Session - 1st Jan. to 30th April Exam - 1st May to 15th May

3.5: Table of B.Sc. (CS) program Structure under CBCS from the academic year 2018-19

First Year- First Semester

COURSE CODE	COURSE NAME	COURSE TYPE	TEACHING LOAD PER WEEK				CREDITS	MARKS		
			L	P	T	Total		CCA	ESE	TOTAL
BCA –101	Mathematics-I	CORE COURSE	4	0	1	5	5	30	70	100
BCA – 102	Computer Fundamental & Office Automation	CORE COURSE	4	2	0	5	5	30	70	100
BCA-151	MS Office Lab	PRACTICAL-1	0	2	0	2	3	25	50	75
BCA –103	Programming principles and Algorithms	CORE COURSE	4	2	0	5	5	30	70	100
BCA-152	Programming & Algorithms Lab	PRACTICAL-2	0	2	0	2	3	25	50	75
AEC-1	English Communication	AECC	-	-	-	-	-	-	-	-
AEC-1-P	English Communication (Practical)	AECC	-	-	-	-	-	-	-	-
		Total	**12**	**08**	**01**	**19**	**21**	**140**	**310**	**450**

First Year- Second Semester

COURSE CODE	COURSE NAME	COURSE TYPE	TEACHING LOAD PER WEEK				CREDITS	MARKS		
			L	P	T	Total		CCA	ESE	TOTAL
BCA–201	Mathematics-II	CORE COURSE	4	0	1	5	5	30	70	100
BCA–202	Database Management System	CORE COURSE	4	2	0	5	5	30	70	100
BCA-251	DBMS Lab	PRACTICAL-1	0	2	0	2	2	10	40	50
BCA–203	'C' Programming	CORE COURSE	4	2	0	5	5	30	70	100
BCA-252	C-Programming Lab	PRACTICAL-2	0	2	0	2	2	10	40	50
AEC-1	English Communication	ABILITY ENHANCEMENT COURSE	2	0	0	2	2	15	35	50
AEC-1 P	English Communication (Practical)	ABILITY ENHANCEMENT COURSE	**0**	**2**	**0**	**2**	**2**	**15**	**35**	**50**
AEC-2	Environmental Studies	AECC	2	0	0	2	2	30	70	100
		Total	**16**	**10**	**1**	**25**	**25**	**170**	**430**	**600**

Second Year- Third Semester

COURSE CODE	COURSE NAME	COURSE TYPE	TEACHING LOAD PER WEEK				CREDITS	MARKS		
			L	P	T	Total		CCA	ESE	TOTAL
BCA –301	Discrete mathematics	CORE COURSE	4	0	1	5	5	30	70	100
BCA – 302	Operating System	CORE COURSE	4	2	0	5	5	30	70	100
BCA-351	Operating system lab	PRACTICAL-1	0	2	0	2	2	10	40	50
BCA –303	Data Structure with Programming in 'C'	CORE COURSE	4	2	0	5	5	30	70	100
BCA-352	Data Structure Lab	PRACTICAL-2	0	2	0	2	2	10	40	50
BCA–304S A BCA-304S B	1.Computer hardware technology & installation 2. Applications of Office Tools	SKILLD ENHANCEMENT COURSE (Choose Any one)	3	2	0	4	4	30	70	100

		Total	**15**	**6**	**2**	**23**	**23**	**140**	**360**	**500**

Second Year- Fourth Sem

COURSE CODE	COURSE NAME	COURSE TYPE	TEACHING LOAD PER WEEK				CREDITS	MARKS		
			L	P	T	Total		CCA	ESE	TOTAL
BCA-401	Computer Communication Networks	CORE COURSE	4	2	0	5	5	30	70	100
BCA-402	Computer Graphics & Multimedia Applications	CORE COURSE	4	2	0	5	5	30	70	100
BCA-451	Graphics Lab	Practical-1	0	2	0	2	2	10	40	50
BCA-403	Object Oriented Programming & C++	CORE COURSE	4	2	0	5	5	30	70	100
BCA-452	C++ Lab	PRACTICAL-2	0	2	0	2	2	10	40	50
BCA-404-A BCA-404-B	1.Designing with corel draw and photoshop 2. Principles of Animation	SKILLD ENHANCEMENT COURSE (Choose any one)	3	2	0	4	4	30	70	100
		Total	**15**	**8**	**0**	**23**	**23**	**140**	**360**	**500**

Third Year – Fifth Sem

COURSE CODE	COURSE NAME	COURSE TYPE	TEACHING LOAD PER WEEK				CREDITS	MARKS		
			L	P	T	Total		CCA	ESE	TOTAL
BCA-501 A BCA-501 B	1. Java Programming & Dynamic Webpage Design 2. Digital electronics & Computer organizations	ELECTIVE COURSE-1 (CHOOSE ANY ONE)	4	2	1	5	5	30	70	100
BCA-551	Practical Lab-1	PRACTICAL-1	0	2	0	2	2	10	40	50
BCA-502 A BCA-502 B	1.Information system : Analysis design & Imp 2. Object oriented system design	ELECTIVE COURSE-1 (CHOOSE ANY ONE)	4	0	1	5	5	30	70	100
BCA-503-A BCA-503-B	1.Cloud Computing 2.Multimedia Systems	ELECTIVE COURSE-1 (CHOOSE ANY ONE)	4	0	1	5	5	30	70	100

BCA-504-A BCA-504-B	1.Software testing methodologies 2. Web Designing	SKILLD ENHANCEMENT COURSE (CHOOSE ANY ONE)	4	2	0	4	5	30	70	100
BCA-552	Practical Lab-2	PRACTICAL-2	0	2	0	2	2	10	40	50
		Total	**16**	**4**	**3**	**23**	**24**	**140**	**360**	**500**

Third Year – Six Sem

COURSE CODE	COURSE NAME	COURSE TYPE	TEACHING LOAD PER WEEK				CREDITS	MARKS		
			L	P	T	Total		CCA	ESE	TOTAL
BCA-601 A BCA-601B	1. Mobile Computing 2. ERP- Systems	ELECTIVE COURSE-1 (CHOOSE ANY ONE)	4	0	1	5	5	30	70	100
BCA-602 A BCA-602 B	1.Web Technology & Cyber Security 2. .Net Framework WITH C#	ELECTIVE COURSE-2 (CHOOSE ANY ONE)	4	2	0	5	5	30	70	100
BCA-651	Practical Lab-1	PRACTICAL-1	0	2	0	2	2	10	40	50
BCA-603 A BCA-603-B	1.Software Engineering 2.Real Time system	ELECTIVE COURSE-3 (Choose any one)	4	0	1	5	5	30	70	100
BCA-604-A BCA-604-B	1. Cyber forensic 2. Artificial Intelligence	SKILLD ENHANCEMENT COURSE	4	0	1	4	5	30	70	100
BCA-652	Project Viva-Voce	PROJECT VIVA-VOCE	2	4	0	6	4	50	100	150
HEV-01	**Universal Human Values and Professional Ethics**	Foundation Course (Qualifying Paper)	**3**	**0**	**0**	**3**	***3***	**0**	**50**	**50**
		Total	**21**	**08**	**03**	**30**	**29**	**180**	**470**	**650**

3.6 List of all Courses under different categories for BCA Program

Course Type	Course Code	Course Name
	BCA –101	Mathematics-I
	BCA –102	Computer Fundamental & Office Automation

Core Course with Practical	BCA-151	MS Office Lab
	BCA –103	Programming principles and Algorithms
	BCA-152	Programming & Algorithms Lab
	BCA–201	Mathematics-II
	BCA–202	Database Management System
	BCA-251	DBMS Lab
	BCA–203	'C' Programming
	BCA-252	C-Programing Lab
	BCA –301	Discrete mathematics
	BCA – 302	Operating System
	BCA-351	Operating system lab
	BCA –303	Data Structure with Programming in 'C'
	BCA-352	Data Structure Lab
	BCA-401	Computer Communication Networks
	BCA-402	Computer Graphics & Multimedia Applications
	BCA-451	Graphics Lab
	BCA-403	Object Oriented Programming & C++
	BCA-452	C++ Lab
	BCA-651	Practical Lab-1
Elective Course	BCA-501 A	Java Programming & Dynamic Webpage Design
	BCA-501 B	Digital electronics & Computer organizations
	BCA-551	Practical Lab-1

	BCA-502 A	Information system : Analysis design & Imp
	BCA-502 B	Object oriented system design
	BCA-503-A	Cloud Computing
	BCA-503-B	Multimedia Systems
	BCA-601 A	Mobile Computing
	BCA-601B	ERP- Systems
	BCA-602 A	Web Technology & Cyber Security
	BCA-602 B	.Net Framework WITH C#
	BCA-603 A	Software Engineering
	BCA-603-B	Real Time system
Ability Enhancement Course	AEC-1	English Communication
	AEC-1-P	English Communication (Practical)
	AEC-2	Environmental Studies
	HVE-01	Universal Human Values and Professional Ethics
Skill Enhancement Course	BCA–304S A	Computer hardware technology & installation
	BCA-304S B	Applications of Office Tools
	BCA-404S -A	Designing with corel draw and photo shop
	BCA-404S -B	Principles of Animation
	BCA-504S- A	Software testing methodologies
	BCA-504S- B	Web Designing
	BCA-604S- A	Cyber forensic
	BCA-604S- B	Artificial Intelligence

4. EXAMINATION AND EVALUATION

The examination in each semester shall be conducted in two parts:

A. Internal Assessment will be of 30 marks as under:-

1. Midterm written test including in-between snap tests if any, after three months carrying 20 marks.
2. A maximum of 10 marks shall be awarded for teacher assessment and attending classes (including practicals) regularly as per the following norms:

85- 100% attendance	-	10 Marks
80- 84.99% attendance	-	9 Marks
75- 79.99% attendance	-	8 Marks
70 – 74.99 % attendance	-	7 Marks
65 – 69.99% attendance	-	5 Marks
60 – 64.99% attendance	-	3 Marks
51 - 59.99% attendance	-	2 Marks
50% attendance	-	1 Mark
Less than 50% attendance	-	0 Mark

B. University Examination carrying 70 marks

The marks obtained in the two parts of the examination together shall be aggregated for the purpose of determining the total marks obtained by a student in a particular paper/subject of study. A special examination may be held in the month of August for the students of the first year of the course to enable them to reappear in those papers in which they had failed or could not appear due to any reason other than shortage of attendance. Students detained due to shortage of attendance may also appear in the special examination provided they make up their attendance by attending extra classes which may be arranged between 15th May to 31st July

ATTENDANCE:

The students are expected to attend all the classes and should not have less than 75 % attendance in theory as well as in practical classes, wherever held, to become eligible to appear for the university examination. Short fall in attendance can, however be condoned in deserving cases to the extent of 10% by the Principal. If the short fall is more than 10% but not more than 15%, the Principal may recommend deserving cases to the Vice Chancellor for condonation. The order of the Vice Chancellor in this regard shall be final.

PAPER SETTING

The work of setting the end semester examination papers and evaluation of scripts and conduct of the end semester practical examination shall be assigned to the course teachers as well as to outsiders, ordinarily in the ratio of 50:50 for internal and external valuation respectively.

RESULTS

Examination results shall be prepared at the end of each academic year by taking into account the marks obtained in all the semesters till date.

1. A candidate shall be declared as passed at the end of an academic year if he/she secures minimum 40% marks in each paper and shall be promoted to the next academic year.

2. If a student fails to secure 40% marks in not more than 1/3 of the numbers of the papers of the academic year, he/she will be provisionally promoted to the next year with carryover papers (PCP) and will have to appear & obtain pass marks in carryover papers along with the subsequent regular examinations for the relevant semester.

3. A student will not be promoted to the next academic year if the carryover papers are more than 1/3 at one point of time.

   If a student fails in only one subject in an academic year by not more than 5 marks, he/she will be declared pass with grace (PWG). Which, however, will not be added to the aggregate?

(i) A Grace Mark is not a matter of right of the student but is the discretion of the University.

(ii) Provided that the candidate has appeared in the main examination of the concerned course and falls short of pass marks by not more than five (05) marks in theory paper only. Benefit of above mentioned shall not be given to the candidate who had appeared in supplementary/special examination/carry over examination.

(iii) Further, benefit of grace marks may be given only to the candidate who will pass the entire concerned examination of the **semester*/year** after awarding the grace marks and not for the purpose of promoting the student to next year with back papers or for improvement of division or percentage.

(iv) If in a head/subject of an examination passing in Theory, Practical or sessional exams separately is mandatory, then the benefit of grace marks shall be given only in Theory examination of the University examination.

(v) The award of grace marks permissible shall be on the basis of 1 grace mark for every 05 marks secured by an examinee over and above the minimum passing aggregate marks of all subjects of the year.

4. If a candidate fails in only one head/subject and having passed in all other heads/subjects of the given examination of a **semester*/year**, then his/her deficiency of marks may be fulfilled by grace marks under the following conditions:-

5. Awarding of Grace Marks shall be done as given below:-

Aggregate Marks Obtained over & above minimum passing marks	**Permissible Grace Marks**
1-5	1
6-10	2
11-15	3
16-20	4
21-25	5

(i) Total number of Grace Marks given to the student will be marked with astrick (*) at the bottom of the marksheet.

* Grace Mark in semester examination will be considered hereinafter.

6. A student not covered by clause (a) to (c) above shall have the following options to complete his/her course -

(i) He/ she may take admission on payment of full annual course fee and repeat the entire year of study. He /She shall be treated as a regular student. Or

(ii) He /She may pay only University exam fee for the End Semester Examination and appear in the End Semester University exams directly. He /She shall not be allowed to attend classes and the Sessional marks obtained earlier shall be retained. Or

(iii) He /She may pay half of the annual course fee and attend classes. The sessional marks obtained by him/her earlier shall be retained. There will not be any requirement of minimum attendance for appearing in the University examination

7. A student will not be promoted to the next academic year if the carryover papers are more than 50% at one point of time.

8. The final result at the end of the course shall be prepared as below by aggregating the marks obtained in all the semesters.

5. EVALUATION UNDER GRADING ASSESSMENT

The minimum Grade/ Grade Point required to pass each paper in a semester examination under CBCS shall be Grade D/ Grade Point 4 in each theory paper/ Practical/Project (wherever applicable) in External Examination and Internal Assessment separately.

6. CALCULATION CRITERIA

To implement the following grading system, the colleges/campuses shall use the following UGC recommended 10 point grading system:

Marks (%)	Letter Grades	Grade Points (G)
85-100	A++ (Outstanding)	10
75 to < 85	A+ (Excellent)	9
70 to <75	A (Very Good)	8
65 to <70	B+ (Good)	7
60 to <65	B (Above Average)	6
50 to <60	C (Average)	5
40 to <50	D (Pass)	4
0 to <40	F (Fail)	0
	AB (Absent)	0

7. COMPUTATION OF SGPA AND CGPA

(Si)= £ (Ci x Gi)/ £ Ci, where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

CGPA=£(Ci x Si) / £ Ci where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

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

8. POWER TO MODIFY

In the event of any emergent situation, if any deviation is considered necessary, the Vice Chancellor is authorized to modify the Ordinance. Subject to subsequent ratification by the Executive Council.

SYLLABUS OF

BACHELOR OF COMMERCE

Semester-I

Course name: Mathematics-I	**Course Code: BCA-101**
Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: The Mathematics program promotes mathematical skills and knowledge for their intrinsic beauty, effectiveness in developing proficiency in analytical reasoning, and utility in modeling and solving real world problems. To responsibly live within and participate in the transformation of a rapidly changing, complex, and interdependent society, students must develop and unceasingly exercise their analytical abilities. Students who have learned to logically question assertions, recognize patterns, and distinguish the essential and irrelevant aspects of problems can think deeply and precisely, nurture the products of their imagination to fruition in reality, and share their ideas and insights while seeking and benefiting from the knowledge and insights of others

Unit-I Set Theory: **15 hrs**

Sets and subsets, Finit and infinite sets, Algebra of sets: Union and Intersection, Complementation, Demorgan's law, Common application of algebra of sets.

Elementary Properties of Numbers: Mathematical Induction**,** Division Algorithm, The Greatest Common Divisor, The Euclidean Algorithm, The Diophantine Equation.

Unit-II Matrix: **12 hrs**

Matrix, Submatix, Types of matrices such as symmetric, skew symmetric, Hermitian, Skew Hermitian, Nilpotent, Involutary, Orthogonal etc., Singular and Non singular matrices, Addition and subtraction of matrices, Rank of matrices, Matrix Equation, Solution by Cramer's rule and Gauss Elimination method.

Unit-III Vectors: **15hrs**

Vectors, Vector algebra, Addition and Subtraction of Vectors, Scalar and vector product of two vectors, Simple application of vectors.

Unit-IV Differentiation: **10 hrs**

Differentiation of Functions as polynomials, rationales, exponential, logarithmic and trigonometric function.

Unit-V Integration: **8 hrs**

Integration as inverse of differentiation, integration of simple Functions, integration by parts, integration by substitution, definite integrals.

At the end of the course, students would be able to

101.1: Analyze real world scenarios to recognize when ordinary differential equations (ODEs) or systems of ODEs are appropriate, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) in order to solve the problems using multiple approaches, judge if the results are reasonable, and then interpret and clearly communicate the results.

101.2: Recognize ODEs and system of ODEs concepts that are encountered in the real world, understand and be able to communicate the underlying mathematics involved to help another person gain insight into the situation.

101.3: Work with ODEs and systems of ODEs in various situations and use correct mathematical terminology, notation, and symbolic processes in order to engage in work, study, and conversation on topics involving ODEs and systems of ODEs with colleagues in the field of mathematics, science or engineering.

101.4: identify a general method for constructing solutions to inhomogeneous linear constant-coefficient second-order equations

101.5: show an awareness of initial and boundary conditions to obtain particular values of constants in the general solution of second-order differential equations

Reference books: 1 W. D. REEVE *The Mathematics Teacher*

Vol. 15, No. 5 (May, 1922), pp. 303-307

Semester-I

Course name: Computer fundamental & office automation	**Course Code: BCA-102**
Credits = [L+T+P : 4+0+2]	**Total Hours = 60**

Objectives: The objective of the course is to introduce the concepts of computer fundamental & their applications for the efficient use of office technology in a business environment

UNIT-I

Introduction to Computers **15 hrs**

Introduction, Characteristics of Computers, Block diagram of computer. Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers. Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages). Data Organization, Drives, Files, Directories. Types of Memory (Primary And Secondary) RAM, ROM, PROM, EPROM. Secondary Storage Devices (FD, CD, HD, Pen drive) I/O Devices (Scanners, Plotters, LCD, Plasma Display) Number Systems Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication

UNIT-II **12 hrs**

Algorithm and Flowcharts

Algorithm: Definition, Characteristics, Advantages and disadvantages, Examples Flowchart: Definition, Define symbols of flowchart, Advantages and disadvantages, Examples

UNIT-III **10 hrs**

Operating System and Services in O.S.

Dos – History, Files and Directories, Internal and External Commands, Batch Files, Types of O.S.

UNIT-IV **10 hrs**

Windows Operating Environment

Features of MS – Windows, Control Panel, Taskbar, Desktop, Windows Application, Icons, Windows Accessories, Notepad, Paintbrush.

UNIT-V **13 hrs**

Editors and Word Processors

Basic Concepts, Examples: MS-Word, Introduction to desktop publishing.

Spreadsheets and Database packages

Purpose, usage, command, MS-Excel, Creation of files in MS-Access, Switching between application, MS-PowerPoint.

Outcome:

102.1: Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming

102.2: Analyze and understand in-depth training in use of office automation packages, internet etc.

102.3: Enhance the ability of essential for common man for day to day office management, and e-governance.

102.4: To understand what computer is? To understand the Basics of Operating systems

102.5 To evaluate how to use software packages in day to day activities

Reference books:

1. Fundamentals Of Computers" by REEMA THAREJA from OXFORD UNIVERSITY PRESS

2. Microsoft Office 2007 Fundamentals, 1st Edition By Laura Story, Dawna Walls (UNIT I, UNIT II, UNIT III, UNIT IV)

3."Computer Fundamentals and Programming in C" by REEMA THAREJA from OXFORD UNIVERSITY PRESS

4. PC SOFTWARE UNDER WINDOWS by Puneet Kumar And Sushil Bhardwaj From Kalyani Publishers

Semester-I

Practical-I

Course Name: Ms- office lab	**Course Code: BCA-151**
Credits = [L+T+P : 0+0+2]	**Total Hours = 30**

Objectives: The objective of the course is to introduce the concepts of computer fundamental & their applications for the efficient use of office technology in a business environment.

1. Prepare your class time table using different Text formatting's in a table.

2. Send a Call Letter for All Applicants to Inform Interview Details using Mail Merge

3. Type your mathematical problems in MS word using Mathematical Equation editor

4. Create Water Marking

5. Create Backup file

6. Create a short film with animation and sound effects

7. Create a payslip with details of employee salary

8. Calculate student grades using his internal and external marks details

9. Draw different types of charts for weather analysis of 5 successive years

10. Prepare an excel sheet for posting attendance of students in various subjects and create a formula for promoting students having 75% minimum attendance

11. Prepare an excel sheet for conducting objective entrance test having multiple choice answers.

12. Prepare an excel sheet for student details and create formulas for accessing student addresses, category etc.

Outcome: 151.1: Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming

151.2: Analyze and understand in-depth training in use of office automation packages, internet etc.

151.3: Enhance the ability of essential for common man for day to day office management, and e-governance.

151.4: To understand what computer is? To understand the Basics of Operating systems

151.5 To evaluate how to use software packages in day to day activities

Reference books:

1. Fundamentals of computers " by reema thareja from oxford university press

2. Microsoft office 2007 fundamentals, 1st edition by laura story, dawna walls (unit i, unit ii, unit iii, unit iv)

3."computer fundamentals and programming in c" by reema thareja from oxford university press

4.pc software under windows by puneet kumar and sushil bhardwaj from kalyani publishers

Semester-I

Course name: Programming principles and algorithms	**BCA-103**
Credits = [L+T+P : 4+0+2]	**Total Hours = 60**

Objectives:

1. Learn how to solve common types of computing problems.

2. Learn data types and control structures of C

3. Learn to map problems to programming features of C.

4. Learn to write good portable C programs.

UNIT-I **12 hrs**

Introduction to 'C' Language

History, Structures of 'C' Programming, Function as building blocks.

Language Fundamentals

Character set, C Tokens, Keywords, Identifiers, Variables, Constant, Data Types, Comments.

UNIT-II **16 hrs**

Operators

Types of operators, Precedence and Associativity, Expression, Statement and types of statements

Build in Operators and function

Console based I/O and related built in I/O function: printf(), scanf(), getch(), getchar(), putchar(); Concept of header files, Preprocessor directives: #include, #define.

Control structures

Decision making structures: If, If-else, Nested If-else, Switch; Loop Control structures: While, Do-while, for, Nested for loop; Other statements: break, continue, goto, exit.

UNIT-III

Introduction to problem solving **12 hrs**

Concept: problem solving, Problem solving techniques (Trail & Error, Brain Stroming, Divide & Conquer) Steps in problem solving (Define Problem, Analyze Problem, Explore Solution) Algorithms and Flowcharts (Definitions, Symbols), Characteristics of an algorithm Conditionals in pseudo-code,

Loops in pseudo code Time complexity: Big-Oh notation, efficiency Simple Examples: Algorithms and flowcharts (Real Life Examples)

UNIT-IV **10 hrs**

Simple Arithmetic Problems

Addition / Multiplication of integers, Determining if a number is +ve / -ve / even / odd, Maximum of 2 numbers, 3 numbers, Sum of first n numbers, given n numbers, Integer division, Digit reversing, Table generation for n, a^b, Factorial, sine series, cosine series, ${}^{n}C_{r,}$ Pascal Triangle, Prime number, Factors of a number, Other problems such as Perfect number, GCD numbers etc (Write algorithms and draw flowchart), Swapping

UNIT-V

Functions **10 hrs**

Basic types of function, Declaration and definition, Function call, Types of function, Parameter passing, Call by value, Call by reference, Scope of variable, Storage classes, Recursion.

Outcome: ***At the end of the course, students would be able to***

103.1 : Understand the fundamental syntax & computer programs

103.2: Understand the fundamental control and loop (iteration) structures program simple algorithms, such as counting, summing, and finding Maximum/minimum

103.3: Implement, test, and debug simple recursive functions and procedures

103.4 : Analyze the basic data structures used in programming (data types and functions etc).

103.5: Demonstrate knowledge of C concepts: variables, functions, etc

Reference books:

1. Computer Fundamentals and Programming in C by REEMA THAREJA from OXFORD UNIVERSITY PRESS

2. E Balagurusamy: ―COMPUTING FUNDAMENTALS & C PROGRAMMING‖

– Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066 909-3.

3. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.

4.2. Henry Mullish & Huubert L.Cooper: The Sprit of C , Jaico Pub. House,1996.

5. Teach your C Skills-Kanithker

Semester-I

Practical-II

Course Name: Programming & Algorithm Lab	**Code: BCA-152**
Credits =[L+T+P : 0+0+2]	**Total Hours = 30**

Objectives: 1. Learn how to solve common types of computing problems.

2. Learn data types and control structures of C

3. Learn to map problems to programming features of C.

4. Learn to write good portable C programs.

1. Write a C program to calculate the expression: ((a*b)/c)+(a+b-c)

2. Write a C program to calculate (a+b+c)3.

3. Program to convert temperature from a. Celsius to Fahrenheit. b. Fahrenheit to Celsius.

4. Write a C program to calculate the Compound Interest.

5. Program to convert Hours into seconds.

6. Write a C program to Fine Biggest of Three numbers.

7. Write a C program to read student marks in five subjects and calculate the Total, Average and Grade according to the following conditions: i. If average >=75 grade is _A'. ii. If average >=60 and <75 grade is _B'. iii. If average >=50 and <60 grade is _C'. iv. Otherwise grade is _D'. v. Check that marks in each subject >= 35.

8. Write a C program to find biggest of two numbers using Switch – Case.

9. Program to display number of days in given month using Switch – -Case.

10. Write a C program to check whether the given number is Prime or Not.

Outcome: ***At the end of the course, students would be able to***

152 .1 : Understand the fundamental syntax & computer programs

152.2: Understand the fundamental control and loop (iteration) structures program simple algorithms, such as counting, summing, and finding Maximum/minimum

152.3: Implement, test, and debug simple recursive functions and procedures

152.4 : Analyze the basic data structures used in programming (data types and functions etc).

152.5: Demonstrate knowledge of C concepts: variables, functions, etc

Reference books:

1. Computer Fundamentals and Programming in C by REEMA THAREJA from OXFORD UNIVERSITY PRESS

2. E Balagurusamy: ―COMPUTING FUNDAMENTALS & C PROGRAMMING‖ – Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066 909-3.

3. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.

4.2. Henry Mullish & Huubert L.Cooper: The Sprit of C , Jaico Pub. House,1996.

5. Teach your C Skills-Kanithker

Semester-I

Ability Enhancement Course-I

Course Name: English Communication	**AECC-1**
Credits = [L+T+P : 2+0+0]	**Total Hours = 30**

Objectives: The purpose of commencing English communication skills course is to develop in students fundamental communication skills being integral to personal, social and professional interactions. One of the significant associations among human beings is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. The present course hopes to address most of these aspects through an interactive approach of teaching learning process; focusing on various dimensions of communication skills. The course also focuses on enhancing the ability to handle casual and formed satiations in terms of personal and intellectual grooming.

Syllabus Modules:

Module 01 – Self Introduction

- Introducing self
- Speaking about achievements
- Voicing future aspects

Module 02 – Non verbal Communication

- Body Language
- Paralanguage skills

Module 03 – Manners and Etiquettes

- Personal grooming
- Dress code
- Telephone etiquettes
- Intellectual grooming

Module 04 – Conversation in Real life situations

- Meeting people,
- Traveling
- Visiting Places
- Shopping

Module 05 – Public Speaking skills

- Extempore
- Role Play
- Group Discussion

Module 06 – Practical Assessment

- Presentations

Outcomes:

1. Projecting the first impression
2. Use simple forms of polite expressions to establish basic social contact and to perform everyday functions including making requests and offers, conducting simple phone conversations, asking and telling time, giving simple directions, asking about price, ordering a meal, etc.
3. Students learn to use general, social and professional language.
4. Polishing manners to behave appropriately in social and professional circles.
5. Handling difficulty situations with grace style and professionalism.

References:

1. An introduction to Professional English and Soft Skills by B. K. Das et al., Cambridge University Press
2. Technical Communication: Principles and Practice, Second Edition by Meenakshi Raman and Sangeeta Sharma, Oxford Publications.
3. Effective Technical Communication by M Ashraf Rizvi, The McGraw-Hill companies.
4. Understanding Body Language by Alan Pease.
5. Communicative Grammar of English by Geoffrey Leech and Ian Svartik.
6. Better English Pronunciation by J.D.O'Connor.
7. English Grammar by Wren and Martin.
8. Strengthen Your English, M. Bhaskaran and D. Horsburgh, Oxford University Press, Delhi 1973

Semester-II

Core Course-I

Course Name: Mathematics-II	**BCA-201**
Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: The Mathematics program promotes mathematical skills and knowledge for their intrinsic beauty, effectiveness in developing proficiency in analytical reasoning, and utility in modeling and solving real world problems. To responsibly live within and participate in the transformation of a rapidly changing, complex, and interdependent society, students must develop and unceasingly exercise their analytical abilities. Students who have learned to logically question assertions, recognize patterns, and distinguish the essential and irrelevant aspects of problems can think deeply and precisely, nurture the products of their imagination to fruition in reality, and share their ideas and insights while seeking and benefiting from the knowledge and insights of others

Unit – I **12 hrs**

The real number system as a complete ordered field, neighbourhood, open and closed sets, limit points of sets.

Unit – II **12hrs**

Limits, continuity, sequential Continuity, algebra of Continuous functions, Continuity of composite functions, Continuity on (a,b) implying boundedness.

Unit – III **12hrs**

Sequence, convergent sequence, Cauchy Sequence, monotonic sequence, Sub-sequence, Limit superior and limit inferior of sequences.

Unit – IV **12hrs**

Infinite series, convergence of series, series of positive terms, comparison tests, Cauchy's n^{th} root test, D' Alemberts ratio test, Raabe's test.

Unit – V **12 hrs**

Alternating series and Maclaurin's series for sin x, cos x, log (1+x), (1+x)n . Applications of mean value theorem to monotonic functions and inequalities. Maxima and minima; Indeterminant forms (applications of Maxima and Minima to simple Problems).

Outcome: ***At the end of the course, students would be able to***

201.1: Describe fundamental properties of the real numbers that lead to the formal development of real analysis;

201.2: . Comprehend rigorous arguments developing the theory underpinning real analysis.

201.3: Demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration;.

201.4: Construct rigorous mathematical proofs of basic results in real analysis;

201.5: Appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.

Reference books: 1 W. D. REEVE *The Mathematics Teacher* Vol. 15, No. 5 (May, 1922), pp. 303-307

Semester-II

Core Course-II

Course Name: DBMS	BCA-202
Credits = [L+T+P : 4+0+2]	Total Hours = 60

Objectives: Upon completion, students should be able to design and implement normalized database structures by creating simple database tables, queries, reports, and forms. **Course Objectives**: ... To develop an understanding of essential **DBMS** concepts such as: database security, integrity, concurrency,

Unit – I **12 hrs**

Overview of Database Management System

Elements of Database System, DBMS and its architecture, Advantage of DBMS (including Data independence), Types of database users, Role of Database administrator.

Unit – II **14 hrs**

Data Models

Brief overview of Hierarchical and Network Model, Detailed study of Relational Model (Relations, Properties, Key & Integrity rules), Comparison of Hierarchical, Network and Relational Model ,CODD's rules for Relational Model,E-R diagram.

Unit – III **12 hrs**

Normalization

Normalization concepts and update anomalies ,Functional dependencies, Multivalued and join dependencies.

Normal Forms: (1 NF, 2 NF, 3NF, BCNF, 4NF, and 5NF)

Unit – IV **11 hrs**

SQL

SQL Constructs, SQL Join: Multiple Table Queries, Build-in functions, Views and their use, Overviews of ORACLE: (Data definition and manipulation)

Unit – V **11 hrs**

Database Security, Integrity and Control

Security and Integrity threats, Defense mechanism, Integrity, Auditing and Control, Recent trends in DBMS-Distributed and Deductive Database.

Outcome: ***At the end of the course, students would be able to***

202.1: Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.

202.2: Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.

202.3: Demonstrate an understanding of the relational data model.

202.4: Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

202.5: Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database. Use a desktop database package to create, populate, maintain, and query a database.

Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.

Reference books: 1. Fundamentals of Relational Database Management Systems by S. Sumathi, S. Esakkirajan, Springer Publications

Semester-II

Practical-I

Course Name: DBMS-LAB	**BCA-251**
Credits = [L+T+P : 0+0+2]	**Total Hours = 30**

Objectives: Upon completion, students should be able to design and implement normalized database structures by creating simple database tables, queries, reports, and forms. **Course Objectives**: ... To develop an understanding of essential **DBMS** concepts such as: database security, integrity, concurrency

1. The Order Tracking Database consists of the following defined six relation schemas.

- Employees(no, name, zip, date)
- Parts(no, name, ,price, level) (hint: quality on hand)
- Customers(no, name, street, zip ,phone)
- Orders(no, received date, shipped date)
- details(no, qty)
- Zip codes(zip, city)

Solve the following queries

2. Get all pairs of customer numbers for customers based on same zip code.

3. Get part numbers for parts that have been ordered by at least two different customers.

4. For each detail row, get no, name, qty and price values along with the total price for the item. (total price=price*qty)

5. Get customer name and employee pairs such that the customer with name has placed an order through the employee

6. Get customer names living in fort dodge or liberal.

7. Get name values of customers who have ordered a product with no 10506.

8. Get name values of parts with the lowest price.

Outcome:

Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database. Use a desktop database package to create, populate, maintain, and query a database. Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.

Reference books: Fundamentals of Relational Database Management Systems by S. Sumathi, S. Esakkirajan, Springer Publications

Semester-II

Core Course-III

Course Name: C-Programming	**BCA-203**

Credits = [L+T+P : 4+0+2]	**Total Hours =60**

Objectives: The **course** is designed to provide complete knowledge of **C language**. Students will be able to develop logics which will help them to create programs, applications in **C**. Also by **learning** the basic **programming** constructs they can easily switch over to any other **language** in future

UNIT-I **13 hrs**

Arrays

Definition, declaration and initialization of one dimensional array; Accessing array elements; Displaying array elements; Sorting arrays; Arrays and function; Two- Dimensional array: Declaration and Initialization, Accessing and Displaying, Memory representation of array [Row Major, Column Major]; Multidimensional array

UNIT-II **12hrs**

Pointers -Definition and declaration, Initialization; Indirection operator, address of operator; pointer arithmetic; dynamic memory allocation; arrays and pointers; function and pointers

UNIT-III **14 hrs**

Strings

Definition, declaration and initialization of strings; standard library function: strlen(), strcpy(), strcat(), strcmp(); Implementation without using standard library functions

Structures

Definition and declaration; Variables initialization; Accessing fields and structure operations; Nested structures; Union: Definition and declaration; Differentiate between Union and structure

UNIT-IV **12 hrs**

Introduction C Preprocessor

Definition of Preprocessor; Macro substitution directives; File inclusion directives; Conditional compilation

Bitwise Operators

Bitwise operators; Shift operators; Masks; Bit field

UNIT-V **09hrs**

File handling

Definition of Files, Opening modes of files; Standard function: fopen(), fclose(), feof(), fseek(), fewind();Using text files: fgetc(), fputc(), fscanf() ,Command line arguments

Outcome: ***At the end of the course, students would be able to***

203.1: Understand the basic terminology used in computer programming

203.2: Write, compile and debug programs in C language.

203.3: Use different data types in a computer program.

203.4: Design programs involving decision structures, loops and functions

203.5: Evaluate the usability of File and preprocessors of c Programming terminology.

Reference books:

1. SamanthaD, Classic Data Structures, Prentice-Hall of India, 2001.

2. Heilman G I,. Data Structures, Algorithms and Object-Oriented Programming, Tata McGraw-l lill. 2002. (Chapters I and 14).

3. Tremblay .1 P, and Sorenson P G, Introduction to Data Structures and Applications, Tata McGraw-Hill,

Semester-II

Practical-II

Course Name: C- Programming Lab	BCA-252

Credits = [L+T+P : 0+0+2]	Total Hours = 30

Objectives: The **course** is designed to provide complete knowledge of **C language**. Students will be able to develop logics which will help them to create programs, applications in **C**. Also by **learning** the basic **programming** constructs they can easily switch over to any other **language** in future

1. WAP to print "Welcome to C" on the console screen.
1. WAP to input a Number and print it.
2. WAP to Input two Numbers and print the addition of them.
3. Write a program to perform the addition on three floating numbers.
4. WAP to find the average of two given numbers.
5. WAP to find the average of five given numbers.
6. WAP to find the area of circle
7. WAP to find the area of square
8. Write a program to find the area of triangle.
9. Write a program to find the area of rectangle.
10. Write a program to print number from 1 to 10 using while loop
11. Write a program to find the multiple of a given number or find the table of given number using do-while loop.
12. Write a program to find the sum of n natural numbers using while loop.
13. Write programs to find the power of required number using do-while loop.
14. Write a program to find the multiple of a given number or find the table of given number using for loop.
15. Write a program to find the sum of n natural numbers using for loop.
16. Write a program to find factorial of given number
17. Write a program to make a pascal triangle.

18. Write a program for swapping of two numbers using function

19. Write a program for addition of two numbers using function

20. Write a program to find factorial of given number using recursion.

Outcome: 203.4: Design programs involving decision structures, loops and functions

203.5: Evaluate the usability of File and preprocessors of c Programming terminology.

Reference

1. SamanthaD, Classic Data Structures, Prentice-Hall of India, 2001.

2. Heilman G I,. Data Structures, Algorithms and Object-Oriented Programming, Tata McGraw-l lill. 2002. (Chapters I and 14).

3. Tremblay .1 P, and Sorenson P G, Introduction to Data Structures and Applications, Tata McGraw-Hill,

Semester-II

Ability Enhancement Course-II

Course Name: Environmental studies	**AECC-2**

Credits = [L+T+P : 2+0+0]	**Total Hours =30**

1. **Objectives:** Understanding of major concepts in environmental sciences and creating the awareness about environmental problems among people;
2. Recognize the interconnectedness of multiple factors in environmental challenges;
3. Imparting basic knowledge about the environment and its allied problems to develop an attitude of concern for the environment in respect to environment protection and environment improvement;
4. Motivating students to participate in Develop analytical skills, critical thinking, in identifying and solving environmental problems.

UNITS

Unit 1: Concept of Environment **(** 3 Hrs)

Definition and concept of environment; Types and components of environment (Lithosphere, Atmosphere, Hydrosphere, Biosphere); Scope and multidisciplinary nature of the subject; Man-environment relationships.

Unit 2: Ecology and Ecosystems (7 Hrs)

Concepts of Ecology: Subdivisions of ecology; Ecological factors - climatic, edaphic, physiographic and biotic; Concept of Biological clock; physiological adaptation of Hydrophytes, Xerophytes, mesophytes; Ecological Succession and classification (hydrosere, xerosere, mesosere etc.).

Structure and Functions of Ecosystem; a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries); Trophic Levels; Ecological Pyramids; food chains and food webs; Energy flow in an ecosystem; Ecological Interactions; Ecotone; Habitat; Ecological Niche; Resilience.

Unit 3: Environmental Pollution and Global Environmental Issues (6 Hrs)

Environmental pollution: types, causes, effects and controls; Air, water, soil, noise, thermal and radioactive pollution; Solid waste management: Control measures of urban and industrial waste, special reference e-waste, biomedical waste; Climate change; global warming; ozone layer depletion; acid rain and its impacts on human communities and agriculture; Case studies on Pollution Tragedies: Love canal, Bhopal Gas, Endosulfan and Minamata; International Agreements: IPCC, Montreal and Kyoto protocol.

Unit 4: Natural Resource Management and Biodiversity Conservation (8 Hrs)

Renewable and non renewable energy resources, use of alternate energy resources, Water resources: sources, usage, over-exploitation and sustainable management of water resources; Conflicts over water (international & inter-state); Land resources: land use change, land degradation, soil erosion and desertification; Forest Resources: types of forest in India, importance of forests, deforestation, Disaster management: floods, earthquake, cyclones and landslides.

Conservation of biodiversity: *In-situ and Ex-situ* conservation of biodiversity; IUCN-Red Data Book categories; Hot spots in India; Biomes; Role of Govt. and Non-Government organizations in Conservation of Biodiversity in India; International Biodiversity conservation practices and strategies.

Unit 5: Environmental Education and Management (6 Hrs)

Environmental Education and movements: Goals of environmental education; Environmental education at primary, secondary and tertiary level Chipko, Silent Valley, Bishnoi, Narmada Bacchao Andolan, and Tehri Dam Conflict; Environmental communication and public awareness; Environmental ethics: Green Politics, Earth Hour, Green Option Technologies; EIA- Principles and Process; ISO standards: ISO 9000 and 14000; Environment Laws and Practices.

Course Outcome: Students will be able,

1. To understand the concept and function of the environment and recognize the physical, chemical, and biological components of the earth's systems and their functions.
2. To acquire the awareness on the ecosystem structure and process which interlinked with human survival, intensively need attention at global and regional level.
3. To identify common and adverse impacts of human activities on biotic communities, soil, water, and air quality and suggest sustainable strategies to mitigate these impacts;

4. Develop an understanding of environmental pollutions and hazards and general measures to control them.
5. To identify surrounding natural resources including renewable resources and non-renewable resources and practices for their restoration.
6. To realize the importance of biodiversity for maintaining ecological balance and Global conservation practices and strategies.
7. To analyze the need for sustainable development in respect of environmental management through Policies, movements and social awareness.
8. To acquire skills required to research and analyze environmental issues scientifically in applied situations such as careers.

References:

BOOK:

1. Banerji, K.S., *Environmental Chemistry*, TMH publication.

2. Bhargava & Gupta, *Environmental Pollution & Human Health*, CBS publication.

3. D. K. Asthana, *Environment : Problems & Solutions*, S. Chand Publishing, 2001

4. G. Tyler Miller, Environmental Science Working With the Earth, Cengage Learning.

5. Ghosh, G.K., Environment and Development, ARH publication.

6. Godfrey Boyle, Renewable Energy, Oxford University Press.

7. Kumar, A., Environment Pollution and Management, ARH publication.

8. M K Varshney, Environmental Pollution & Control, Ashian Publication.

9. Odum Eugene P, Fundamental of Ecology, Cengage Learning

10. Rajagopalan, R, Environmental Studies, Oxford University Press

11. Sakarama Somayaji, Environmental Concept and Sustainable Development, TERI.

12. Shivdut Upadhyay, Environmental Education and Disaster Management, Bharat Publication.

13. Shrivastava, A.K., Environmental Ethics, ARH publication.

14. Trivedi, P.R., Ecology & Environment, ARH publication.

Semester-III

Core Course-I

Course Name: Discrete Mathematics	**BCA-301**

Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: Simplify and evaluate basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth tables and the properties of logic.

- E xpress a logic sentence in terms of predicates, quantifiers, and logical connectives
- Apply the operations of sets and use Venn diagrams to solve applied problems; solve problems using the principle of inclusion-exclusion.

Unit-I Mathematical Logic **12hrs**

Statements, simple statement, compound statement , Combination of truth table, Negation operation, connectivity, conjunction, disjunction, conditional, bi-conditional statements, NOR,NAND,XOR, Tautology, contradiction, contingency, Logically equivalency, Duality, Argument, valid Argument, invalid Argument, algebra of Proposition.

Unit-II Boolean algebra **14hrs**

Development of Boolean Algebra, AND, OR, NOT Operations, Truth table, Law of Boolean Algebra, Reducing Boolean expressions, principle of Duality, Minterm, Maxterm, K-map ,Reduction of maps, Switching Algebra, Application of Boolean Algebra of switching circuit designs, Combinations of two switches in an electric circuit, Different positions of switches and currents in the electric circuit, switching circuits and functions of three switches, Logic gates and circuits.

Unit-III Graph Theory **12hrs**

Definition of graph, Types of graph, finite graph, infinite graph , Application of graph, incidence and degree of a vertex, self loop, parallel edges, pendant vertex, isolated vertex, sub-graph, walk, Types of walk, path, circuit, connected and disconnected graph, cut set, cut vertex, planner graph, non planner graph, incidence matrix, adjacency matrix, path matrix, Eulerian graph, complete graph, regular graph,

Bipartite graph, rank and nullity of graph, tree, application of trees, spanning tree, rooted tree, ordered rooted tree, expression tree.

Unit-IV **12hrs**

Regular expressions, Generalized Transition graph. Conversion of regular expression to Finite Automata, FA, DFA, Conversion of NFA to DFA, FA with output: Moore machine, Mealy machine, Conversions.

Unit-V **10 hrs**

Kleene Closure, Arithmetic expressions, Chomsky Hierarchy Non-regular language: Pumping Lemma, Pushdown Automata, and Introduction to Turing Machine .

Outcome: 301.1: Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.

301.2: Understand the basic principles of sets and operations in sets.

301.3: Demonstrate an understanding of relations and functions and be able to determine their properties

301.4: Acquire ability to describe computer programs (e.g. recursive functions) in a formal mathematical manner

301.5: Have substantial experience to comprehend formal logical arguments

Reference books:

1. Discrete structures and graph theory by T.V. Rajani Kanth, K. Vijayalakshmi, Hi – Tech Publishers.

2. Mathematical foundation for Computer Science for B.Tech JNTU by Dr. Swapan Kumar Sarkar, S. Chand Publishers

Semester-III

Core Course-II

Course Name: Operating System	**BCA-302**

Credits = [L+T+P : 4+0+2]	**Total Hours = 60**

Objectives:

1.To understand the services provided by and the design of an operating system.

2. To understand the structure and organization of the file system.

3. To understand what a process is and how processes are synchronized and scheduled.

4. To understand different approaches to memory management.

5. Students should be able to use system calls for managing processes, memory and the file system.

6. Students should understand the data structures and algorithms used to implement an OS.

Unit – I **12 hrs**

Operating Systems and Resource Manager, Operating system classifications, simple monitor, multiprogramming, timesharing, real time systems, multiprocessor systems, operating systems services.

Unit – II **12 hrs**

File System : File supports, access methods, allocation methods-contiguous linked and index allocation; directory systems single level, tree-structure, a cyclic graph and general graph directory, file protection.

Unit – III **12 hrs**

CPU Scheduling: Basic scheduling concepts, Process overviews, process states, multiprogramming, Schedulers, and Scheduling algorithms, multiple- processor scheduling.

Unit – IV **13 hrs**

Memory Management: Bare machine approach, resident monitor, Partition, Paging and segmentation, virtual memory, demand paging.,Deadlocks: Deadlock Characterizations, deadlock prevention, avoidance detection and recovery.

Unit – V **11 hrs**

Resource Protections : Mechanisms, Policies & domain of protection, Access matrix and its implementation, dynamic protection structures.Case Study of Windows-NT: Design Principle; System components, Environment subsystem; File System, Programmer Interface.

Outcome:

302.1: Analyze the structure of OS and basic architectural components involved in OS design.

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

302.3: Demonstrate the various device and resource management techniques for timesharing and distributed systems

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

302.5: Interpret the mechanisms adopted for file sharing in distributed Applications and conceptualize the components involved in designing a contemporary OS

Reference books:

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.

2.Principles of Operating Systems by Naresh Chauhan, OXFORD University Press

3. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.

4. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.

5. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhere, TMH.

6.Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.

7.Operating Systems, A. S. Godbole, 2nd Edition, TMH

Semester-III

Practical-I

Course Name: Operating System Lab	**BCA-351**

Credits = [L+T+P : 0+0+2]	**Total Hours =30**

Objectives:

1.To understand the services provided by and the design of an operating system.

2. To understand the structure and organization of the file system.

3. To understand what a process is and how processes are synchronized and scheduled.

4. To understand different approaches to memory management.

1. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time. (2 sessions)

2. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time. (2 sessions)

3. Developing applications using Inter Process Communication (using shared memory, pipes or message queues)

4. Implement the Producer – Consumer problem using semaphores

5. Implement any two memory management schemes

6. Implement any two file allocation techniques (Linked, Indexed or Contiguous)

7. Implement any two Page Replacement Algorithms

8. Implement Deadlock prevention algorithm.

9. Implement any two disk scanning algorithms

Outcome: Demonstrate the various device and resource management techniques for timesharing and distributed systems

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

Interpret the mechanisms adopted for file sharing in distributed

Reference books: **Personal Computer Hardware and Troubleshooting Reference Guide**
Kenneth C. Mansfield, Kenneth C. Mansfield

E-Sources:

Semester-III

Core Course-III

Course Name: Data structure & Programming with "C"	**BCA-303**

Credits = [L+T+P : 4+0+2]	**Total Hours = 60**

Objectives: 1. To impart the basic concepts of data structures and algorithms

2.To understand concepts about searching and sorting techniques

3.To Understand basic concepts about stacks , queues , lists , trees and graphs

4. To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

Unit – I **12 hrs**

C-Language Programming

Data types, I/O functions, Logical Operators, Control structures of C, Conditional Statements, Switch Statement, Arrays.

Unit – II **10hrs**

Pointers, Functions, Recursion, Structures & Unions, Operations on bits, File Handling & C Preprocessor.

Unit – III **12 hrs**

Data Structure

Introduction to Algorithm Design and Data Structure : Design & analysis of algorithm, Topdown and Bottom-up approaches to algorithm design, Analysis of algorithm, Frequency count, Complexity measures in terms of time and space.

Unit – IV **14 hrs**

Arrays; Stacks and Queues : Representation of array (single & multi dimensional arrays), Address calculation using column & row major ordering, representation of stacks & Queues using arrays and their operations, circular queues, Applications of arrays, stacks & queues, conversions from Infix to postfix & prefix and evolution of prefix expressions using stack.Linked list: Singly linked list (Operations on list), Linked stacks and queues, polynomial representation and manipulation using linked list. Application: Reading and writing polynomials, polynomial addition. Circular linked list and doubly linked list, generalized list, sparse matrix representation using generalized list structure.

Unit – V **12 hrs**

Trees : Logical level of binary search tree, BST transversal methods (Preorder, Postorder and Inorder), Recursive and non-recursive algorithms for traverse method, Insertion into and deletion from a BST and their implementation, preorder and Postorder, traversal, Insertion in Threaded tree, B-tree (Insertion and Deletion algorithms).Searching and Sorting: Sequential and binary searches, Indexed search, Hashing schemes, Sorting methods (Insertion, Selection, Bubble, Quick, Merge and Heap Sorts).

Outcome: 303.1: Analyze algorithms and algorithm correctness

303.2: summarize searching and sorting techniques

303.3: Describe stack, queue and linked list operation

303.4: Ability to have knowledge of tree and graphs concepts

303.5 To develop application using data structures

Reference books: :

1. Data Structures and Algorithms, 2008, G. A. V. Pai, TMH

2. Classic Data Structures, 2/ e, Debasis , Sarnanta,PHI,2009

3.Fundamentals of Data Structure in C, 2le,' Horowitz, Sahni, Anderson Freed, University Press.

Semester-III

Practical-II

Course Name: Data Structure Lab	**BCA-352**

Credits = [L+T+P : 0+0+2]	**Total Hours = 30**

Objectives: To Understand basic concepts about stacks , queues , lists , trees and graphs

To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

1. Write Programs to implement the Stack operations using an array.

2. Write Programs to implement the Queue operations using an array.

3. Write Programs to implement the Stack operations using Pointers.

4. Write Programs to implement the Queue operations using Pointers.

5. Write a program for arithmetic expression evaluation.

6. Write a program for Binary search Tree Traversals

7. Write a program to implement dequeue using a doubly linked list.

8. Write a program to search an item in a given list using (i) Linear Search (ii) Binary Search.

9. Write a program for (i)Bubble Sort (ii) Quick Sort (iii)Merge Sort.

10. Write a program for polynomial addition using SLL

Outcome:

352.1 : Analyze algorithms and algorithm correctness

352.2: summarize searching and sorting techniques

352.3: Describe stack, queue and linked list operation

352.4: Ability to have knowledge of tree and graphs concepts

352.5 To develop application using data structures

Reference books: :

1. Data Structures and Algorithms, 2008, G. A. V. Pai, TMH

2. Classic Data Structures, 2/ e, Debasis , Sarnanta,PHI,2009

3.Fundamentals of Data Structure in C, 2le,' Horowitz, Sahni, Anderson Freed, University Press

Semester-III

Skilled Enhancement Course (A)

(Choose any one FROM A AND B)

Course Name: Computer Hardware Technology & Installation	**BCA--304 A**

Credits =[L+T+P : 3+0+2]	**Total Hours = 60**

Objectives: Identifying external ports and interfacing of peripherals such as monitor, keyboard, mice, speakers, printers, modem, mother board, memory board, display card, NIC card, sound blaster card, interfacing floppy drives, Hard disk, CDROMs

UNIT 1 **12 hrs**

Introducing Hardware, Hardware Needs Software to Work ,PC Hardware Components , Hardware Used for Input and Output , The Motherboard , The CPU and the Chip Set , Storage Devices, Interface (Expansion) Cards ,Input and output devices

UNIT-II: **12 hrs**

Introduction and history of Operating systems, structure and operations, processes and files, Understanding the Boot Process and Command Line Accessing ,Command Prompt Launching a Program Using the Command Prompt, File and Directory Naming Conventions, Wildcards Commands to Manage Disks, Hard Drives, Files, and Directories.

UNIT-III **12 hrs**

Electricity and Power Supplies , Measures and Properties of Electricity ,AC and DC, Protecting Your Computer System ,EMI (Electromagnetic Interference),Surge Protection and Battery Backup, Case Power Supply, and Motherboard Form Factors ,Types of Cases ,Power Supply Problems, Upgrading Your Power Supply, Introduction to Troubleshooting ..

UNIT-IV **12 hrs**

The Motherboard, Types of Motherboards, Components on the Motherboard, Preparing the Motherboard to Go into the Case , Installing the Motherboard in the Case , Completing the Installation, Troubleshooting the Motherboard and CPU,ROM BIOS, Buses and Expansion Slot, Hardware Configuration, Protecting Documentation and Configuration Settings, Building a Computer .

UNIT-V **12 hrs**

Windows, Window XP, Window 7, Window vista, Understanding and Installing Windows, Managing and Troubleshooting Windows, Managing and Supporting Windows XP, Windows Update, Keystroke Shortcuts in Windows, Virtual Machines, System Restore, System Recovery, Error Messages and Their Meanings.

Outcome: 1 Understand what all the terms highlighted in bold in the text mean

2. Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components

3. Understand the difference between an operating system and an application program, and what each is used for in a computer

4. Describe some examples of computers and state the effect that the use of computer technology has had on some common products

5. Identify the principal components of a given computer system and draw a diagram after the style of Figures 6 and 12 to represent the data flows between them

Reference books: 1. Personal Computer Hardware and Troubleshooting Reference Guide
Kenneth C. Mansfield, Kenneth C. Mansfield

Semester-III

Skilled Enhancement Course (B)

Course Name: Applications of Office Tools	**BCA-304 B**

Credits = [L+T+P : 3+0+2]	**Total Hours = 60**

Objectives: The objective of the course is to introduce the concepts of computer fundamental & their applications for the efficient use of office technology in a business environment

UNIT-I **12 hrs**

Microsoft Office 365: Office on demand, Office Web Apps, SkyDrive and SkyDrive Pro, Most Used Office Applications, Creating a Microsoft Account, Managing Account Settings.

UNIT –II **12 hrs**

Microsoft Skydrive and SkyDrive Pro: Getting Started with SkyDrive, Creating a Document, Sharing a Document, Using SkyDrive App, Uploading Files from Your Computer, Uploading Files on the Web, Getting Started with SkyDrive Pro, Creating a Document, Sharing a Document, Uploading Files on the Web, Checking Your E-mail.

UNIT –III **12 hrs**

Microsoft Word 2013: Starting Word, The Ribbon, Basic Text Formatting Tools, Adding Images, Adding Tables, Saving Your Wok, Printing Your Work.

UNIT –IV **10 hrs**

PowerPoint 2013: Starting PowerPoint, The Ribbon, Designing a Slide, saving Your Work, Printing Your Work, Giving Presentations.

UNIT –V **06 hrs**

Microsoft Excel 2013: Starting Excel, What is Spreadsheet? , The Ribbon, Entering Data, using Formulas, Formatting Data, Adding Chart, Saving Your Work, Printing Your Work.

Outcome:

102.1: Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming

102.2: Analyze and understand in-depth training in use of office automation packages, internet etc.

102.3: Enhance the ability of essential for common man for day to day office management, and e-governance.

102.4: To understand what computer is? To understand the Basics of Operating systems

102.5 To evaluate how to use software packages in day to day activities

Reference books:

1. Fundamentals of computers " by reema thareja from oxford university press

2. Microsoft office 2007 fundamentals, 1st edition by laura story, dawna walls (unit i, unit ii, unit iii, unit iv)

3."computer fundamentals and programming in c" by reema thareja from oxford university press

4.pc software under windows by puneet kumar and sushil bhardwaj from kalyani publishers

5. Joe habraken, microsoft office 2000, 8 in 1 by, prentice hall of india

6. I.t. Tools and applications by a. Mansoor, pragya publications, matura

TEXT BOOK

1. Using Office 365: With windows 8 by Kevin Wilson

Semester-IV

Core Course-I

Course Name: Computer Communication Networks	BCA-401

Credits = [L+T+P : 4+0+2]	Total Hours = 60

Objectives: The **course objectives** include **learning** about **computer network** organization and implementation, obtaining a theoretical understanding of data communication and **computer networks**, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems.

Unit – I **12 hrs**

Introduction: Uses of networks, goals and applications. OSI reference model. Example Network- Novell Netware, ARPNET, NSFNET, The Internet.

Unit – II **13 hrs**

The Physical Layer: Transmission media : Twisted pair, Baseband and Broadband coaxial cable, Fiber optics; Wireless Transmission : Radio transmission, Microwave transmission, Infrared and light wave transmission; ISDN services; Virtual Circuits verses circuit Switching. Transmission in ATM Networks, Paging Systems, Cordless Telephones, Cellular telephones; Communication Satellite.

Unit – III **13 hrs**

The Data Link Layer : Framing, Error control, Flow control; Error detection and Correction; Protocols : Simplex stop and wait protocols, One bit sliding window, Using Go-Back n, Example: The Data Link Layer in the Internet.

The Medium Access Sub Layer : Framing Static and Dynamic Channel Allocation in LANS and MANs; IEEE standard 802.3 and Ethernet; IEEE standard 802.4 and Token Bus, IEEE 802.4 and token Ring; Bridges; Bridges from 802 x to 802 y, Transparent Bridges, Source Routing Bridges.

Unit – IV **12 hrs**

The Network Layer : Network layer design issues, shortest path routing. Flooding, Flow based routine, Broadcast routine, Congestion control and prevention policies; Internet working; connectionless Internet working, Tunneling Internet work Routing, Fragmentation, Firewalls, IP address, Internet control protocols.

Unit – V **10 hrs**

The Transportation Layer : The transport service; Transport protocols : Addressing, Establishing and releasing a connection; The internet transport protocols : TCP.

The Application Layer: Network Security, Electronic mail.

Outcome: 401.1: Independently understand basic computer network technology.

401.2: Understand and explain Data Communications System and its components.

401.3: Identify the different types of network topologies and protocols.

401.4: Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.

401.5: Identify the different types of network devices and their functions within a network and understand and building the skills of sub netting and routing mechanisms

Reference books: 1. Computer Networking: A Top-Down Approach Featuring the Internet by James F Kurose, Keith W. Ross, Second Edition, Addison Wesley Publication

Semester-IV

Core Course-II

Course Name: Computer Graphics & Multimedia Applications	**BCA-402**

Credits = [L+T+P : 4+0+2]	**Total Hours = 60**

Objectives: **Computer Graphics** is utilized by a wide variety of fields -- including **computer** science -- as a tool to assist in the problem solving aspects of the field. The primary **objective** of this **course** is to have -you- learn the basic principles of 3-dimensional **computer graphics**.

UNIT-I **14 hrs**

Introduction: The Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Classification of Application Development of Hardware and software for computer Graphics, Conceptual Framework for Interactive Graphics, Overview, Scan: Converting Lines, Scan Converting Circles, Scan Converting Ellipses.

UNIT-II **13 hrs**

Hardcopy Technologies, Display Technologies, Raster-Scan Display System, Video Controller, Random-Scan Display processor, Input Devices for Operator Interaction, Image Scanners, Working exposure on graphics tools like Dream Weaver, 3D Effects etc.

Clipping

Southland- Cohen Algorithm, Cyrus-Beck Algorithm, Midpoint Subdivision Algorithm

UNIT-III **10 hrs**

Geometrical Transformation

2D Transformation, Homogeneous Coordinates and Matrix Representation of 2D Transformations, composition of 2D Transformations, the Window-to-Viewport Transformations, Introduction to 3D Transformations Matrix.

UNIT-IV **10 hrs**

Representing Curves & Surfaces

Polygon meshes parametric, Cubic Curves, Quadric Surface;

Solid Modeling

Representing Solids, Regularized Boolean Set Operation primitive Instancing Sweep Representations, Boundary Representations, Spatial Partitioning Representations, and Constructive Solid Geometry Comparison of Representations.

UNIT-V **13 hrs**

Introductory Concepts: Multimedia Definition, CD-ROM and the multimedia highway, Computer Animation (Design, types of animation, using different functions) Uses of Multimedia, Introduction to making multimedia – The stage of Project, hardware & software requirements to make good multimedia skills and Training opportunities in Multimedia Motivation for Multimedia usage

Outcome: 402.1: Know and understand the structure and technologies needed in a multimedia system and be able to discriminate which technology may be more useful in order to best achieve the expected end result

402.2: Classify, Correlate and implement or effectively use advanced techniques in animation, modeling, visualization and graphics animation.

402.3: Analyze and compare the different kinds of user interfaces in order to be able to decide which one will be more efficient and ergonomic according to the required specifications of the application to be developed.

402.4: Recall the main concepts and operating techniques of Virtual Reality and Augmented Reality, so they can effectively decide and implement the most appropriate algorithms to suit the purpose of the application of Virtual Reality or Augmented Reality that they would like to develop.

402.5 : Analyze the graphics library OpenGL 3.1 (Open Graphics Library), used for graphical visualization in Windows, Linux and Mac OS platforms, as well as in workstations (Sun, Silicon Graphics) and GLSL shaders language, which willallow the students to implement shaders, graphic effects or optimization displays in scenes with lots of geometry.

Reference books:

1. “Computer Graphics” by Desai and Apurva A

2. “Fundamentals of Computer Graphics and Multimedia” by Mukherjee

3. “Express Learning – Computer Graphics and Multimedia” by ITL ESL

Semester- IV

Practical-I

Course Name: Computer graphics Lab	BCA-451

Credits = [L+T+P : 0+0+2]	Total Hours =30

Objectives: Objective is to make students aware of the concepts underlying modern Computer Graphics and Machine Vision. At the end of the course the student will have the generic skills to design algorithms for digital image synthesis for a broad-based set of computing problems in various domains. This course contains 2D geometric transformations , Algorithms for clipping, 3D geometric and modeling transformation, Illumination models and surface rendering methods

1. Implementation of Bresenhams Algorithm – Line, Circle, Ellipse.
2. Implementation of Line, Circle and ellipse Attributes
3. Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear.
4. Composite 2D Transformations
5. Cohen Sutherland 2D line clipping and Windowing
6. Sutherland – Hodgeman Polygon clipping Algorithm
7. Three dimensional transformations - Translation, Rotation, Scaling
8.Composite 3D transformations
9.Drawing three dimensional objects and Scenes
10.Generating Fractal images.

Outcome: 451.1: Know and understand the structure and technologies needed in a multimedia system and be able to discriminate which technology may be more useful in order to best achieve the expected end result

451.2: Classify, Correlate and implement or effectively use advanced techniques in animation, modeling, visualization and graphics animation.

451.3: Analyze and compare the different kinds of user interfaces in order to be able to decide which one will be more efficient and ergonomic according to the required specifications of the application to be developed.

451.4: Recall the main concepts and operating techniques of Virtual Reality and Augmented Reality, so they can effectively decide and implement the most appropriate algorithms to suit the purpose of the application of Virtual Reality or Augmented Reality that they would like to develop.

451.5 : Analyze the graphics library OpenGL 3.1 (Open Graphics Library), used for graphical visualization in Windows, Linux and Mac OS platforms, as well as in workstations (Sun, Silicon Graphics) and GLSL shaders language, which willallow the students to implement shaders, graphic effects or optimization displays in scenes with lots of geometry.

Reference books:

1. "Computer Graphics" by Desai and Apurva A

2. "Fundamentals of Computer Graphics and Multimedia" by Mukherjee

3. "Express Learning – Computer Graphics and Multimedia" by ITL ESL

4. "Computer Graphics: A Programming Approach" by Steven Harrington

Semester-IV

Core Course-III

Course Name: Object oriented programming & C++	BCA- 403

Credits = [L+T+P : 4+0+2]	Total Hours = 60

Objectives:

Develop a greater understanding of the issues involved in.

Programming language design and implementation

Develop an in-depth understanding of functional, logic, and object-

Oriented programming paradigms

Unit – I **10 hrs**

Object-Oriented Analysis and Data Modeling: Object Oriented Concepts, Object oriented Analysis Modeling, Data Modeling.

Object-Oriented Design : Origins of object-Oriented Design, Object Oriented design concepts, Object Oriented Design methods, class and object definition, Refining Operations, Program Components and Interfaces, Annotation for object-oriented Design, Implementation of Detail Design, An alternative object-oriented Design Strategy Integrating OOD with SA/SD.

Unit – II **12 hrs**

Introduction to OOP and C++ : Advantages of OOP, Need of object-oriented programming, characteristics of object-oriented languages, C++ and C.

C++ Programming Basics: Basic program construction, input/output using cin/count; Preprocessor Directives; Comments, integer, character, float data types manipulators Arithmetic operators; Library functions.

Unit – III **11 hrs**

Loops and Decisions: Relational operators, Loops, Decisions, Logical Operators, Precedence, Control statements.

Structure and Functions: Structure, Enumerated Data Types, simple functions, Passing arguments to and returning values from functions, Reference Arguments. Overloaded functions, Inline functions, Default Arguments, Variable and Storage classes, Returning by reference.

Unit – IV **13 hrs**

Objects and Classes: Specifying & using class & object, Constructors, objects as function arguments.

Arrays and Operator Overloading : Array Fundamentals, Arrays as class member data, Arrays of objects, strings, overloading Unary & Binary operators, Data conversion, Pitfalls of overloading & Conversion.

Unit – V **14 hrs**

Inheritance: Derived class and their constructs, overriding member functions, class hierarchies, Public & Private Inheritance, Inheritance levels.

Pointers : Pointers with Arrays, functions, strings, pointer to objects, new-delete, Linked-Lists Virtual Functions, files and Streams : Virtual, friend and static function; the this pointer ; streams; string, character, object I/O; I/O with Multiple objects; File pointers; Disk I/O with member function; Error Handling; Redirection; ;command-line Arguments.

Outcome: 403.1: Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.

403.2: Develop solutions for a range of problems using objects and classes.

403.3: Programs to demonstrate the implementation of constructors, destructors and operator overloading.

403.4: Apply fundamental algorithmic problems including type casting, inheritance, and polymorphism.

403.5: Understand generic programming, templates, file handling.

Reference books:

1. Robert Lafore, "Object Oriented Programming in C++", Galgotia Publication Pvt. Ltd,4 th edition, New Delhi, 2002

2. Object Oriented Programming With C++ By Sourav Sahay Form Oxford University Press

3. Ashok N Kamathane, "Object Oriented Programming with ANSI & Turbo C++", Pearson Education, New Delhi, 2003.

4. Bjarne Stroustrup," C++ Programming language", Pearson Education, New Delhi, 2001.

Semester-IV

Practical-II

Course Name: C++ LAB	BCA-452

Credits = [L+T+P : 0+0+2]	Total Hours =30

Objectives: 1. To learn advanced features of the C++ programming language as a continuation of the previous course.

2. To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.

3. To learn the basic principles of object-oriented design and software engineering in terms of software reuse and managing complexity.

4. To enhance problem solving and programming skills in C++ with extensive programming projects.

1. Write a C++ program to find the sum of individual digits of a positive integer.

2. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C++ program to generate the first n terms of the sequence.

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

4. Write a C++program to find the factorial of a given integer

5. Write a C++program to find the GCD of two given integers

6. Write a C++ program that uses a recursive function for solving Towers of Hanoi problem.

7. Write a C++program to implement call by value and call by reference parameters passing

8. Write a C++ program to implement function templates

9. Write a program to implement Overloading and Overriding

10. Write a C++ program to implement the matrix ADT using a class. The operations supported by this ADT are:

a. Reading a matrix.

b. Printing a matrix

c. Addition of matrices

d. Subtraction of matrices

e. Multiplication of matrices

11. Write C++programs that illustrate how the Single inheritance, Multiple inheritance Multi level inheritance and Hierarchical inheritance forms of inheritance are supported

12. Write a C++program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class

13. Write a C++ program that illustrates how run time polymorphism is achieved using virtual functions

Outcome: 452.1: Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.

452.2: Develop solutions for a range of problems using objects and classes.

452.3: Programs to demonstrate the implementation of constructors, destructors and operator overloading.

452.4: Apply fundamental algorithmic problems including type casting, inheritance, and polymorphism.

452.5: Understand generic programming, templates, file handling.

Reference books:

1. Robert Lafore, "Object Oriented Programming in C++", Galgotia Publication Pvt. Ltd,4 th edition, New Delhi, 2002

2. Object Oriented Programming With C++ By Sourav Sahay Form Oxford University Press

3. Ashok N Kamathane, "Object Oriented Programming with ANSI & Turbo C++", Pearson Education, New Delhi, 2003.

4. Bjarne Stroustrup," C++ Programming language", Pearson Education, New Delhi, 2001.

Semester-IV

Skilled Enhancement Course-A

(Choose any one form A and B)

Course Name: Designing with Corel draw and Photoshop	**BCA-404-A**

Credits = [L+P+T: 3+2+0]	**Total Hours = 60**

Objectives: This course level will equip participants with the basic knowledge of CorelDraw Graphics Suite. By the end of the course, participants will be familiar with the CorelDraw workspace, tools, panels, basic techniques and gain an insight into the techniques of creating and manipulating vector (design) objects, shapes and color fills. They will also be able to work with artistic text for the creation of logos, labels and any other one page print design material.

Unit I **12 hrs**

Resume designing , Paragraph setting , Text column wise designing , Text base paper add

Unit-II **12 hrs**

Create college Logo , Table creation , Student marks list , Book work

Unit-III **12 hrs**

Picture insertion, Application form , Text based Visiting card , Notice designing

UNIT-IV **12 hrs**

Typographic alignment styles

UNIT-V **12 hrs**

Wedding card designing, Letter models

Outcome: Basic knowledge of hardware and software used during graphic processing, work with vector and bitmap graphics software. Exploring DTP techniques, different graphic formats and pre-press jobs. Practical implementation of CorelDraw, Adobe Illustrator, Adobe Photoshop and its use for making 2D vector graphics, web graphics, text documents, posters for project presentations and technical drawings

Semester-IV

Skilled Enhancement Course- B

Course Name: Principles of Animation	**BCA- 404 B**

Credits = [L+P+T: 3+2+0]	**Total Hours = 60**

Objectives:

- Describe and evaluate the eight major classical types of animation (individual objective)
- Produce a short film using each of the eight major classical animation types (collaborative objective)
- Identify modern day examples for each classical animation type (individual objective) Create an individual short animated film (individual objective)

Unit –I **12 hrs**

Beginning of Animation

Introduction to Animation

Origin and development of Animation

Early Animation- Victorian, Zoetrope, The magic lantren, Thau Matrope

Flip Book, Praxinoscope

Unit –II **13 hrs**

The Present:-

Traditional Animation, Feature Length Film, Stop motion,

Computer Animation

The Future:- Animated Humans, Cell Shaded Animation

Unit III **13 hrs**

Process of Animation

Method of Animation

Principle of Animation:-

Stretch and squash, Anticipation, Exaggeration, Arc

Slow in and slow out, Secondary Action

Unit –IV **11 hrs**

Flow Through and Overlapping Action,

Unit-V Straight Ahead Action and pose to pose Action, Time and Space, Staging **11 hrs**

Outcome: Create animated sequences from the development of the original concept through design to final film or video production.

Communicate ideas, believable action and emotion effectively by employing principles of animation and performance in all aspects of drawing.

Integrate the concepts, principles and theories involved in the physics of animation in all aspects of drawing.

Refine personal narrative voice that holistically integrates the elements of storytelling and performance in order to actively engage the audience.

Create 2D and 3D characters and environments that reflect the integration of graphic clarity, design principles, performance principles and theoretical constructs.

Reference books: 1: Animator's Survival Kit *by Richard Williams*

2: Draw the Looney Tunes The Warner Bros. Character Design Manual.

3: Timing for Animation *by Harold Whitaker and John Halas.*

4: Ruegg, Ruedi & Frohlich, Godi : Basic Typography, ABC edition, Zurich,1972.

5:Naik, Bapurao; Typography of Devanagari. Directorate of Languages, Bombay, 1971.

6:Ruder, Emil; Typography, a manual of Design March 1, 2001.

7: Schmid, Helmut: The Road to Basel, 1997.

8: Bringhurst, Robert; The elements of typographic Styl. Hartley and Marks 15 Jan

Semester-IV

Course Name: Universal Human Values and Professional Ethics	**BFC-001**

Credits = [L+T+P: 3+0+0]	**Total Hours = 45**

Objectives:

- To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in **harmony** at various levels

UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself!

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

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. *Understanding Harmony in the family – the basic unit of human interaction*
14. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;

Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship

15. Understanding the meaning of *Vishwas*; Difference between intention and competence
16. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
17. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals
18. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*- from family to world family!

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

19. Understanding the harmony in the Nature
20. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
21. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
22. Holistic perception of harmony at all levels of existence

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

Semester-V

Elective –I (A)

Choose any one from (A and B)

Course Name: Java programming and web page design	**BCA-501 A**

Credits = [L+T+P : 4+1+2]	**Total Hours =60**

Objectives: Understand fundamentals of object-oriented **programming** in **Java**, including defining classes, invoking methods, using class libraries and also be aware of the important topics and principles of software development.

UNIT-I **13 hrs**

Java Programming: Data types, control structured, arrays, strings, and vector, classes (inheritance, package, exception handling) multithreaded programming.

UNIT-II **11 hrs**

Java applets, AWT controls (Button, Labels, Combo box, list and other Listeners, menu bar) layout manager, string handling (only main functions)

UNIT-III **13 hrs**

Networking (datagram socket and TCP/IP based server socket) event handling, JDBC: Introduction, Drivers, Establishing Connection, Connection Pooling.

UNIT-IV **12 hrs**

Java Servlets: Introduction, HTTP Servlet Basics, The Servlet Lifecycle, Retrieving Information, Sending HTML Information, Session Tracking, Database Connectivity

UNIT-V **11 hrs**

Java Server Pages: Introducing Java Server Pages, JSP Overview, Setting Up the JSP Environment, Generating Dynamic Content, Using Custom Tag Libraries and the JSP Standard Tag Library, Processing Input and Output.

Outcome: 501.1: Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc

501.2: Identify and analyze classes, objects, members of a class and relationships among them needed for a specific problem.

501.3: Demonstrate the concepts of polymorphism and inheritance.

501.4 : Understand the principles of inheritance, packages and interfaces.

501.5: Understand the fundamentals of object-oriented programming in Java, including defining classes , objects, invoking methods etc and exception handling mechanisms.

Reference books: 1: **Java**: The Complete Reference (Ninth Edition**)**: Schildt,Herbert 5th Edition

2: Programming: Black Book

3: Java Programming and Website Design 2011 by Lalit Arora

4: Object Oriented System with Java 2012 by Lalit Arora

Semester-V

Practical Lab

Course Name: Java Practical Lab	BCA-551

Credits = [L+T+P : 0+0+2]	Total Hours = 30

Objectives: 1. To build software development skills using java programming for real world applications.

2. To implement frontend and backend of an application

3. To implement classical problems using java programming.

1. Write a JAVA program to implement the concept of inheritance.
2. Write a JAVA program to find the largest number from two numbers.
3. Write a JAVA program of constrauctor.
4. Write a JAVA program using command line argument.
5. Write a JAVA program to implement the concept of interface.
6. Write JAVA program to implement the concept of super.
7. Write a JAVA program to creation single dimensional Array.
8. Write a JAVA program to find out the addition and multiplication of two numbers.
9. Write a JAVA program to create a simple Applet.
10. Write JAVA program to connect Ms-Access database with Java application.
11. Write JAVA program to implement the concept the Multithreading.
12. Write JAVA program tom implements the concept of Exception Handling.

Outcome:

551.1: Understanding and implementation of Java programming, multi-threaded programs and Exception handling.

551.2: Knowledge of object-oriented paradigm in the Java programming language,

551.3: Understand the principles of inheritance, packages and interfaces.

551.4: Explain the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.

Reference books: 1: **Java**: The Complete Reference (Ninth Edition**)**: Schildt,Herbert 5th Edition

2: Programming: Black Book

3: Java Programming and Website Design 2011 by Lalit Arora

4: Object Oriented System with Java 2012 by Lalit Arora

Semester-V

Elective –I (B)

Course Name: Digital electronics & computer organization	BCA-501 B

Credits = [L+T+P : 4+1+2]	Total Hours = 60

Objectives: The objective of this course is to introduce the organization of a computer and its principal components, viz, ALU, Control, Memory and Input/output. The course will also enable the student to understand the design components of a digital subsystem that required realizing various components such as ALU, Control, etc.

Unit – I **12 hrs**

Digital Electronics

Logic gates and circuits: Gates (OR, AND, NOR, NAND, XOR & XNOR); Demorgan's laws; Boolean laws, Circuit designing techniques (SOP, POS, K-Maps).

Unit – II **13 hrs**

Combinational Building Blocks: Multiplexes; Decoders; Encoders; Adder and substractor. Sequential Building Blocks: Flip-Flops (RS, D, JK, Master-slave & & T flip-flops); Registers & Shift registers; Counters: Synchronous and Asynchronous (Designing method).Memories: ROMs, PROMs, EPROMs, RAMs, Hard Disk, Floppy Disk and CD-ROM.

Unit – III **13 hrs**

Computer Organization

Central Processing Unit: Introduction, Register Organization; Stack Organization, Instruction format and addressing modes. Control Unit: Control memory; Horizontal and vertical formats; Address sequencer; Multiprogramming Vs Hardwired control; RISC Vs CISC.

Unit – IV **12 hrs**

Arithmetic Algorithms: Integer multiplication using shift and add, Booth's algorithm, Integer division, Floating-point representations and arithmetic algorithms.I/O Organization: Strobe based and handshake base communication; Vector and priority interrupt; DMA based data transfer.

Unit – V **10 hrs**

Memory Organization: Basic cell of static and dynamic RAM; Building large memories using chips; Associative memory; Cache memory organization and Virtual memory organization.

Outcome: 501.1 Explain the generic principles that underlie the design of digital computer, including data representation, digital logic and process simulation.

501.2 Describe the structure and functioning of a digital computer, including its overall system architecture, operating system, and digital components**.**

501.3: Apply and Implement fundamental coding schemes.

501.4: Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.

501.5. Understand the evolution of processors, their present technology and inter-process communication.

Reference books: 1. "Digital Circuits and Logic Design" by Lee S C

2. "Digital Circuits and Logic Design" by Sanjay Sharma
3. "Digital Logic and Computer Design" by M Morris Mano
4. "Digital Design: with an Introduction to the Verilog Hdl" by M Morris Mano

Semester-V

Elective –II (A)

(Choose any One)

Course Name: Information systems: analysis, design & implementation	BCA-502 A

Credits = [L+T+P : 4+1+0]	Total Hours = 60

Objectives:

Defining a system
The role of computer in information systems
What are the characteristic and element of information system
What are the various types of information system and models.
What are the different types of specialised information system

Unit – I **14 hrs**

Overview of System Analysis and Design : Systems Development Life Cycle; concept and Models: requirements determination, logical design, physical design, test planning, implementation, planning and performance evaluation, communication, interviewing, presentation skills; group dynamics; risk and feasibility analysis; group based approaches, JAD, structures walkthroughs, and design and code reviews; prototyping; database design software quality metrics; application categories software package evaluation and acquisition.

Unit – II **12 hrs**

Information Requirement Analysis: Process Modeling with physical logical data flow diagrams, data modeling with logical entity relationship diagrams.

Developing a Proposal: Feasibility study and cost estimation.

Unit – III **14 hrs**

System Design : Design of input and control, design of output and control, file design/database design, process, user interface design, prototyping; software constructors; documentation.

Application Development Methodologies and CASE tools : Information engineering, structured system analysis and design, and object oriented methodologies for application development data modeling, process modeling, user interface design, and prototyping, use of computer aided software engineering (CASE) tools in the analysis, design & implementation of information systems.

Unit – IV **10 hrs**

Design and Implementation on OO Platform : Object oriented analysis and design through object modeling technique, object modeling, dynamic modeling and functional, object oriented design and object oriented programming systems for implementation, object oriented data bases.

Unit – V **10 hrs**

Managerial issues in Software Projects : Introduction to software markets; planning of software projects, size and cost estimates; project scheduling; measurement of software quality & productivity, ISO and capability maturity models for organizational growth.

Outcome: 502.1: Gather data to analyse and specify the requirements of a system.

502.2: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

502.3: Build general and detailed models that assist programmers in implementing a system.

502.4: Design a database for storing data and a user interface for data input and output, as well as controls to protect the system and its data.

502.5: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

Reference books:1. Analysis and Design of Information Systems **Authors:** Langer**, Arthur M.**

2. The analysis, design, and implementation of information systems (3rd ed.) Author: Henry C. Lucas,Jr.

3. Systems Analysis and Design Methods Book by Jeffrey L. Whitten **4. Systems Analysis and Design by Elias M. Awad**

Semester-V

Elective –II (B)

Course Name: Object oriented system design	**BCA-502 B**

Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: Object-oriented analysis and design (OOAD) is a popular technical approach for analyzing and designing an application, system, or business by applying object-oriented programming, as well as using visual modeling throughout the development life cycles to foster better stakeholder communication and product quality.

UNIT I **12 hrs**

Introduction to OOAD – What is OOAD? – What is UML? What are the United process(UP) phases - Case study – the NextGen POS system, Inception -Use case Modeling - Relating Use cases – include, extend and generalization.

UNIT II **12hrs**

Elaboration - Domain Models - Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class hierarchies- Aggregation and Composition- UML activity diagrams and modeling

UNIT III **12 hrs**

System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams - UML interaction diagrams

UNIT IV **12 hrs**

GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – Controller – High Cohesion – Designing for visibility - Applying GoF design patterns – adapter, singleton, factory and observer patterns.

UNIT V **12 hrs**

UML state diagrams and modeling - Operation contracts- Mapping design to code -UML deployment and component diagrams

Outcome: 502.1: Deigned the fundamental principles of OOAD programming.

502.2: Understanding key principles in OOAD analysis, design, and development.

502.3: Identify the application of the Unified Modeling Language (UML) towards analysis and design.

502.4: Discuss common patterns in OOAD design and implement.

502.5: Analysis of group/team projects and presentations and also be exposed to technical writing and oral presentations.

Reference books:1. "Object Oriented Analysis and Design" by Grady Booch

2. "Object – Oriented Modeling and Design With UML" by Michael R Blaha

3. "Object-Oriented Design & Patterns" by Horstmann C

4. "Object-Oriented Systems Analysis and Design Using UML" by Bennett Simon J

E-Sources:

Semester-V

Elective –III (A)

Course Name: Cloud computing	**BCA-503 A**

Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: For an organization to adopt a sound **cloud computing** program, it is paramount to set clear **objectives** that span from the top of the line, such as productivity gains, to the bottom line, like operational expenses. Most often, **cloud computing** is viewed as a means to move from capex to opex.

Unit 1 **12 hrs**

Cloud Computing Overview – Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service , Broad network access , Location independent resource pooling , Rapid elasticity , Measured service

Unit II **12 hrs**

Cloud scenarios – Benefits: scalability , simplicity , vendors ,security. Limitations – Sensitive information - Application development – Security concerns - privacy concern with a third party - security level of third party - security benefits

Unit III **13 hrs**

Cloud architecture: Cloud delivery model – SPI framework , SPI evolution , SPI vs. traditional IT Model

Software as a Service (SaaS): SaaS service providers – Google App Engine, Salesforce.com and google platfrom – Benefits – Operational benefits - Economic benefits – Evaluating SaaS

Platform as a Service (PaaS): PaaS service providers – Right Scale – Salesforce.com – Rackspace – Force.com – Services and Benefits

Unit IV **10 hrs**

Infrastructure as a Service (IaaS): IaaS service providers – Amazon EC2 , GoGrid – Microsoft soft implementation and support – Amazon EC service level agreement – Recent developments – Benefits

Cloud deployment model : Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing

Unit V **13 hrs**

Virtualization : Virtualization and cloud computing - Need of virtualization – cost , administration , fast deployment , reduce infrastructure cost - limitations Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization Desktop virtualization: Software virtualization – Memory virtualization - Storage virtualization – Data virtualization – Network virtualization

Outcome: 503.1: Define the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.

503.2: identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.

503.3: Explain the core issues of cloud computing such as security, privacy, and interoperability.

503.4: Discuss the appropriate technologies, algorithms, and approaches for the related issues.

503.5: Analyze and evaluate various cloud computing solutions.

503.6: Provide the appropriate cloud computing solutions and recommendations according to the applications used.

Reference books: 1. “Cloud Computing: Concepts, Technology & Architecture” by Thomas Erl

2. “Cloud Computing Explained” by John Rhoton

3. “Cloud Computing: A Hands-On Approach” by Arshdeep Bahga and Vijay Madisetti

4. “Cloud Computing: From Beginning to End” by Mr Ray J Rafaels

E-Sources:

Semester-V

Elective –III (B)

Course Name: Multimedia Systems	**BCA -503 B**

Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: The aim of our work at Lancaster is to develop a distributed multimedia application platform. Such a platform must provide tools to enable programmers to construct distributed applications which make use of continuous media such as audio and video. If the platform is to be of use as part of a large scale distributed system, it must also take into account current standards activities.

Unit I

Evolution of Multimedia and its objects, Scope of multimedia in business & work, Production and planning of Multimedia applications. Multimedia hardware, Memory & Storage Devices, Communication Devices, Multimedia Software, Presentation and object generation tools, Video, sound, Image capturing, Authoring Tools, Card & Page Based Authoring Tools. **12hrs**

Unit II

Production and Planning of Multimedia building blocks, Text, sound (MIDI), Digital Audio, Audio File Formats, MIDI under Windows environment, Audio & Video Capture. **12hrs**

Unit III

Macromedia products, Basic drawing techniques, Advance animation techniques, Creating multi layer combining interactivity and multiple scenes, Creating transparency effects using text in Flash, Flash animation. **12hrs**

Unit IV

Digital Audio Concepts, Sampling variables, Loss Less compression of sound, Lossy compression & Silence compression. **10 hrs**

Unit V

Multimedia monitor bitmaps, Vector drawing, Lossy graphic compression, Image file formatic animations Image standards, J P E G compression, Zig Zag coding, Video representation, colors, video compression, MPEG standards, MHEG standard, recent development in multimedia. Multimedia Application Planning, Costing, Proposal preparation, and Financing-Case study of a typical industry.

14 hrs

Outcome:503.1: Analyze fundamentals principles of multimedia, including digitization and data compression for non-textual information

503.2: To understand issues in representing, processing, and transmitting multimedia data.

503.3: Describe core multimedia technologies and standards

503.4: To gain hands-on experience in image, sound and video editing and in some aspects of various computer applications.

503.5: Knowledge about Multimedia authoring (incorporating images, sound, video, and animation) to design, capture, store and integrate sound, images and video to deliver multimodal information.

Reference books: 1. Andreas Halzinger, "Multimedia Basics", Vol-I to Vol-III, Firewall Media, New Delhi.

2. Tay Vaughan, "Multimedia Making It work", Tata McGraw Hill.

3. Buford, "Multimedia Systems", Addison Wesley.

4. Agarwal and Tiwari, "Multimedia Systems", Excel.

5. Rosch, "Multimedia Bible", Sams Publishing

6. Sleinreitz, "Multimedia Systems", Addison Wesley

7. Ken Milburn, John Croteau, "Flash 4 web special Effects, Animation & Design Handbook", Dreamtech Press.

8. John Villamil–Casanova & Louis Molina, "Multimedia-Production, Planning & Delivery", PHI

Semester-V

Skilled Enhancement Course I (A)

Course Name: Software testing methodologies	**BCA-504 A**

Credits = [L+T+P : 4+0+2]	**Total Hours = 60**

Objectives: **Software Testing** has different **goals** and **objectives**. The major **objectives of Software testing** are as follows: Finding defects which may get created by the programmer while developing the **software**. Gaining confidence in and providing information about the level of quality. To prevent defects.

Unit-I **12 hrs**

Basic Aspects of Software Testing: Testing in the Software Life Cycle, Product Paradigms, Metrics and Measurement

Unit-II **12 hrs**

Testing Processes: Processes in General, Test Planning and Control, Test Analysis and Design, Test Implementation and Execution, Evaluating Exit Criteria and Reporting, Test Closure

Unit-III **12 hrs**

Test Management: Business Value of Testing, Test Management Documentation, Test Estimation, Test Progress Monitoring and Control, Testing and Risk,

Unit-IV **12 hrs**

Test Techniques: Specification-Based Techniques, Structure-Based Techniques, Defect Based Techniques, Experience-Based Testing Techniques, Static Analysis, Dynamic Analysis, Choosing Testing Techniques,

Unit-V **12 hrs**

Testing of Software Characteristics: Quality Attributes for Test Analysts,. Quality Attributes for Technical Test Analysts.

Outcome: 501.1: Define a range of different software testing techniques and strategies and be able to apply specific (automated) unit testing method to the projects.

501.2: Distinguish characteristics of structural testing methods.

501.3: Understand the concept of integration testing which aims to uncover interaction and compatibility problems as early as possible.

501.4: Discuss about the functional and system testing methods.

505.5: Explain various issues for object oriented testing.

Reference books:

1. Lessons Learned in Software Testing By: Cem Kaner

2. Software Testing By: Ron Patton

3. Software Testing: A Craftsman's Approach, Third Edition 3rd Edition **By: Paul C. Jorgensen**

4. Lessons Learned in Software Testing: A Context-Driven Approach (Paperback) by Cem Kaner

Semester-V

Skilled Enhancement Course I (B)

Course Name: Web Designing	**BCA-504 B**

Credits = [L+T+P : 4+0+2]	**Total Hours = 60**

Objectives: **Setting Successful Website Goals & Objectives**. A successful site requires an effective, sustained marketing strategy beyond presenting a collection of products, services, images, videos or other files. That means your **website design** should be focused on specific goals, along with measurable **objectives** to attain them.

UNIT-I **14 hrs**

What are the design principles used when creating web pages? , What is HTML and CSS and how are they different from each other, What are the criteria for evaluating the quality of websites, Sequence of focus lessons , Basic Site Evaluation , Color Theory , Web Standards , Planning a Website

Unit - 2 **12 hrs**

Creating Pages with HTML ,What are the basics of HTML coding, Pre-Coding , Basic HTML Markup , HTML Lists , Creating Links ,Creating a Data Table ,HTML Video

Unit –3 Formatting **11 hrs**

Web Pages with Style Sheets ,How is the visual look of web pages controlled by using Cascading Style Sheets, Introduction to Cascading Style Sheets , Color in CSS ,Typography in CSS , The Box Model in CSS , The Role of ID and CLass in CSS , Page Layout Techniques

Unit - 4 Graphics **12 hrs**

How can you get digital images and reformat them ,How can you create basic graphics for use on a web page? Sequence of focus lessons ,Introduction to Web Graphics , Creating a Web Photo Album, Creating a Button , Creating a Web Page Banner

Unit -5 Scripting **11 hrs**

Overview of Scripting on the Web , JavaScript, Validating Websites , Testing Usability, Basic Features of Web Authoring Software , Publishing on the Web, Client Website-Planning, Constructing, and Quality Control

Outcome: 501.1: Design and implement solutions to problems encountered in all phases of the design process.

501.2: Explain visual communications through the application of design theories and principles to develop effective design solutions.

502.3: Define typographic skills and knowledge to create effective visual communications.

502.4: Discuss the working of web elements like buttons, banners & Bars and of course complete UI designs.

502.5: Understanding the debug JavaScript code, making use of good practice and debugging tools.

502.6: Explain JavaScript libraries (e.g.J Query) to create dynamic pages

Reference books: 1. Blanck, Peter. *eQuality: The Struggle for Web Accessibility by Persons with Cognitive Disabilities*, Cambridge Disability Law and Policy Series, 2015.

2. Burgstahle, Sheryl. *Universal Design in Higher Education: From Principles to Practice*, Harvard Education Press, 2008.

3. Byrne, Jim. *60 hot to touch Accessible Web Design tips – the tips no web developer can live without!*, Jim Byrne, 2006, (ISBN: 978-1-4116-6729-7).

4. Web Design Complete Reference [Thomas A. Powell]

Semester-V

Practical Lab-2

Course Name: Practical lab-2 (Web Designing)	BCA-552

Credits = [L+T+P : 0+0+2]	Total Hours = 30

Objectives: **Setting Successful Website Goals & Objectives**. A successful site requires an effective, sustained marketing strategy beyond presenting a collection of products, services, images, videos or other files. That means your **website design** should be focused on specific goals, along with measurable **objectives** to attain them.

1. Write an html code for writing Subharti University.
2. Write an html code with using heading, font and center tag.
3. Write and html code with using paragraph tag and marquee.
4. Write an html code for creating the tables on a web page.
5. Write an html code for putting the images on a web page.
6. Write an html code for changing the font color, font size and font style.
7. Write an html code with using anchor tag.
8. Write an html code for creating the buttons, labels and checkbox on web pages.
9. Write an html code for sorted and unsorted lists on web page.
10. Write an html code for making the form of college registration.

Semester-VI

Elective –I (A)

(Choose any One)

Course Name: Mobile computing	**BCA-601 A**

Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: To learn about the concepts and principles of mobile computing;

- To explore both theoretical and practical issues of mobile computing;
- To develop skills of finding solutions and building software for mobile computing applications.

Unit I **12hrs**

Issues in Mobile Computing, Wireless Telephony, Digital Cellular Standards, Bluetooth Technology, Wireless Multiple Access Protocols, Channel Allocation in Cellular Systems.

Unit II **12hrs**

Data Management Issues: Mobility, Wireless Communication and Portability, Data Replication and Replication Schemes, Basic Concept of Multihopping, Adaptive Clustering for Mobile Network, Multicluster Architecture.

Unit III **12 hrs**

Location Management, Location Based Services, Automatically Locating Mobile Uses, Locating and Organizing Services, Issues and Future Directions, Mobile IP, Comparison of TCP and Wireless.

Unit IV **12 hrs**

Transaction Management, Data Dissemination, Cache Consistency, Mobile Transaction Processing, Mobile Database Research Directions, Security Fault Tolerance for Mobile N/W.

Unit V **12 hrs**

What is Ad-hoc Network? , Problems with Message Routing in Wireless Ad-hoc Mobile Networks, Routing scheme based on signal strength, Dynamic State Routing (DSR), Route Maintenance and Routing error, Fisheye Routing (FSR), Ad-hoc on Demand Distance Vector (ADDV)

Outcome: 601.1: Describe the basic principles of Mobile Computing.

601.2: Analyze the functionalities and components of mobile computing systems into different layers and apply various techniques for realizing the functionalities.

601.3: Analyze requirements and solve problems using systematic planning and development approaches.

601.4: Demonstrate mobile computing applications by analyzing their characteristics and requirements,.

601.5 : Define the concepts and features of mobile computing technologies and applications.

Reference books:1. Mobile Communication 2nd edition by Jochen Schiller, Pearson education

2. Mobile Computing by Asoke Talukder, Roopa Yavagal (Tata McGraw Hill)

3. Kaveh Pahlavan, Prasanth Krishnamoorthy- "Principles of Wireless Networks"

4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober- "PrinciplesofMobileComputing"

5. Hazysztof Wesolowshi- "Mobile Communication Systems"

Semester-VI

Elective –I (B)

Course Name: ERP Systems	**BCA-601 B**

Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: The Core **Objectives of ERP**. **ERP** or **enterprise resource planning** is a commonly used **software** package for enhancing the operational efficiency of business resources. It is a composition of **software** modules assisting company owners to achieve their goals at a faster rate.

Unit-I **12 hrs**

Enterprise wide information system, Custom built and packaged approaches, Needs and Evolution of ERP Systems, Common myths and evolving realities, ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Warehousing, Data Mining and OLAP, ERP Drivers, Decision support system.

Unit-II **12 hrs**

ERP Domain, ERP Benefits classification, Present global and Indian market scenario, milestones and pitfalls, Forecast, Market players and profiles, Evaluation criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement phases, ERP Modules.

Unit- III **14 hrs**

Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in evaluating ERP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation vendors evaluation criterion, ERP Implementation approaches and methodology, ERP implementation strategies, ERP Customization, ERP-A manufacturing Perspective.

Unit- IV **12 hrs**

Critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP implementation, Hidden costs, ERP success inhibitors and accelerators, Management concern for ERP success, Strategic Grid: Useful guidelines for ERP Implementations.

Unit- V **10hrs**

Technologies in ERP Systems and Extended ERP, Case Studies Development and Analysis of ERP Implementations in focusing the various issues discussed in above units through Soft System approaches or qualitative Analysis tools, Learning and Emerging Issues, ERP and E-Commerce.

Outcome: 601.1: To comprehend the technical aspects of ERP systems.
601.2: To understand concepts of reengineering and how they relate to ERP system implementations;
601.3: To be able to map business processes using process mapping techniques and to understand the steps and activities in the ERP life cycle.
601.4: To be able to identify and describe typical functionality in an ERP system.
601.5: To obtain practical hands on experience with one of the COTS ERP Software e.g. SAP, Oracle.

Reference books: 1. "Enterprise Resource Planning" by Bansal
2. "Enterprise Resource Planning" by Rajesh Ray
3. "Enterprise Resource Planning: Concepts and Practice" by Garg
4. "Concepts in Enterprise Resource Planning" by Monk

Semester-VI

Elective –II (A)

(Choose any One)

Course Name: Web Technology & Cyber Security	**BCA-602 A**

Credits = [L+T+P : 4+0+2]	**Total Hours = 60**

Objectives: The objective of this course to make a student will be familiar with client server architecture and able to develop a web application using java technologies. Students will gain the skills and Project based experience needed for entry into web application and development career.

Unit-I **11 hrs**

History of the web, Growth of the Web, Protocols governing the web, , Web project, Web Team, Team dynamics.

Unit-II **12 hrs**

Communication Issues, the Client, Multi-departmental & Large scale Websites, Quality Assurance and testing, Technological advances and Impact on Web Teams.

Unit-III **12 hrs**

HTML: Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML. JavaScript: Introduction, Documents, Documents, forms, Statements, functions, objects in JavaScript, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas.

Unit IV **12 hrs**

Cyber Laws: Introduction to Cyber Laws in India, Introduction to International Cyber laws, Cyber Crimes, Types of Cyber Crimes, Hacking, Criminal behaviors, Networks Security

Unit V **13 hrs**

Cyber Crime Investigation: Indian IT ACT 2000, Firewalls, Packet Filters, Password, Virus and Warms, Cyber world with computer crimes, Protection mechanism of computer and web with firewalls , Security Concepts.

Outcome: 602.1: To master information security governance, and related legal and regulatory issues,

602.2: Understanding external and internal threats to an organization with information security awareness.

603.3: Knowledge about network security threats and countermeasures.

603.4: Explain advanced security issues and technologies (such as DDoS attack detection and containment, and anonymous communications,)

605.5: discuss about network security threats and countermeasures,

Reference books:1. Cyber Security Principles by Garrett Gee

2. "Semantic Web Technologies: Trends and Research in Ontology-based Systems" by John Davies and Rudi Studer

3. "Semantic Web Technologies for Intelligent Engineering Applications" by Stefan Biffl and Marta Sabou

4. Cyberwar: The Next Threat to National Security & What to Do About It (Hardcover)

5. Cybersecurity and Cyberwar: What Everyone Needs to Know(r) by P.W. Singer

Semester-VI

Elective –II (B)

Course Name: .Net framework and c#	**BCA-602 B**

Credits = [L+T+P : 4+0+2]	**Total Hours = 60**

Objectives: The basic objective to Provide a consistent object-oriented programming environment whether object code is stored and executed locally, executed locally but Internet-distributed, or executed remotely.

Unit-I **12 hrs**

The .NET framework: Introduction, Common Language Runtime, Common Type System, Common Language Specification, The Base Class Library, The .NET class library Intermediate language, Just-in- Time compilation, garbage collection, Application installation & Assemblies, Web Services, Unified classes.

Unit-II **12 hrs**

C# Basics: Introduction, Data Types, Identifiers, variables & constants, C# statements, Object Oriented Concept, Object and Classes, Arrays and Strings, System Collections, Delegates and Events, Indexes Attributes, versioning.

Unit-III **12 hrs**

C# Using Libraries: Namespace-System, Input Output, Multi-Threading, Networking and Sockets, Data Handling, Windows Forms, C# in Web application, Error Handling.

Unit-IV **12 hrs**

Advanced Features Using C#: Web Services, Windows services, messaging, Reflection, COM and C#, Localization.

Unit-V **12 hrs**

Advanced Features Using C#: Distributed Application in C#, XML and C#, Unsafe Mode, Graphical Device Interface with C#, Case Study (Messenger Application)

Outcome: 602.1: Identify important events and individuals in the history of human-computer interfaces.

602.2: Design and develop Windows application using different Windows technologies that use a variety of GUI controls and classes to fulfill specific user requirements.

602.3. Analyze how event driven applications use threading to perform time-consuming operations.

602.4: Demonstrate how to use specific features of the C# programming language to write object-oriented programs and handle run-time errors.

602.5: Evaluate public setting how user interfaces should be designed to accommodate human physiology and limitations.

Reference books:1. C# the Complete Reference by Herbert Schildt
2. Mastering C# and .NET Framework by Marino Posadas
3. Programming C# by Jesse LibertyC#

4. 3.0 Design Patternsby Judith Bishop

Semester-VI

Practical-1

Course Name: Practical Lab	**BCA-651**

Credits = [L+T+P : 0+0+2]	**Total Hours =30**

Objectives: Laboratory practical work is commonly intercalated with theoretical and seminar classes in packages that cover single units of a given course program. Emphasis is put in to illustrate important theoretical concepts and in to improve students" laboratory handling skills.

1. Write a C# program to implement the concept of inheritance.
2. Write a C# program to find the largest number from two numbers.
3. Write a C# program of constructor.
4. Write a C# program using command line argument.
5. Write a C# program to implement the concept of interface.
6. Write a C# program to implement the concept Delegate.
7. Write a C# program to creation single dimensional Array.
8. Write a C# program to find out the addition and multiplication of two numbers.
9. Write a C# program to implement the concept of indexer.
10. Write C# program to implement the concept the Multithreading.
11. Write C# program tom implements the concept of Exception Handling.

Outcome:

651.1: Understand the .Net language in the aspects of designing, coding and implementation.

651.2 Knowledge about new ideas and advances, techniques, and tools and to use them effectively.

651.3 Implement an interactive and effective student progress monitoring system.

Reference books:

1. C# the Complete Reference by Herbert Schildt
2. Mastering C# and .NET Framework by Marino Posadas
3. Programming C# by Jesse LibertyC#
4. 3.0 Design Patternsby Judith Bishop

Semester-VI

Elective –III (A/B)

Course Name: Software Engineering	**BCA-603 A**

Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: New **software** can be created by developing new programs, configuring generic **software** systems or reusing existing **software**. **Software engineering** is an **engineering** discipline that is concerned with all aspects of **software** production. ... A set of activities whose goal is the development or evolution of **software**.

Unit – I **05 hrs**

Software Engineering: Definition and paradigms, A generic view of software engineering.

Unit – II **15 hrs**

Requirements Analysis: Statement of system scope, isolation of top level processes and entitles and their allocation to physical elements, refinement and review. Analyzing a problem, creating a software specification document, review for correctness, consistency, and completeness.

Unit – III **15 hrs**

Designing Software Solutions : Refining the software Specification; Application of fundamental design concept for data, architectural and procedural designs using software blue print methodology and object oriented design paradigm; creating design document : Review of conformance to software requirements and quality.

Unit – IV **13 hrs**

Software Implementation: Relationship between design and implementation: Implementation issues and programming support environment; Coding the procedural design, Good coding style & review of correctness and readability.

Unit – V **12 hrs**

Software Maintenance: Maintenance as part of software evaluation, reasons for maintenance, types of maintenance (Perceptive, adoptive, corrective), designing for maintainability, techniques for maintenance. Comprehensive examples using available software platforms/case tools, Configuration Management.

Outcome: 603.1: Analyze and resolve information technology problems through the application of systematic approaches and diagnostic tools. Support the implementation and administration of computer systems.

603.2: Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle

603.3: Demonstrate and compare an ability to use the techniques and tools necessary for engineering practice

603.4: Know and understand classical and evolving software engineering methods, can select and tailor appropriate methods for projects, and can apply them as both team members and managers to achieve project goals.

603.5: Analyze basic software quality assurance practices to ensure that software designs, development, and maintenance meet or exceed applicable standards.

Reference books:1. "Fundamentals of Software Engineering" by Rajib Mall

2. "Software Engineering" by Ian Sommerville

3. "Software Engineering" by Gaurav Gupta and Deepika Gupta

4. "Software Engineering 1st Edition" by Udit Agarwal

Semester-VI

Elective –III (A/B)

Course Name: Real Time System	**BCA-603 B**

Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: The different **objective** is reflected in the scheduling policy. **Real time** / embedded **systems** are designed to provide a timely response to **real** world events. ... This may require sharing processing **time** "fairly" between tasks of equal priority if they are ready to run simultaneously.

Unit-I

Introduction to Real Time Systems, Prioritites, Embedded Systems, Task, Classification & Requirements, Deadlines, Soft, Hard. **12 hrs**

Unit-II

Firm Real Time Systems, Introduction to Real Time Operating Systems, Task Management, Inter Process Communication, Case Studies of Maruti II, HART OS, VRTX etc. **13 hrs**

Unit-III

Characterizing Real Time Systems and Task, Task Assignment & Scheduling Theory, Fixed and Dynamic Priority Scheduling Uniprocessor (RM and EDF), Multiprocessor (Utilization Balancing, Next-fit for RM & Bin-Packing Assignment for EDF) Scheduling **13 hrs**

Unit-IV

Programming Languages and Tools, Real Time Databases Real Time Communication, FDDI, Specification and Verification using Duration Calculus, Flow Control, Protocols for Real Time (VTCSMA, Window, IEEE 802.3, IEEE 802.4, IEEE 802.5, Stop and Go Protocol, Media Access Protocol), **12 hrs**

Unit-V

Fault, Fault Classes, Fault Tolerant Real Time System, Clocks, Clock Synchronization, Issues in Real Time Software Design. **10 hrs**

Outcome: 603.1: Explain the real time system and present the mathematical model of the system.

603.2: Define real-time algorithm for task Management.

603.3: Understand the working of real-time operating systems and real-time database.

603.4: Design and development of protocols related to real-time communication.

603.5: Discuss the term of Fault classes and Fault Tolerant in real time system and also discuss about the issues in real time software design.

References

1. Krishna, C.M, "Real Time Systems", McGraw Hill

2. Jane W.S. Liu, "Real Time Systems", Pearson Education Asia

3. Levi and Agarwal, "Real Time Systems", McGraw Hill

4. Mathi & Joseph, "Real Time System: Specification, Validation & Analysis", PHI

Semester-VI

Skilled Enhancement Course

Course Name: Cyber forensic	**BCA-604 A**

Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: **Cyber Forensics** is the process of identifying, preserving, analyzing and presenting the digital evidence in such a manner that the evidences are legally acceptable". .**Objective of Computer Forensics** The mainθ **objective** is to find the criminal which is directly or indirectly related to **cyber** world.

Unit I **14 hrs**

Introduction to Computer Forensics : Computer forensics definitions ,Computers' roles in crimes ,Computer forensics tasks ,Prepare for an investigation, Collect evidence ,Preserve evidence ,Recover evidence, Document evidence Challenges associated with making "cybercrime" laws, Jurisdictional issues.

Unit II **14 hrs**

Computer Crimes :Crimes ,Violent crimes where computers are used include terrorism, assault threat, stalking, child pornography ,Nonviolent crimes where computers are used include trespass, theft, fraud, vandalism , Where evidence often resides for different types of crimes ,Address books, chat logs, e-mail, images, movies, Internet browser history, etc.

Unit III **11 hrs**

Computer Criminals: Using evidence to create a crime timeline , Modify Access Create (MAC) dates associated with files ,Problems with using these (they don't change in a logical fashion in some cases) ,Criminals and crime fighters ,Understanding "cyber criminals" and their victims ,Understanding "cyber investigators.

Unit IV **10 hrs**

Building a Cybercrime Case: Bodies of law ,Constitutional law ,Criminal law ,Civil law ,Administrative regulations ,Levels of law ,Local laws ,State laws ,Federal laws ,International laws ,Levels of culpability ,Intent ,Knowledge ,Recklessness ,Negligence , Level and burden of proof ,Criminal versus civil cases ,Vicarious liability ,Laws related to computers ,CFAA, DMCA, CAN Spam, etc.

Unit V **11 hrs**

Preserving and Recovering Digital Evidence: Disk imaging ,Creating a message digest or hash code for a disk ,Where data hides; deleted and erased data ,File systems ,Files ,Modify Access Create (MAC) dates to establish time line ,File headers - info about file type

Outcome: **601.1:** Understand the definition of computer forensics fundamentals.

601.2: Describe the types of computer forensics technology.

601.3: Analyze various computer forensics systems

601.4: Illustrate the methods for data recovery, evidence collection and data seizure.

601.5: Summarize duplication and preservation of digital evidence.

Reference books: 1. "Digital Forensics and Cyber Crime" by Joshua I James and Frank Breitinger

2. "Forensics Computer Investigator, Digital Forensics Analyst, Job Interview Bottom Line Practical Questions and Answers" by M Kumar

3."Digital Forensic And Cyber Crime" by Mohammed Sajid

4. "Handbook of Research on Civil Society and National Security in the Era of Cyber Warfare" by Metodi Hadji-Janev and Mitko Bogdanoski

Semester-VI

Skilled Enhancement Course

Course Name: Artificial Intelligence	**BCA-604 B**

Credits = [L+T+P : 4+1+0]	**Total Hours = 60**

Objectives: Objectives of artificial intelligence that build machines that think as like a human's. The basic knowledge representation of problem solving, and learning methods of Artificial Intelligence and Assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving particular engineering problems.

Unit-I **12hrs**

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II **13hrs**

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III **13hrs**

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic , Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV **12hrs**

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning.

Unit-V **10hrs**

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

Outcome:

601.1: Describe the key components of the artificial intelligence (AI) field and its relation and role in Computer Science;

602.2: Identify and describe artificial intelligence techniques, including search heuristics, knowledge representation, automated planning and agent systems, machine learning, and probabilistic reasoning.

602.3: Identify and apply AI techniques to a wide range of problems, including complex problem solving via search, knowledge-base systems, machine learning, probabilistic models, agent decision making

602.4: Design and implement appropriate AI solution techniques for such problems.

602.5: Analyze and understand the computational trade-offs involved in applying different AI techniques and models.

Reference books: 1. “Artificial Intelligence: A Modern Approach” by Stuart Russell and Peter Norvig

2. “Artificial Intelligence: A New Sythesis” by Nils J Nilsson

3. “Artificial Intelligence: A Modern Approach” by Norvig and Russell

4. “Artificial Intelligence and Machine Learning” by Anand Hareendran S and Vinod Chandra S S

Semester-VI

Project VIVA VOCE

Course Name: Project work	BCA – 651

Credits = [L+T+P : 2+0+4]	Total Hours = 60

Objectives: To create an application using any programming language, and submit the same at the time of final exam VIVA-VOCE

This viva-voce examination is meant to evaluate the abilities of the students on the basis of Project Report prepared by them.