SHRI GURU RAM RAI UNIVERSITY

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized by UGC u/s (2f) of UGC Act 1956]

SYLLABUS

FOR

Bachelor of Computer Application (BCA)

Under CBCS PATTERN

School of Computer Application & Information Technology

(w.e.f. 2021-2022)

Programme outcome (POs)

Students will be able to

PO1	Ability to demonstrate knowledge of Computer science and its applications in order to enhancebasic understanding of various software technologies.
PO2	Ability to analyze and identify various business and technical problems to further solve problemswith effective communication.
PO3	Ability to adapt analytical, logical and managerial skills with the technical aspects in order to design and deploy reliable software programs and application for real world problems
PO4	Ability to investigate complex problems and provide computer-based solutions.
PO5	Ability to understand and deliver ethical, social and cultural responsibilities in professionalenvironment as an individual and team.
PO6	Ability to adapt new technologies for upgrading their skills and contributing to a life longlearning.
PO7	Ability to create and manage multidisciplinary projects and successfully apply software and project management principles.
PO8	Ability to become employable in a variety of IT companies and government sector and also seekentrepreneurship opportunities for the betterment of an individual and society at large.
PO9	An ability to design and implement database solutions using available technologies.
PO10	Acquired skills and to recognize the need for life-long learning for continuing professional development.
PO11	Excellent verbal communication skills with capability to work in multidisciplinary teams with positive attitude
PO12	An ability to work effectively as an individual as well as a member of a team and provide technical and visionary leadership to others.

Eligibility for admission:

Intermediate (Class XII) in any discipline with minimum 45% marks and Maths as compulsory subject at 10+2.

Duration of the Programme: 3 years

STUDY & EVALUATION SCHEME
Choice Based Credit System
Bachelor of Computer Application (BCA)

First Semester

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Core	BCA-AEC1	General English	2	-	-	2	30	70	100
2	Core	BCA-101	Computer Fundamental & Information Technology	4	1	-	5	30	70	100
3	Core	BCA-102	Programming in 'C'	4	-	-	4	30	70	100
4	Core	BCA-103	Mathematical Foundation of Computer Science	4	1	-	5	30	70	100
Practical										
5	Core	BCA-P11	Lab- Computer Fundamental	-	-	4	2	30	70	100
6	Core	BCA-P12	Lab- Programming in 'C'	-	-	4	2	30	70	100
			Total	**14**	**2**	**8**	**20**	**180**	**420**	**600**

L – Lecture, T – Tutorial, P – Practical, C – Credit

Second Semester

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Core	BCA-AEC2	Environmental Science	2	-	-	2	30	70	100
2	Core	BCA-201	Data Structure & File Organization	4	1	-	5	30	70	100
3	Core	BCA-202	Object Oriented Programming in C++	4	-	-	4	30	70	100
4	Core	BCA-203	Digital Electronics	4	1	-	5	30	70	100
Practical										
5	Core	BCA-P21	Lab- Data Structure & File Organization	-	-	4	2	30	70	100
6	Core	BCA-P22	Lab- Programming in C++	-	-	4	2	30	70	100
			Total	**14**	**2**	**8**	**20**	**180**	**420**	**600**

L – Lecture, T – Tutorial, P – Practical, C – Credit

Third Semester

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Core	BCA-301	Computer Networks	4	-	-	4	30	70	100
2	Core	BCA-302	Core Java	4	-	-	4	30	70	100
3	Core	BCA-303	Computer Organization & Architecture	4	-	-	4	30	70	100
4	Elective	BCA-SEC1.1	System Analysis & Design	4	-	-	4	30	70	100
		BCA-SEC1.2	Principles And Practices of Management							
		BCA-SEC1.3	Cyber Laws							
Practical										
5	Core	BCA-P31	Lab- Computer Networks	-	-	4	2	30	70	100
6	Core	BCA-P32	Lab-Core Java	-	-	4	2	30	70	100
			Total	**16**	**-**	**8**	**20**	**180**	**420**	**600**

L – Lecture, T – Tutorial, P – Practical, C – Credit

Fourth Semester

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Core	BCA-401	Database Management System	4	-	-	4	30	70	100
2	Core	BCA-402	Operating System Organization and UNIX	4	-	-	4	30	70	100
3	Core	BCA-403	Software Engineering	3	1	-	4	30	70	100
4	Elective	BCA - SEC2.1	Graph Theory	4	-	-	4	30	70	100
		BCA-SEC2.2	Introduction to logic							
		BCA-SEC2.3	Software Testing							
Practical										
5	Core	BCA-P41	Lab- Database Management Systems	-	-	4	2	30	70	100
6	Core	BCA-P42	Lab- UNIX	-	-	4	2	30	70	100
			Total	**15**	**1**	**8**	**20**	**180**	**420**	**600**

L – Lecture, T – Tutorial, P – Practical, C – Credit

Fifth Semester

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Elective	BCA- DSE 1.1	Python Programming	4	-	-	4	30	70	100
		BCA- DSE 1.2	Android Programming							
		BCA- DSE 1.3	Web Programming using HTML & CSS							
2	Elective	BCA- DSE 2.1	C# Programming with .Net framework	4	-	-	4	30	70	100
		BCA- DSE 2.2	PHP Programming							
		BCA- DSE 2.3	SQL & /PL/SQL							
3	Elective	BCA-DSE 3.1	Introduction to IOT	3	1	-	4	30	70	100
		BCA-DSE 3.2	Introduction to Blockchain							
		BCA-DSE 3.3	Artificial Intelligence							
		BCA-DSE 3.4	Algorithm Analysis & Design							
4	Elective	BCA-SEC3.1	Data Ware Housing & Data Mining	4	-	-	4	30	70	100
		BCA-SEC3.2	Management Information System							
		BCA-SEC3.3	Enterprises Resources Planning							
		BCA-SEC3.4	Advance RDBMS							
Practical										
5	Elective	BCA-P51	Lab Based on DSE1	-	-	4	2	30	70	100
6	Elective	BCA-P52	Lab Based on DSE2	-	-	4	2	30	70	100
			Total	**15**	**1**	**8**	**20**	**180**	**420**	**600**

L – Lecture, T – Tutorial, P – Practical, C – Credit

Sixth Semester

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Elective	BCA-DSE4.1	Advance Java Programming	4	-	-	4	30	70	100
		BCA-DSE4.2	Data Science using Python							
		BCA-DSE4.3	Microprocessor							
2	Elective	BCA-DSE5.1	Advance Software Engineering	4	-	-	4	30	70	100
		BCA-DSE5.2	Computer Graphics							
		BCA-DSE 5.3	Computer Based Numerical Techniques							
3	Elective	BCA-SEC4.1	Statistics	4	-	-	4	30	70	100
		BCA-SEC4.2	Cloud Computing							
		BCA-SEC4.3	Operation Research							
		BCA-SEC4.4	Network Security& Cryptography							
Practical										
4	Elective	BCA-P61	Lab Based on DSE4	-	-	4	2	30	70	100
5	Elective	BCA-P62	Lab Based on DSE5	-	-	4	2	30	70	100
6	Core	BCA-P63	Project	-	-	4	2	50	150	200
7	Core	BCA-SM	Seminar	-	-	4	2	100	-	100
			Total	**12**	**-**	**16**	**20**	**300**	**500**	**800**

L – Lecture, T – Tutorial, P – Practical, C – Credit

Examination Scheme:

Components	Internal	Assignment	Attendance	External (ESE)
Weightage (%)	15	10	5	70

Course code : BCA-AEC1				
Course Name : General English				
Semester /Year : Ist Semester				
	L	**T**	**P**	**C**
	2	**0**	**0**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To familiarize the students with the basic communication skills.
2. To enhance the written and speaking skills of the students.
3. To develop the confidence and ability to communicate effectively among the students.
4. To teach the students essentials of English language.
5. To enhance the employability skills.

COURSE CONTENTS

UNIT 1: English Grammar [No. of Hours: 10]

Important aspects of English Grammar- Speech and its uses- Pronunciation, Punctuation and Phrase.

UNIT 2: Essentials of English Language [No. of Hours: 10]

Grammar: Parts of Speech- Tenses- Active and Passive Voice
Vocabulary: Idioms and Phrases- Antonyms- Synonyms- One word substitution

UNIT 3: Essential skills [No. of Hours: 10]

Writing skills: Introduction- Importance- Types- Formal and Informal letter
Listening Skills: Introduction- Importance- Types- Purpose of Listening skills

UNIT 4: Formal Writing [No. of Hours: 10]

Formal Writing: CV- Job Application- Importance and Purpose
Essentials of Career Skills: Group Discussion- Personality Development- Interviews

Text Books:

TB1. Business Communication by Rajendra Paul.
TB2. Business English, Pearson.

Reference Books:

RB1. Fluency in English- Part 2, Oxford University Press.
RB2. Language, Literacy and Creativity, Orient Black Swan.

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed statement of the CO
CO1	To understand communication skills and soft skills.
CO2	Use English Language effectively.
CO3	To be able to create job applications and CVs in an effective manner.
CO4	To apply the knowledge of Essential Skills in practical life.
CO5	To explain the importance of professional and ethical attitude at the workplace.
CO6	To develop essential professional skills among students.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2			2	3	1		3	3	3	2
CO2	2	3			2	3	1	2	3	2	3	2
CO3	1	3			3	3	1	2	3	3	3	2
CO4	2	2			3	3	1	2	3	3	3	2
CO5	1	3			2	3	1	2	3	2	3	3
CO6	2	2			2	2	1	2	3			
AVG	**1.7**	**2.5**			**2.3**	**2.8**	**1.0**	**2.0**	**3.0**	**2.6**	**3.0**	**2.2**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-101**				
Course Name	**: Computer Fundamental & Information Technology**				
Semester /Year	**: Ist Semester**				
		L	**T**	**P**	**C**
		4	**1**	**0**	**5**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To provide understanding of the various components and functional units of computers, their design and working.
2. To provide insight into digital systems and logic circuit design.

COURSE CONTENTS

UNIT I Introduction to Computers [No. of Hours: 8]

Generation of Computer, Hardware Components, Memory Devices, Magnetic Disk, Floppy Disk, Compact Disc/ DVD; Input Devices- Keyboard, Mouse, Scanner, OCR, OMR, MICR. Output Devices- Printer, Types of Printer, Plotter, Monitor: CRT; Central Processing Unit, CPU- Arithmetic Logic Unit, Control Unit, Instruction Set, Registers, Processor Speed, Type Of Processors; Memory- Main Memory Organization, Main Memory Capacity, RAM, ROM, EPROM, PROM, Cache Memory, OCR, OMR, MICR.

UNIT II Number Systems [No. of Hours: 6]

Number Systems: Binary, Decimal, Octal, Hexadecimal, Binary Arithmetic, Character Codes (BCD), Excess-3, Gray Code, ASCII

UNIT III –System Software and Application Software [No. of Hours: 10]

System software, utility packages, compilers, interpreters, Operating Systems, Elementary commands of DOS, Booting.

Application softwares– word-processing, spreadsheet, presentation graphics, Data Base Management Software, Characteristics, Virus- working, features, types of viruses, virus detection prevention and cure.

UNIT IV - Programming Languages and Algorithms [No. of Hours: 8]

Generation of Languages: Machine language, Assembly languages, High level languages, Language translators (Compiler, Interpreter, Assembler) , Syntax error, Logical error, runtime error, General concepts of OOPS (Object oriented programming), Structured Query Language

Algorithm development, techniques of problem solving- Flowchart, Pseudo-code, Decision trees, Programming paradigms: Top-down, bottom-up etc.

UNIT V – Computer Network & Communication Technologies [No. of Hours: 8]

Communication system elements, communication modes (simplex, half duplex and full duplex analog and digital, synchronous and Asynchronous, Communication media: wired and wireless, LAN WAN, MAN, network topologies.

Text Books:

TB1. Pradeep K. Sinha, PritiSinha, "Computer Fundamentals". BPBPublications.
TB2. Rajaraman, V., "Fundamental of Computers". Prentice Hall India,New Delhi
TB3. Dorothy House(2015), "Microsoft Word, Excel, and PowerPoint: Just for Beginners. Outskirts
TB4. Press 2 Peter Norton(2017), "Introduction to Computers",4th Edition, TMH Ltd, New Delhi.

Reference Books:

RB1. Sanders D.H, Computers Today

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Describe the knowledge of basic components of computer systems and its functionality.
CO2	Understand the classification of various types of memory in computer and concept of input and output devices and.
CO3	Solve the number systems by applying various types of conversion techniques and their representations.
CO4	Illustrate an operating system by analyzing its working learn basic word processing, spreadsheet and presentation graphics and learn about various viruses and prevention from them.
CO5	Evaluate various problem solving techniques like algorithm, flowchart etc. and Learn generation of languages, basic concepts of OOPs, SQL etc.
CO6	Design and Develop computer network and various communication modes, communication media like LAN, MAN, WAN etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1			1						1	1	1
CO2	2				1		1	1		1	1	1
CO3	2	1	1	3	1	1		1		1	1	1
CO4	3	2	2	2	1	2	1	2	1	1	1	1
CO5	3	1	1	2	2	2	2	3	2	2	2	2
CO6	3	1	1	2	2	2	2	3	2	2	2	2
AVG	**2.3**	**0.8**	**0.8**	**1.6**	**1.1**	**1.1**	**1**	1.6	0.8	1.3	1.3	1.3

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-102**			
Course Name	**:Programming in 'C'**			
Semester /Year	**: Ist Semester**			
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Understand the basics of Programming Paradigms,
2. To learn the basic concepts and syntax of C programming.
3. To be able to develop logics which help them to create programs and applications using C language.
4. To learn the use of C libraries functions in C language.
5. To learn the file handling and basic memory allocation concepts in C language.
6. After learning the C programming they can easily switch over to any other language

COURSE CONTENTS

UNIT-I **[No. of Hours: 7]**

History of 'C' Programming, Types of Programming Languages. Introduction to C and structure of 'C' Program, some simple C programs, Desirable program characteristics. C Fundamentals- C character Set, Identifiers and keywords, datatypes, constants, variables and arrays, Declarations, expressions, statements, Symbolic constants.

UNIT –II **[No. of Hours: 10]**

Operators and expressions- Arithmetic operators, unary operator, Relational and logical operators, assignment operators, conditional operators, Library Functions. Data Input and Output- Preliminaries, singe character input, singe character output, entering input data, writing output data, the gets and puts function. Precedence and associatively of operators, Side effects, Type conversion, Managing input and output.

UNIT-III **[No. of Hours: 10]**

Control Statements- Preliminaries, Branching, Looping, Nested control statements, switch statement, break statement, the continue statement. Arrays: Defining an array, processing an array, passing arrays to functions, Multidimensional arrays, Arrays and strings. **Functions:** A brief overview, defining a function, accessing a function, function prototypes, passing arguments to a function, recursion. Storage classes.

UNIT-IV **[No. of Hours:6]**

Pointers- Fundamentals, Pointer declarations, Passing pointers to the functions, pointers and one-dimensional array, dynamic memory allocation, Operations on pointers, arrays of pointers. Pointer to Pointer, call by value call by reference, pointer to function.

UNIT-V **[No. of Hours: 7]**

Structure &Union: Declaration & Initialization of Structure & Union, Array of Structure, passing structure to a function, union and array as member, of union, concept of memory saving and union. Data files- Opening and closing a data file, creating a data file, processing a data file, unformatted data files. Command line argument in 'C'.

Text Books:

TB1. Pointers in C, KanetkarY.P. , BPB Publications
TB2. Kanetkar Y.P., Let us C, BPB Publications

Reference Books:

RB1. The C programming language, Kernighan and Ritchie, PHI
RB2. The Spirit of C, Cooper Mullish, Jaico Publishing House, Delhi

Course Outcomes (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Identify the basic concepts of C programming language & improve the understanding, remembering of using data types, variables and arithmetic operations in C programming.
CO2	Understanding Array String, Functions concepts and implement array and string using functions.
CO3	Apply the concept of pointer & preprocessor directives. In addition, resolve real world problems Able to design and develop various programming problems using C programming concepts.
CO4	Analyze the concepts of structure and union & dynamic memory allocation by using malloc and calloc function etc.
CO5	Evaluate file handling using C Programming language.
CO6	plan a project using C programming language.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	1	1	1					
CO2	2	2	1	1	1	1	1					
CO3	1	2	2	2	1	1	1	1				
CO4	1	2	2	2	1	1	1					
CO5	2	1	1		1	1	1	2				
CO6			1		2	2	3					
AVG	1.3	1.3	1.5	1.1	1.1	1.1	1.3	0.5				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA 103**				
Course Name	**: Mathematical foundation of Computer Science**				
Semester /Year	**: Ist Semester**				
		L	**T**	**P**	**C**
		4	**1**	**0**	**5**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Know the basic principle of set theory, relations, function and its operations.
2. Able to Understand the concepts of groups, and elementary properties of Rings and Fields.
3. Learn the logical notation and determine if the argument is or is not valid in preposition and predicate logic.
4. Learn the representation of lattices with POSET.
5. Learn the concepts of graphs, trees and it's traversal, and recurrence relations.

COURSE CONTENTS

UNIT I **[No. of Hours: 8]**

Set Theory: Set, Subset, Operation on sets, DeMorgan's Law, Power set of set. Matrices: Matrices operations, Transpose, Inverse and power of Matrices.

UNIT II **[No. of Hours: 8]**

Relation: Type and compositions of relations, Pictorial representation of relations, Equivalence relations, Partial ordering relation. Function: Types, Composition of function, Recursively defined function.

UNIT III **[No. of Hours: 8]**

Mathematical Induction: Piano's axioms, Mathematical Induction, Discrete Numeric Functions and Generating functions, Simple Recurrence relation with constant coefficients, Linear recurrence relation without constant coefficients, Asymptotic Behaviour of functions

UNIT IV **[No. of Hours: 8]**

Algebric Structures: Properties, Semi group, monoid, Group, Abelian group, properties of group, Subgroup, Cyclic group, Cosets, Permutation groups.

UNIT V **[No. of Hours: 8]**

Prepositional Logic: Preposition, First order logic, Basic logical operations, Tautologies, Contradictions, Algebra of Proposition, Logical implication, Logical equivalence, Normal forms, Inference Theory, Predicates and quantifiers, Posets, Hasse Diagram.

Text Books:

TB3. Kenneth H. Rosen, "Discrete Mathematics and its applications', TMH.
TB4. Liptschutz, Seymour, "Discrete Mathematics", TMH.".

Reference Books:

RB1. Hopcroft J.E. Uliman J.D., "Introduction to Automata Theory, Language and Computation" Narosa Pub. House, New Delhi.

RB2. C.L.Liu "Elements of Discrete Mathematics", McGraw Hill.

Course Outcomes (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Illustrate the basic concepts of sets, matrices
CO2	Understand the various concepts of relations and functions
CO3	Teach to use mathematical induction to solve various linear and non-linear, asymptotic behaviour of a function etc.
CO4	Analyse and illustrate representation of lattices and be able to determine their properties with Boolean algebra.
CO5	Able to evaluate the use Algebraic Structures like various types of groups and permutation groups
CO6	design posset and hasse diagrams and solve various types of logic by using prepositional logic

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1		1		2	1					1
CO2	1	1		2	1	1	2					1
CO3	1	2	2	2	2	1	2	1				2
CO4	2	1		2		2	1	1				1
CO5	1	3	2	1	1	2	1	1				2
CO6	1	3	2	1	2	2	2	2	1	1	1	1
AVG	**1.1**	**1.8**	**1**	**1.5**	**1**	**1.6**	**1.5**	**0.8**	**0.1**	**0.1**	**0.1**	**1.3**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P11				
Course Name : LAB-COMPUTER FUNDAMENTAL				
Semester /Year : Ist Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To provide understanding of the various components and functional units of computers, their design and working.
2. To provide insight into digital systems and logic circuit design.

COURSE CONTENTS

- Various Components of Computer
- Internal And External DOS Commands
- Windows Operating System
- MS Word
- MS Excel
- MS Power Point
- Web Browser and E-mail

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	**Detailed Statement of the CO**
CO1	Name, define, find, relate, show the basics of computer
CO2	Illustrate, outline, show, summarize word processing techniques
CO3	Implement or apply word processing using spread sheets
CO4	Analyze, compare examine the MS-Office techniques
CO5	Assess MS-office tools and techniques
CO6	Build, Design, develop new spreadsheets, PowerPoint presentation, word documents for give problem or case study

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2			1						
CO2	3	3	2	2								
CO3	3	3	2		1							
CO4	2	3	3									
CO5	3	3	3			2						
CO6	3	3	3	2	1	1						
AVG	**2.8**	**3**	**2,5**	**0.6**	**0.3**	**0.6**						

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P12				
Course Name : LAB - PROGRAMMING IN C				
Semester /Year : Ist Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To understand basic concepts of C programming, operators and expressions.
2. To learn the Concept of Various Decision Control statements and loops.
3. To understand the Concept of Arrays and String Operations.
4. To understand Concept of Functions, Pointers, Structure, Union and Enumeration.
5. To understand Concept of File Handling

COURSE CONTENTS

- Simple Program based on operators
- Simple Program based on Loops
- Program based on arrays
- Program based on strings
- Program based on function
- Program based on pointers
- Program based on structure & union
- Program based on File handling

Course Outcomes (CO):
After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Simple programs to understand & create the concepts of data types, operations and expressions.
CO2	By analyze and applying conditional and control statements.
CO3	Implementing Concept of array and String to solve problem.
CO4	Analyze and Implementation of functions, pointers, operation on pointers and dynamic storage allocation.
CO5	Defining, applying and handling structures, array of structures, union and processing data
CO6	To create a project using c programming language.

CO-PO Mapping:

CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	2	3	2	1					
CO2	2	2	3	2	3	1	2	1				
CO3	1	3	3	2	2	1	1	1			1	
CO4	1	2	3	2	2	1	2	1			1	
CO5	3	1	2	2	2	1	2	1				
CO6			1		2	2	3					
AVG	**1.5**	**1.5**	**2.5**	**1.6**	**2.3**	**1.3**	**1.8**	**0.6**			**0.3**	

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-AEC2**			
Course Name	**: ENVIRONMENTAL STUDIES**			
Semester /Year	**: IInd Semester**			
	L	**T**	**P**	**C**
	2	**0**	**0**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To develop a comprehensive understanding of various facets of life forms and ecological processes
2. To gain the knowledge of how natural resources relate today to the economy and environment.
3. To aware about the problem of environmental pollution and to learn about the various methods and processes by which pollution can be controlled
4. To know about the various programs working at global level for environment
5. To appreciate the ethical, cultural and historical context of environmental issues

COURSE CONTENTS

UNIT I: Introduction to environmental studies and Ecosystems [No. of Hours:10]

Definition of environment Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development.

What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession.

Unit II: Natural Resources [No. of Hours: 13]

Natural resources and their type Land resources and land use change; Land degradation, soil erosion and desertification, Deforestation: Causes and impacts due to mining, dam building on environment Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state)., Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

UNIT III: Environmental Pollution and Environmental Laws [No. of Hours: 15]

Environmental pollution: types, causes, effects and controls; Nuclear hazards and human health risks, Solid waste management: Control measures of urban and industrial waste, Pollution case studies.

Climate change, global warming, greenhouse effect ozone layer depletion, acid rain and impacts on human communities and agriculture

Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD)

UNIT IV: Biodiversity and Conservation **[No. of Hours : 12]**

Definition of biodiversity Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit V: Human population growth **[No. of Hours : 10]**

Impacts on environment, human health and welfare, Resettlement and rehabilitation of project affected persons; Disaster management: floods, earthquake, cyclones and landslides, Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan., Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Case studies (e.g., CNG vehicles in Delhi).

Field work, visit to an area to document environmental assets: river/ forest/ flora/fauna, etc., Visit to a local polluted site-Urban/Rural/Industrial/Agricultural., Study of common plants, insects, birds and basic principles of identification., Study of simple ecosystems-pond, river, Delhi Ridge, etc.

Text Books:

TB1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha
TB2. Fundamental Concept in Environmental Studies by Dr D D Mishra

Reference Books:

RB1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha
RB2. Fundamental Concept in Environmental Studies by Dr D D Mishra

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	To gain the knowledge of multidisciplinary nature of environmental science
CO2	To understand and explain about protection of wildlife and other natural resources.
CO3	To gain the knowledge about the different control technologies and awareness programs regarding environment
CO4	To identify, formulate and solve environmental problems by utilizing the concept of environmental studies
CO5	To evaluate and reframe various policies and practices for environment protection
CO6	To demonstrate an integrative approach to environmental issues with a focus on sustainability

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	1	3		2	3	2	2
CO2	2	3	3	2	3	1	3		3	2	2	2
CO3	3	3	3	3	3	2	2	2	3	3		
CO4	1	1	2	2	2	2	1	2	1	3		
CO5	3	3	1	1	2		2	1	1	3		
CO6	3	2	2	3	3	3	2	1		2	1	3
AVG	**2.4**	**2.4**	**2**	**1.8**	**2.4**	**1.2**	**2.2**	**1**	**2**	**2.8**	**0.8**	**0.8**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-201**				
Course Name	**: DATA STRUCTURE & FILE ORGANIZATION**				
Semester /Year	**: IInd Semester**				
		L	**T**	**P**	**C**
		4	**1**	**0**	**5**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To learn basic knowledge about data structure and arrays.
2. To learn how to create and use linked list and its applications.
3. To learn the importance of static and dynamic use of stack and queues.
4. To learn the basic terminology of trees.
5. To learn basics of sorting and searching techniques

COURSE CONTENTS

UNIT I **[No. of Hours: 6]**

Introduction: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off. Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered list, Sparse Matrices, and Vector.

UNIT II **[No. of Hours: 8]**

Link List: Representation and implementation of Singly linked lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List of Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

UNIT III **[No. of Hours: 8]**

Stacks: Array Representation and Implementation of stack, Operations and Stacks: Push and POP, Array Representation of Stack, Linked Representation of stack, Operations Associated with Stacks, Application of stack, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Recursion: Recursive definition and processes. Queues: Array and linked representation and implementation of queues, Operations on Queue; Create, Add, Delete, Full and Empty, Circular queue, Dequeue and Priority Queue.

UNIT IV **[No. of Hours: 10]**

Trees: Basic terminology, Binary Tree, Binary tree representation algebraic Expressions, Complete Binary Tree, Extended Binary Tree, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees. Tree traversing, Threaded Binary tree, Huffman algorithm. Searching and Hashing: Sequential search, comparison and analysis, Hash Table, Hash Function, Collection Resolution Strategies, Hash Table Implementation.

UNIT V **[No. of Hours: 8]**

Sorting: Insertion Sort, Bubble sorting, Quick Sort, Two way Merge Sort, Trees: Binary Search (BST), Insertion and Deletion in BST.

Text Books:

TB5. Lipschutz, "Data Structure", TMH

Reference Books:

RB1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia

RB2. R. Kruseetal, "Data Structures and Program Design in C" Pearson Education

COURSEOUTCOMES(CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Able to understand& remember basics of C programming language and arrays & able to apply basic concepts of linked list & its types
CO2	Able to understand & apply basic concepts of stack and queues through array and linked list
CO3	To understand & apply the basic knowledge of Binary trees & its representation, traversing in BST, Threaded binary tree, Huffman algorithm etc.
CO4	Able to understand the concepts of sorting and searching & Hashing techniques.
CO5	Apply the basic knowledge of to implement File Structure
CO6	Create the structure of stack, queues, trees etc. using array and linked list.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1		1							
CO2	2	2	1		1		1					
CO3	2	1	2		2		1					
CO4	2	1	1	1		1	1					
CO5	2	1		1		2	1					
CO6	2	2	2	2	2	1	1					
AVG	**2**	**1.3**	**1.4**	**1.3**	**1.5**	**1.3**	**1.0**					

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA 202				
Course Name : OBJECTORIENTEDPROGRAMMING in C++				
Semester /Year : IInd Sem				
	L	**T**	**P**	**C**
	4	**0**	**4**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

- To learn the features of object oriented programming, Application of OOPs
- To learn basic concepts of class , constructor destructor, this pointer, inline function
- To learn & implement various programming problems in C++ like operator OL & Inheritance.
- To learn & implement advanced programming concepts in C++ like dynamic binding& Virtual base class
- To learn error handling technique in C++ and improve problem solving ability.

Couse Contents

UNIT I **[No. of hours: 6 Hr]**

Introduction: Introduction to OOP, Basic Concepts of OOP, Applications of OOP. Introduction to C++, Introduction to C++ stream I/O, declarations in C++, Creating New data types in C++, Function Prototypes, Inline functions, Reference Parameters, Const Qualifier, Dynamic memory allocation, default arguments, Unary Scope resolution operator, Linkage specifications.

UNIT II **[No. of hours: 8Hr]**

Class, Constructors, Friend Class : Introduction, Comparing class with Structure, Class Scope, Accessing Members of a class, Constructor, Destructor, Const objects, Const member functions, Friend class, Friend function, This pointer, Data abstraction and Information hiding, container classes and Iterators

UNIT III **[No. of hours: 10 Hr]**

Overloading & Inheritance: Operator Overloading, Fundamentals, Restrictions, Overloading stream, Insertion and stream extraction operators, Overloading unary & binary operators, Converting between types, Overloading ++ and --. Inheritance, Introduction, Protected members, Casting base _class pointers to derived _class pointers Overloading Base class members in a Derived class, Public, Protocols and Private inheritance, Direct base classes and Indirect Base Classes, Using Constructors and Destructors in Derived classes, Implicit Derived class object to base class object conversion.

UNIT IV **[No. of hours: 8 Hr]**

Virtual Function: Introduction, Type fields and switch statements, Virtual functions, Abstract base classes and concrete classes, Polymorphism, Dynamic binding, Virtual destructors.

UNIT V **[No. of hours: 8 Hr]**

C++ Stream I/O: Streams, Stream Input, Stream Output, Unformatted I/O, Stream manipulators, Stream format states, Stream error, States.

Text Books:

TB6. E. Balagurusamy "Object Oriented Programming with C++".
TB7. YashwantKanetkar, "Let Us C++".

Reference Books:

RB1. Deitel H.M. &Deitel P.J. – "How to Program C++" – PHI – 2003
RB2. Al stevenes – "C++ Programming" – Wiley dreamtech – 2003.
RB3. Herbert Scheldt, "Complete Reference

Course Outcome (COs):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	To understand &remember the concept of object-oriented programming
CO2	To understand &implement the concept of constructor, copy constructor destructor, this pointer, inline function etc.
CO3	Design, analyze and develop various programming problems using basic concepts of C++ like Binary & unary operator OL,
CO4	Learn and implement the concept function Over loading & Inheritance.
CO5	Understand and implement advance programming concepts of C++ like virtual and pure virtual function, virtual base class
CO6	To create and design the concept of file handling mechanism in C++.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1		1		1					
CO2	2	1	2		1	1	1					
CO3	1	2	2	1	1	2	2					
CO4	1	1	2	1	1	2	2					
CO5	1	1	2	1	1	1	2					
CO6	1	1	2	1	1	1	1					
AVG	**1.5**	**1.1**	**1.7**	**0.6**	**1**	**1.1**	**1.5**					

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-203**			
Course Name	**: Digital Electronics**			
Semester	**: II**			
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
3. To implement simple logical operations using combinational logic circuits.
4. To design combinational logic circuits, sequential logic circuits.

COURSE CONTENTS

Unit 1 **[No. of Hours: 6]**

Binary Systems and Logic Circuits: The Advantage of Binary, Number Systems- Binary, Octal, Decimal and Hexadecimal. Conversions between number systems. Use of Binary in Digital Systems, Logic Gates, Logic Family Terminology.

Unit 2 **[No. of Hours: 6]**

Binary Arithmetic: Binary Addition, Subtraction, Multiplication and Division. Complements, Representation of Signed and Unsigned numbers – Signed magnitude , Signed 1's Complement, Signed 2's complement, Decimal subtraction using 9's and 10's complement, Binary subtraction using 1's and 2's complement.

Unit 3 **[No. of Hours: 8]**

Boolean Algebra and Mapping Methods: Boolean Algebra, SOP and POS forms of representation, minterms and maxterms, Simplification of logic functions by theorems and Karnaugh's map, don't care conditions, Realizing Logic Function with Gates, Combinational Design Examples.

Unit 4 **[No. of Hours: 10]**

Combinational Logic: Adders- Half adder and full adders, Subtractors- Half and Full Subtractors, Encoders and Decoders, Multiplexers and De-multiplexers.

Unit 5 **[No. of Hours: 10]**

Sequential Logic: Latch, Flip Flops- SR, Data, JK & Toggle

Registers: Serial-in-Serial-Out, Serial-in-Parallel-Out, Parallel-in-Serial-Out, Parallel-in-Parallel-Out Shift registers

Counters- Synchronous and Asynchronous/ Ripple counters, Design of Ripple counter - Modulo-n counter.

Text Books:

TB8. M. M. Mano, Digital Design, 3rd ed., Pearson Education, Delhi, 2003.

TB9. D.P. Leach, Malvino, Guha, Digital Principles and Applications, TMH, New Delhi, 2011.

Reference Books:

RB1. T. L. Floyd and Jain, Digital Fundamentals, Pearson Education, 2003.

RB2. R.J. Tocci and N.S. Widner, Digital Systems - Principles & Applications, PHI, 10th Ed., 2007

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Identify and represent numeric information in different forms.
CO2	Understand machine level representation of data and perform operations on it.
CO3	Apply K-Maps and Tabulation methods for Simplification of Boolean expressions and construct logic circuit.
CO4	Analyse logic circuits and deduce logic expressions and truth tables.
CO5	Evaluate digital number systems and use Boolean algebra theorems, Properties and Canonical form for digital logic circuit design.
CO6	Design and analyse small combinational & sequential circuits to build larger more complex circuits.

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1	1	-	2	-	-	-	2	-	-
CO2	2	1	2	2	-	2	-	-	-	1	-	-
CO3	3	2	2	2	-	1	-	-	-	1	-	-
CO4	2	1	1	3	-	1	-	-	-	1	-	-
CO5	2	1	1	3	-	1	-	-	-	1	-	-
CO6	3	1	1	1	-	2	-	-	-	2	-	-
AVG	**2.5**	**1.2**	**1.3**	**2**	**0**	**1.5**	**0**	**0**	**0**	**1.3**	**0**	**0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P21				
Course Name : LAB- DATA STRUCTURE & FILE ORGANIZATION				
Semester /Year : IInd Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To learn how to design the algorithms to solve the programming problems.
2. To learn how to discriminate the usage of various structures in approaching the problem solution.
3. To learn how to use effective and efficient data structures in solving various Computer Engineering domain problems
4. To learn how to analyse the problems to apply suitable algorithm and data structure.
5. To learn how to use appropriate algorithmic strategy for better efficiency

COURSE CONTENTS

- Program based on arrays
- Program based on strings
- Program based on Link List & types of Link List
- Program based on stack
- Program based on Queues
- Program based on Trees
- Program based on different types of sorting

Course Outcomes (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Analyze & understand the difference between linear and non linear DS &
CO2	Implement array & link list and its types
CO3	Understand and implement stack and queues using array and link list
CO4	Understand and implement BST, addition and deletion of nodes, Huffman algorithm etc.
CO5	To implement different sorting techniques like selection Bubble, insertion, merge quick sort etc.
CO6	To create the data using linked list.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2				1					
CO2	3	1	2			1	1					
CO3	3	2	3	1	1	2	2					
CO4	1	1	3	1		2	2					
CO5	1	1	3	1		1	2					
CO6		2	3	1	1	2	3					
AVG	**1.6**	**1.6**	**2.6**	**0.6**	**0.3**	**1.3**	**1.8**					

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA P22				
Course Name : P22 LAB :PROGRAMMING in C++				
Semester /Year : II / I				
	L	**T**	**P**	**C**
	0	**0**	**4**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

- To learn writing skill of C++ programming to the students and solving problems.
- To learn how to design and apply OOP principles for effective programming
- To learn the concepts class, constructor, destructor etc
- To learn how to use overloading & Inheritance
- To learn how to use virtual function & virtual destructor
- To learn the concept of file handling in C++

Couse Contents:

1. Program based on constructors & types of constructors
2. Program based on function Overloading
3. Program based on operator Overloading
4. Program based on static data member & member function
5. Program based on inline function
6. Program based on this pointer
7. Program based on different types of inheritance
8. Program based on File handling

Course Outcome (COs):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	To understand& analyze the strengths of object-oriented programming in C++.
CO2	To understand, create& implement the concept of constructor, copy constructor, destructor, this pointer, inline function etc.
CO3	To create, understand& implement the concept of operator Overloading, Inheritance
CO4	To understand& implement the concept of virtual function, Abstract base class, concrete class, virtual destructor
CO5	To analyze, understand & implement abstract base class, concrete class, virtual destructor
CO6	To create and design the concept of file handling mechanism in C++

CO-PO MAPPING:

CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	3	2	1					
CO2	2	2	2	2	3	1	2					
CO3	1	3	2	2	2	1	1	1			1	
CO4	1	2	2	2	2	1	2	1			1	
CO5	3	1	2	2	2	1	2	1				
CO6												
Avg												

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA 301				
Course Name : COMPUTER NETWORKS				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Build an Understanding of the Fundamental Concepts of Computer Networking.
2. Familiarize the Student with the Basic Taxonomy and Terminology of the Computer Networking Area.
3. Introduce the Student to Advanced Networking Concepts
4. Preparing the Student for Advanced Courses in Computer Networking.

COURSE CONTENTS

Unit I **[No. of Hours: 8]**

Introductory Concepts: Goals and Applications of Networks, Network structure and transmission, switching methods, Integrated services digital networks, terminal handling.

Unit II **[No. of Hours: 8]**

Medium Access sub Layer: Channel allocations, LAN protocols, ALOHA Protocols-Pure Aloha, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, FDDI, Data Linked Layer elementary data link protocols, sliding windows protocols, error handling, High Level Data Link Control.

Unit III **[No. of Hours: 8]**

Network Layer: Point-to Point networks, routing algorithms, congestion control algorithms, internetworking, TCP/IP packet, IP addresses, Ipv6.

Unit IV **[No. of Hours: 8]**

Transport Layer: Design issues, connection management, TCP window Management, User Datagram Protocol, Transmission Control Protocol.

Unit V **[No. of Hours: 8]**

Application Layer: Network Security, DES, RSA algorithms, Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Cryptography and compression Techniques.

Text Books:

TB1. Forouzan, "Data Communication and Networking:. TMH
TB2. A.S. Tanenbaum, "Computer Networks, 3rd Edition," PHI

Reference Books:

RB1. Comer, "Internetworking with TCP/IP" PHI
RB2. Comer, "Computer networks & Inter" PHI

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Define and state the functions of each layer in the OSIreference model and TCP/IP protocol suite while illustrating the process of data encoding and multiplexing.
CO2	Explain the fundamentals of data communication andnetworking identify the topologies and connecting devices of networks
CO3	Identify the appropriate MAC layer/ data link layerprotocols for the given network
CO4	Classify IPv4& IPv6 protocols, along with their characteristics and functionality.
CO5	Evaluate and implement routing algorithms and multicasting.
CO6	Adapt transport and application layer protocols along with concepts of mobility and security in networks

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3								
CO2	3	3	2	3								
CO3	3	3	2	3								
CO4	3	3	2									
CO5	3	3	2	3		2				2		
CO6	3	3	3	3	3	2				2		
AVG	**3**	**3**	**2.5**	**2.5**	**0.5**	**0.6**	**0**	**0**	**0**	**0.6**	**0**	**0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-302**			
Course Name	**: CORE JAVA**			
Semester /Year	**: IIIrd Semester**			
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To learn why Java is useful for the design of desktop and web applications.
2. To learn how to implement object-oriented designs with Java.
3. To identify Java language components and how they work together in applications.
4. To design and program stand-alone Java applications.

COURSE CONTENT

Unit I **[No. of Hours: 8]**

Introduction to Java programming–Java Buzzword, The Java Virtual Machine, Variables and data types, Operators and Expressions- Introduction, Arithmetic Operators, Relational Operators Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators, Type Conversion and Associativity,

Unit II **[No. of Hours: 8]**

Decision Making and Branching- Introduction, Decision Making with if Statement, Simple if Statement, The if…..else Statement, Nesting of if .Else Statements, The else if Ladder, The Switch Statement, The ?: Operator. Decision Making and Looping – Introduction, while Statement, do Statement, for Statement, Jumps in Loops Labeled Loops

Unit III **[No. of Hours: 8]**

Classes, Objects and Methods- Introduction, Defining a Class, Adding Variables, Adding Methods, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods, Inheritance- Types of inheritance single, multiple, multi-level, hierarchical, Interfaces, Extending a Class Overriding Methods, Final Variables and Methods, Finalizer methods, Abstract Methods and Classes, Visibility Control. Arrays, Strings and Vectors- Arrays, One-dimensional Arrays, Creating an Array, Two -Dimensional Arrays, Creating an Array, Two – dimensional Arrays, Strings, Vectors, Wrapper Classes.

Unit IV **[No. of Hours: 8]**

Multithreaded Programming- Introduction, Creating Threads, Extending the Thread Class, Stopping and Blocking a thread, Life Cycle of a thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the 'Runnable' Interface.Packages - Using a Package, Adding a Class to a Package, Exceptions Handling - Introduction, Types of Exception Handling Code, Multiple Catch Statements, Using Finally Statement,

Unit V **[No. of Hours: 8]**

Applet Programming - Introduction, How Applets Differ from Applications, , Applet Life Cycle, Creating Applet Tag, Adding Applet to HTML File, running the Applet, Input/OutputFiles in JAVA:- Introduction, Concept of Streams, Stream Classes, Byte Stream Classes, Character Stream Classes, Using Streams, Using the File Class

Text Books:

TB1. A. Balaguruswamy, "Programming with JAVA", A Primer, TMH, 1999.

Reference Books:

RB1. Thomas Boutel, "CGI programming in C and Perl", Addison – Wesley, 1996.
RB2. Jefry Dwight et al, Using CGI, Second Edition, Prentice Hall, India, 1997.
RB3. Patrick Naughton& Herbert Schildt, JAVA 2: The Complete Reference, THM, 1999.
RB4. Schildt, "JAVA The Complete Reference", 7th Edition.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Understand the object oriented concepts
CO2	Implement multi-threading programs
CO3	Implement Exception handling
CO4	Develop GUI based applications
CO5	Understand file handling
CO6	Design program based on files

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3					2						
CO2	2	2		1			2		2	2	1	
CO3	1		3		2	2						
CO4	2	2										
CO5	1			2								
CO6	1	1	2	2	2	2						
AVG	**2.0**	**0.83**	**0.83**	**0.83**	**0.66**	**1.0**	**0.4**		**0.4**	**0.4**	**0.2**	

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-303**			
Course Name	**: COMPUTER ORGANIZATION & ARCHITECTURE**			
Semester	**: III**			
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To understand the structure, function and characteristics of computer systems.
2. To understand the design of the various functional units and components of computers.
3. To identify the elements of modern instructions sets and their impact on processor design.
4. To explain the function of each element of a memory hierarchy,
5. To identify and compare different methods for computer I/O.

Course Contents

Unit 1 **[No. of Hours: 10]**

Introduction to Computers- Basics of Computer, Von Neumann Architecture, Generation of Computer, Classification of Computers, Instruction Execution, Register Transfer and Micro operations- Register Transfer, Bus and Memory Transfers, Tree-State Bus Buffers, Memory Transfer, Micro-Operations, Register Transfer Micro-Operations, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations.

Unit 2 **[No. of Hours: 8]**

Computer Arithmetic - Addition and Subtraction with Signed-Magnitude, Multiplication Algorithm, Booth Multiplication Algorithm, Fixed Point and IEEE floating-point number representation.

Unit 3 **[No. of Hours: 8]**

Control Unit Organization – Hardwired and Microprogrammed Control Unit, CPU Organization-Types, Instruction Formats, Three - Address Instructions, Two – Address Instructions, One-Address Instructions, Zero Address Instructions, Addressing modes, CISC Characteristics vs. RISC Characteristics, Pipelining - Arithmetic Pipeline & Instruction Pipeline.

Unit 4 **[No. of Hours: 8]**

Memory Organization- Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory, Virtual Memory. Address Space and Memory Space, Associative Memory, Page Table, Page Replacement.

Unit 5 **[No. of Hours: 6]**

Input-Output Organization- Modes of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPU-IOP Communication.

Text Books:

TB10. M. M. Mano, Computer System Architecture Digital Design, 3rd ed., Pearson Education, Delhi, 2007.

TB11. T. Radhakrishnan and V. Rajaraman – Computer Organization & Architecture, PHI, 2004.

Reference Books:

RB1. D.P. Leach, A. P. Malvino, Goutam Guha, Digital Principles and Applications, Tata Mc-Graw Hill, New Delhi, 2011.

RB2. R.J. Tocci and N.S. Widner, Digital Systems - Principles & Applications, PHI, 10th Ed., 2007

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Outline the principles of computer design and understand the basic organization of computer and BUS architecture of the system.
CO2	Understand the digital representation of data in a computer system and performing arithmetic calculations on data.
CO3	Demonstrate the different types of control logic designs in processors, instruction set principles and instruction format.
CO4	Illustrate the effect of addressing modes on the execution time of a program.
CO5	Summarize the concepts of memory system, memory mapping. Evaluate the computer memory types based on performance and cost and interpret replacement algorithms.
CO6	Integrate the concepts of input/output organization, different communication schemes and data transfer modes.

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	2	-	2	-	-	-	2	-	-
CO2	3	2	2	2	-	2	-	-	-	1	-	-
CO3	3	2	2	2	-	1	-	-	-	1	-	-
CO4	2	1	1	1	-	1	-	-	-	1	-	-
CO5	2	1	1	1	-	1	-	-	-	1	-	-
CO6	3	2	2	2	-	1	-	-	-	1	-	-
AVG	**2.7**	**1.7**	**1.7**	**1.7**	**0.0**	**1.3**	**0.0**	**0.0**	**0.0**	**1.2**	**0.0**	**0.0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-SEC1.1				
Course Name : SYSTEM ANALYSIS & DESIGN				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To study different types of system and life cycle of system development.
2. To learn roles of system analyst and different information gathering tools.
3. To learn use tools for structured analysis, cost/benefit strategies and feasibility study.
4. To learn process and stages of system design and form design.
5. To learn system testing and quality assurance with proper hardware and software selection.

COURSE CONTENTS

Unit I **[No. of Hours: 6]**

System Concepts and Information System Environment- The System Concept, Definition, Characteristics of Systems, Elements of a System, Open and Closed and closed system, Formal and Informal Information Systems, Computer based Information Systems, Management Information System, Decision Support System

Unit II **[No. of Hours: 10]**

The System Development Life Cycle- Recognition of needs, Impetus for System Change, Feasibility Study, Analysis, Design, Implementation, Post implementation and Maintenance. The Role of the Systems Analyst, Academic and Personal Qualifications, Skills of System Analyst

Unit III **[No. of Hours: 12]**

Systems Planning and Initial Investigation- Strategies for Determining Information Requirement, Problem Definition and Project initiation, Background Analysis, Fact Analysis, Review of Written Documents, Onsite Observations, Interviews and Questionnaires, Fact Analysis, Performance Analysis, Efficiency Analysis, Service Analysis. Information Gathering- Kind of Information needed. Information about the firms, Information gathering tools, the art of Interviewing, Arranging the Interview, Guides to Successful Interview, Types of Interviews and Questionnaires, The Structured and Unstructured Alternatives.

Unit IV **[No. of Hours: 8]**

The Tools of Structured Analysis- The Dataflow Diagram (DFD), Data Dictionary, Decision Table, Decision Trees and Structured English.

Unit V **[No. of Hours: 4]**

Input/Output and Forms Design- Input Design, CRT Screen Design, Output Design, Requirements form Design.

Text Books:

TB1. Elias M.Awad, "Systems Analysis and Design" Galgotia Publication
TB2. System Analysis and Design Handbook: V. K. Jain, Wiley dreamtech

Reference Books:

RB1. Hoffer, "Modern Systems Analysis and Design" Addision Wesley
RB2. Kendall, "Introduction to System Analysis and Desogm", McGraw Hill

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Defining the concept of system, analysis, design, system analyst and system development life cycle.
CO2	Understand and describe the work done during the development of a system.
CO3	Apply the fact-finding techniques to collect information to generate the system's requirements for the development of a system constructs.
CO4	Analyze the system using data flow diagram, data dictionary and process specification tools to understand how each process is working and connected to others. Analyze the GUI, input/output screen and reports layouts.
CO5	Evaluate the system planning tools and techniques and testing of software projects to ensure its correctness and completeness.
CO6	Implement the newly developed system and giving training to the users.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1			1				
CO2	2	3	2	2		2	3			1	1	1
CO3	1	3	2	3	1		1			1	2	1
CO4	2	3	1	3			2	1		1	2	1
CO5		1	1	1		2	1			1		
CO6	2	1		1	2	2	3	1		1	3	1
AVG	**1.5**	**2**	**1.2**	**1.8**	**0.7**	**1**	**1.7**	**0.5**		**0.8**	**1.3**	**0.7**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-SEC1.2**			
Course Name	**: PRINCIPLES AND PRACTICES OF MANAGEMENT**			
Semester /Year	**: IIIrd Semester**			
L	**T**	**P**	**C**	
4	**0**	**0**	**4**	

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

- To help the students gain understanding of the functions and responsibilities of managers.
- To provide them tools and techniques to be used in the performance of the managerial job.
- To enable them to analyze and understand the environment of the organization.
- To help the students to develop cognizance of the importance of management principles.

COURSE CONTENTS

Unit I: **[No. of Hours: 8]**

Business Organization: Introduction to business Forms of business organizations.

Management: Concept, Management: Art and Science, Management as a Profession, Management Administration, Management process, Managerial roles & skills, Levels of management, Ethical and best practices in management.

Evolution of Management: Taylor and Scientific Management, Fayol's Administrative Management, Bureaucracy, Hawthorne Experiments and Human Relations, Social System Approach, Decision Theory Approach.

Unit II: **[No. of Hours: 8]**

Planning: Nature, Objectives, Types and Levels, Process of Planning, Planning Premises and Forecasting, MBO, Decision Making.

Unit III: **[No. of Hours: 8]**

Organizing: Concept, Forms of Organizational Structure, Combining Jobs: Departmentalization, Span of Control, Delegation of Authority, Authority & Responsibility.

Unit IV: **[No. of Hours: 8]**

Staffing: Concept; Overview of - Manpower Planning, Job Design, Recruitment & Selection, Training & Development, Performance Appraisal.

Unit V: **[No. of Hours: 8]**

Directing: Concept, Direction and Supervision.

Controlling: Concept, Types of Control, Controlling Techniques.

Text Books:

TB1. Koontz, H, & Weihrich, H (2016*). Essentials of Management*: *An International Perspective* (8th ed.), Tata McGraw Hills, New Delhi.

TB2. Ghuman, K & Aswathapa, K, (2017). *Management concepts and cases* (10th ed.*)*, Tata McGraw Hills, New Delhi.

TB3. Telsan, M.T. (2016). *Industrial and Business Management*, (4th ed.), S. Chand, New Delhi.

Reference Books:

RB1. Robbins, S. (2017). *Management*, (13th ed.), Pearson Education, New Delhi.

RB3. Ramaswamy, I. (2011). *Principles of Business Management*, (8th ed.), Himalaya Publishing House, New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Knowledge of the concepts related to Business.
CO2	Describe the roles, skills and functions of management.
CO3	Apply the knowledge to diagnose and solve organizational problems and develop optimal managerial decisions.
CO4	Analyze the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.
CO5	Evaluate the concept of manpower planning, recruitment and selection.
CO6	Design a case study for planning and recruitment process.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3						1					
CO2		2	1		1							
CO3	3	3	2	2			1					
CO4	3		1	3			1					
CO5		1	1	2								
CO6	2	2	2	2	1		1					
AVG	**2.8**	**2.0**	**1.4**	**2.3**	**1.0**		**1.0**					

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-SEC1.3				
Course Name : CYBER LAWS				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

CourseObjectives:Theobjectivesofthiscourseare

1. The course deals with all the aspects of Cyber law as per Indian/IT act 2008.
2. It also covers overview of Intellectual Property Right and Trademark Related laws with respect to Cyber Space.

COURSE CONTENTS

Unit I **[No. of Hours: 8]**

Definitions, Digital Signature and Electronic Signature, Penalty and Compensation for damage to computer, computer system, etc.

Unit II **[No. of Hours: 8]**

Tampering with Computer Source Documents, Punishment for sending offensive messages through communication service, etc.

Unit III **[No. of Hours: 8]**

Punishments for dishonestly receiving stolen computer resource or communication device, Punishment for identity theft.

Unit IV **[No. of Hours: 8]**

Punishment for cheating by personation by using computer resource, Punishment for violation of privacy, Punishment for cyber terrorism, Punishment for publishing or transmitting obscene material in electronic form.

Unit V **[No. of Hours: 8]**

Punishment for publishing or transmitting of material containing sexually explicit act, etc. in electronic form, Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form, Breach of confidentiality and privacy

Text Books:

TB1. M. Merkow, J. Breithaupt, Information Security Principles and Practices, Pearson Education.2005

Reference Books:

RB1. G.R.F. Snyder, T. Pardoe, Network Security, Cengage Learning, 2010

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Knowledge about Cyber and different Cyber Laws cover the basics of digital signatures.
CO2	To understand the importance of security in our daily lives in the IT field. And also explain unauthorized act of Computer Source Documents.
CO3	Illustrate different punishments related with Cyber offenses, Identity Theft. Describe different sections also.
CO4	Analyze some appropriate level of awareness, knowledge of different punishments and skill on the disciplines of technology, business and law to allow them to minimize the occurrence and severity of information security incidents.
CO5	Evaluate the meaning of Cyber criminals, Cyber Terrorism. Reframe different Punishments and describe different Sections related with IT laws.
CO6	Compose the knowledge of how to secure private data and try to prevent data breaches.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1				1				
CO2	3	1	1				1					
CO3	3						1					
CO4	2	2		1	2							
CO5	2	3				1						
CO6	2	1		2	1					1		
AVG	**2.5**	**1.5**	**0.3**	**0.6**	**0.5**	**0.16**	**0.3**	**0.16**				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P31				
Course Name : LAB - COMPUTER NETWORKS				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To teach various networking commands to students
2. To teach Cisco Packet Tracer to students.

COURSE CONTENTS

Part1 : Networking Commands [No. of Hours:10]

1. Ping, tracert, arp, pathping, getmac, hostname etc. networking commands.

Part2 : Cisco Packet Tracer [No. of Hours:10]

2. Bus Topology
3. Star Topology
4. Ring Topology
5. Hybrid Topology
6. Configuring a router in a network

Text Books:

TB1. Forouzan, "Data Communication and Networking:. TMH
TB2. A.S. Tanenbaum, "Computer Networks, 3rd Edition," PHI

Reference Books:

RB1. Comer, "Internetworking with TCP/IP" PHI
RB2. Comer, "Computer networks & Inter" PHI

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Select suitable Network Simulator.
CO2	Demonstrate network configuration skills to design specific network scenarios.
CO3	Utilize various connecting devices and LAN connectivity to build networks.
CO4	Examine the various network commands
CO5	Determine various connecting devices and LAN connectivity for network topologies.
CO6	Create various network topologies

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	3	3	3						
CO2	3	3	3	2		3		2		2		
CO3	3	3	3	2		3						
CO4	3	3	3	2	3	3		2		2		
CO5	3	3	3	2		3				2		
CO6	3	3	3	3	3			2				
AVG	**3**	**3**	**3**	**2.3**	**1.5**	**2.5**	**0**	**1**	**0**	**1**	**0**	**0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P32				
Course Name : LAB - CORE JAVA				
Semester /Year : IIIrd Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To teach the students basics of JAVA programs and its execution.
2. To teach the students the differences between C++ and Java programming.
3. To make the students learn concepts like packages and interfaces.
4. To make the students understand threads.
5. To make the students understand the usage util package.
6. To teach the student, to develop java programs using inheritance and interfaces.
7. To understand exceptional handling, command line arguments and file handling

Course Outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Define basic data types and class objects and understand multithreading
CO2	Understand exception handling
CO3	Compare and contrast method overloading with method overriding
CO4	Implement event handling
CO5	Create java applet
CO6	Plan java applets

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3					2						
CO2		2		2			2	2				
CO3			2		1							
CO4				2								
CO5		2			2							
CO6	1	1	2			2						
AVG	**0.66**	**0.83**	**0.66**	**0.8**	**0.6**	**0.66**	**0.4**	**0.4**				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-401**			
Course Name	**: DATABASE MANAGEMENT SYSTEM**			
Semester /Year	**: IVth Semester**			
	L	**T**	**P**	**C**
	3	**1**	**2**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

In this course, the learners will be able to develop expertise related to the following:-

1. Develop a broad understanding of database concepts and database management system software, data models, schemas and instances, data constraints, relational algebra and calculus.
2. Acquire Knowledge to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
3. Be able to write SQL commands to create and manipulate databaseobjects.
4. Be able to discuss importance of normalization and improve the database design by applying various normal forms.

COURSE CONTENT

Unit I **[No. of Hours: 7]**

Database fundamental concepts, Advantages and Disadvantages of DBMS, Database Administrator, Architecture of DBMS, Schema and Sub Schema, Data Models: Hierarchical data Model, Network Data Model, Relational Data Model.

Unit II **[No. of Hours: 7]**

Keys: Super Key, candidate key, Primary key, Foreign Key; Referential Integrity, Entity, Attribute, Relationship, Generalization and Specialization, Entity – Relationship (E-R) Data Model,

Unit III **[No. of Hours: 8]**

Relationship Degree, Relational Algebra, Relational calculus: Tuple relational calculus, Domain relational calculus.

Unit IV **[No. of Hours: 10]**

Database design and Normalization: Function Dependency, Lossless – Join Decomposition, Dependency Preservation, Anomalies in a database, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF

Unit V **[No. of Hours: 10]**

SQL: Creating table, DDL, DML, Restricting and Sorting Data, Single-Row Functions, Aggregated Data Using the Group Functions, Joining, Sub queries, Keys.

TEXT BOOKS:

TB1. Elmsari and Navathe, "Fundamental of Database System", Addison Wesley. New York.
TB2. H.Korth & A. Silberschatz, "DATABASE SYSTEM CONCEPTS", TMH.

REFERENCE BOOKS:

RB1. Date. CJ, "An Introduction to Database System", Narosa Publishing House. New Delhi.
RB2. Desai, B, "An Introduction to Database Concepts", Galgotia Publications. New Delhi.
RB3. Ullman. J.D, "Principles of Database Systems", Galgotia Publications, New Delhi.

Course Outcome (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Knowledge and remember the basic concepts of DBMS, applications of DBMS and various DBMS Models.
CO2	Able to understand the basic concepts of ER Model and How to draw ER Diagrams domain relation expression for SQL queries.
CO3	Ability to define various constraints and writing queries using SQL syntax.
CO4	Analyze the Relational algebra and Calculus to define expressions for queries
CO5	Examine the use of normalization and functionaldependency for database design.
CO6	Create SQL queries for DDL, DML, DQL etc.

Mapping of PO and CO:

CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1			1	1						
CO2	3	1	2			1	1	2				
CO3		2	3	1	1	2	2					
CO4	1	3	2	2		2	1				1	1
CO5		2	2	1	1	1		1		2	1	1
CO6	2	2	2	4			1	1	1	1		
AVG	**1.5**	**1.83**	**1.83**	**1.33**	**0.5**	**1.16**	**0.83**	**0.66**	**0.16**	**0.5**	**0.33**	**0.33**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-402				
Course Name : OPERATING SYSTEM ORGANIZATION AND UNIX				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

COURSE OBJECTIVES:

1. To study types of Operating System and Process Management.
2. To learn Scheduling and Process Synchronization.
3. To study Deadlock and its prevention and avoidance.
4. To study about Virtual Memory and File Management.
5. To learn Disc Management.

COURSE CONTENTS

UNIT 1 **[No. of Hours: 8]**

Introduction: Operating System- Definition, Types of OS- Simple batch system, Time sharing systems, Real time systems, Multiprocessor systems, Distributed systems, System components - OS Services, System Calls.

UNIT 2 **[No. of Hours: 8]**

Process concepts: PCB, Process Scheduling, Operations on Processes, Co-operating process, IPC, Threads- Overview, Benefits, User & Kernel Threads.

CPU Scheduling, Scheduling criteria, Pre-emptive & Non-preemptive scheduling, Scheduling algorithms

UNIT 3 **[No. of Hours: 8]**

Process Synchronization: Background, Critical Section problem, Critical Regions, Synchronization hardware, Semaphores, Classic Problems of Synchronization

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

UNIT 4 **[No. of Hours: 8]**

Memory Management: Logical vs. Physical address space, Swapping, Contiguous memory allocation, Non-Contiguous memory allocation- Paging, Segmentation, Segmentation with paging.
Virtual Memory: Background, Demand paging - Performance, Page replacement, Page replacement algorithms (FCFS, LRU, Optimum), Allocation of frames, Thrashing.

UNIT 5 **[No. of Hours: 8]**

File Systems: File concept, access methods, Allocation methods-contiguous, linked and index allocation, Directory System – single level, tree structured, File protection.

Disk Management: Secondary storage structure: Disk structures, Disk Scheduling, Disk Performance Parameter.

Text Books:

TB1. Abraham Silberschatz, Peter Baer Galvin & Greg Gagne , "Operating System Concepts", Sixth Edition, John Wiley & Sons, Inc.

Reference Books:

RB1. Milankovic M "Operating System concepts and Design", 2nd edition, Tata Mcgraw hill.
RB2. Deitel H.M. "An Introduction to Operating Sysems" ,2nd edition, Pearson Education.

Course Outcomes (COs):

After completion of the course, a student will be able to

CO	Detailed Statement of the CO
CO1	Explain the types of operating system and ability to create threads and perform interposes communication.
CO2	Understand process management, resource management, memory management, Disk management problems.
CO3	Apply issues surrounding process management, resource management, memory management, Disk management problems.
CO4	Analyse issue pertaining to process management, resource management, memory management, Disk management problems
CO5	Be able to evaluate to process management, resource management, memory management, Disk management problems.
CO6	To create design and develop algorithms related to process management, resource management, memory management, Disk management problems

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	1	1	2	1					
CO2	3	1		2		1	2	1				
CO3	3	2	1	1		2	1					
CO4	2	1	2	2	1	2	3	1			1	1
CO5	1	2	1	3	2	2	2				1	
CO6						2						1
AVG	**2.2**	**1.4**	**1.4**	**1.8**	**0.8**	**1.8**	**1.8**	**0.4**	**0**	**0**	**0.4**	**1**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-403				
Course Name : SOFTWARE ENGINEERING				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To understand the nature of software development and software life cycle.
2. Explain methods for capturing specifying, visualizing analyzing software requirement.
3. To know basic of testing and understanding concept of software quality assurance.
4. To understand the concept of software cost model.
5. To develop good quality software and able to maintain quality of software
6. To develop knowledge of tools available for software development.

COURSE CONTENTS

Unit I **[No. of Hours: 6]**

Introduction: Introduction to software engineering, Importance of software, evolving role of software, Software Characteristics, Software Components, Software Applications, Software Crisis, Software engineering problems, Software Development Life Cycle, Software Process.

Unit II **[No. of Hours: 8]**

Software Requirement Specification: Analysis, Principles, Water Fall Model, The Incremental Model, Prototyping, Spiral Model, Role of management in software development, Role of matrices and Measurement, Problem Analysis, Requirement specification, Monitoring and Control.

Unit III **[No. of Hours: 8]**

Software-Design: Design principles, problem partitioning, abstraction, top down and bottom up-design, Structured approach functional versus object oriented approach, design specifications and verification, Monitoring and control, Cohesiveness, coupling, Fourth generation techniques, Functional independence, Software Architecture, Transaction and Transform Mapping, Component level Design.

Unit IV **[No. of Hours: 10]**

Coding: Top-Down and Bottom Up programming, structured programming, information hiding, programming style and internal documentation. Testing principles, Levels of testing, functional testing, structural testing, test plane, test case specification, reliability assessment, software testing strategies, Verification and validation, Unit testing, Integration Testing, Alpha & Beta testing, system testing and debugging.

Unit V **[No. of Hours: 8]**

Software Reliability & Quality Assurance: Reliability issues, Reliability metrics, Reliability growth modeling, Software quality, ISO 9000 Certification for software industry, SEI capability maturity

model, comparison between ISO & SEI CMM. CASE (Computer Aided Software Engineering): CASE and its scope, CASE support in software life cycle, documentation, project management, internal interface, Reverse Software Engineering, Architecture of CASE environment.

Text Books:

TB1. Pressman, Roger S., "Software Engineering: A Practitioner's Approach Ed.Boston: McGraw Hill, 2001
TB2. Jalote, Pankaj, "Software Engineering Ed.2"New Delhi: Narosa 2002

Reference Books:

RB1. Schaum's Series, "Software Engineering" TMH
RB2. Ghezzi Carlo and Others "Fundamentals of Software Engineering" PHI

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Define, label, name, Select, show, software engineering process and software process models.
CO2	Classify, compare, outline, relate, summarize requirements, types of requirements for the development of application.
CO3	Identify various system models for business processes and construct, develop the existing system.
CO4	Analyze and maintains efficient reliable software solutions by creating a blue print for further development.
CO5	Assessing and evaluate SW engineering testing and risk strategies, and develops their appropriate applications.
CO6	Build, create or develop Software engineering tools

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3			2								
CO2			3									
CO3		1	2		1	2				1		
CO4				3		2				2		
CO5								1	1			
CO6							1					
AVG	**0.5**	**0.16**	**0.8**	**0.8**	**0.16**	**0.66**	**0.16**	**0.16**	**0.16**	**0.5**		

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-SEC2.1**			
Course Name	**: GRAPH THEORY**			
Semester /Year	**: IVth Semester**			
L	**T**	**P**	**C**	
4	**0**	**0**	**4**	

Course Objectives:

1. To know various terminology of graph and types of graph
2. To understand various properties of different graphs
3. To know the application of graph theory to solve real life problem, engineering problems
4. To learn & understand various algorithms applied on graphs
5. To understand various theorems of graph theory.

COURSE CONTENTS:

UNIT 1: Introduction to Graphs [No. of Hours: 8]

Definition of a graph, applications of graph, finite and infinite graphs, degree of a vertex, types of graphs, isomorphism, sub-graphs, walk, path, circuit, connectedness, operations on graphs, Euler graph, Hamiltonian graph, circuits and cut-sets., Euler's polyhedron formula, Kuratowski's graphs.

UNIT 2: Trees and shortest path algorithms [No. of Hours: 8]

Tree Basics & Properties, pendent vertices, distance, center, diameters, radius, eccentricity, rooted and binary trees, On counting tress, Depth of Tree, spanning tree, Minimum Spanning Tree, fundamental circuits, finding all spanning trees of a graph..

Shortest distance Algorithms: Algorithms of Prims & Kruskal,Dijkstra's Algorithm.

UNIT3: Matrix representation of directed & undirected graphs [No. of Hours: 8]

Incidence matrix of graph, sub matrices of A(G), circuit matrix, fundamental circuit matrix and rank of B, cut set matrix, relationships among A(G) , adjacency matrices, path matrix, rank- nullity .Directed graph , Types of directed graphs, Fundamental circuit in digraph, Matrices A, B, C of digraph, adjacency matrix of digraph.

UNIT 4: Graph Coloring [No. of Hours: 8]

Partitioning of graph, Chromatic number, Wetch-Powell Algorithm, Chromatic partitioning, Chromatic polynomials, Decomposition theorem, Edge coloring, Chromatic Index, Region coloring, Four color problem.

TEXT Books:

TB1. Narsingh Deo, "Graph Theory: With Application to Engineering and Computer Science", Prentice Hall of India, 2003.

TB2. Grimaldi R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley, 1994.

Reference Books:

RB1. Clark J. and Holton D.A, "A First Look at Graph Theory", Allied Publishers, 1995.
RB2. Mott J.L., Kandel A. and Baker T.P. "Discrete Mathematics for Computer Scientists and Mathematicians" Prentice Hall of India, 1996.
RB3. Liu C.L., "Elements of Discrete Mathematics", Mc Graw Hill, 1985.
RB4. Rosen K.H., "Discrete Mathematics and Its Applications", Mc Graw Hill, 2007.

Course Outcomes (COS):
Upon successful completion of the course a student will be able to

.

CO#	Detailed Statement of the CO
CO1	To gain knowledge of graph theory to solve real life problems
CO2	Understand and interprets various graph theory concepts including theorems.
CO3	Apply theories and concepts to test and validate intuition and independent mathematical thinking in problem solving
CO4	Analyze new networks using the main concepts of graph theory.
CO5	Evaluate algorithms with given problem of graph theory
CO6	Create and design own methods to Graph theory solve real life problems with help of graph theory

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3			2								
CO2		3	1				1					
CO3	1		2			1		2	2			
CO4			3							3		1
CO5	1										2	
CO6	1											1
AVG	**1**	**0.6**	**1.2**	**0.4**	**0**	**0.2**	**0.2**	**0.4**	**0.4**	**0.6**	**0.4**	**1**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**:**	**BCA-SEC2.2**			
Course Name	**:**	**INTRODUCTION TO LOGIC**			
Semester /Year	**:**	**IVth Semester**			
		L	**T**	**P**	**C**
		4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Understanding the nature of inferential reasoning, types of reasoning. Learning major vocabulary, analyzing the nature of arguments and the relation between truth and validity.
2. Understanding the importance of symbolic logic and symbolic representation of natural language to find out the logical features, learning to compose compound statements and arguments, analyzing the nature of truth-functional compound statements and determining their truth values.
3. To use truth-table method to test the validity-invalidity of arguments, understanding the formal nature of arguments and statements, their classification and determining the logical status of statement forms.
4. Understanding the rules of Inference and rules of replacement and applying them to prove the validity of the arguments, to use conditional proof as a tool to check the validity of the arguments. Also proving the invalidity of without using truth tables and formal proofs.
5. Understanding to employ reduction ad absurdum as method to assess the validity of the arguments and the status of the statements drawing insights from truth table technique.
6. Understanding how to symbolize statements that involve quantifiers, knowing the nature and function of quantifiers, the relation between propositions involving quantifiers according to the square of opposition and comparing it with the traditional square of opposition.
7. Understanding the nature of quantification rules and applying them to prove arguments involving quantifiers. Knowing to prove the invalidity of certain arguments by assigning truth-values.

COURSE CONTENT

UNIT 1 **[No. of Hours: 8]**

Introduction: logic, truth tables, equivalence, language to logic, applications to circuit design, exponential growth . Semantic tableaux , problem solving with semantic tableaux.

UNIT 2 **[No. of Hours: 8]**

Propositional logic: Syntax of propositional logic, rules of natural deduction, the sequent calculus.

UNIT 3 **[No. of Hours: 8]**

Predicate Logic : Intro
duction on First order predicate calculus.

UNIT 4 **[No. of Hours: 8]**

Resolution in propositional logic. Normal forms, Resolving arguments, Resolution, Combinatorial search problems.

UNIT 5 **[No. of Hours: 8]**

Resolution in Predicate Logic: Predicate Logic, quantifiers, Normal Forms, Herbrand Universes, Resolution, Unification, Problem solving using resolution

Text Books:

TB1. The Essence of Logic. John Kelly. Prentice-Hall International
TB2. Virginia Klenk, Understanding Symbolic Logic, 5/e, Pearson Education

Course Outcomes (COs):

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

CO #	Detailed Statement of the CO
CO1	Define Logic and various Logic concepts and its application in Computer software development.
CO2	Classify, compare, explain use of propositional logic in knowledge representation and truth verification.
CO3	Make use of predicate logic in knowledge representation and truth verification.
CO4	Examine, simplify, test the use of resolution in propositional logic.
CO5	Deduct, explain, prove use of resolution in predicate logic.
CO6	Build, create, combine, estimate application of Logics in day to day life

Co-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3								
CO2	3	2		1								
CO3	3	2		1								
CO4	3	2		2								
CO5	3		3									
CO6				2								
AVG	**2.5**	**1.5**	**0.8**	**1.5**								

3 – Highest Correlated, 2 – Medium Correlated, 1 – Low Correlated

Course code : BCA-SEC2.3				
Course Name : SOFTWARE TESTING				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To gain knowledge of the concept of Software Testing.
2. Core Software Testing Concepts
3. Testing at the unit, module, subsystem and system levels
4. The testing processes.
5. Testing Best Practices

COURSE CONTENTS

Unit 1: Introduction to Testing [No. of Hours: 10]

Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System Testing, Basic Terminologies, V Shaped Software Lifecycle Model

Unit 2: Functional Testing [No. of Hours: 10]

Black-box Testing, Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing

Unit 3 Structural Testing [No. of Hours: 10]

White-box Testing, Basis Path Testing: Program Graph, DD Path graph, Cyclomatic Complexity, Graph Matrices, Control Flow Testing: Statement Coverage, Branch Coverage, Condition Coverage, Path Coverage

Text Books:

TB1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, Seventh Edition, McGraw Hill Education.2009.

Reference Books:

RB3. Yogesh Singh, Software Testing, Cambridge University Press, 2011

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Define Testing and fundamentals of software testing.
CO2	Relate and extend knowledge of testing for given set of test cases during development and regression testing
CO3	Identify tests according to their purpose and the test activities they support.
CO4	Distinguish between black box and white box testing
CO5	Determine cyclomatic Complexity
CO6	Design test cases and discuss debugging tools

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3		3								
CO2	2	3	3	2	3							
CO3	2	3	3	2	2		2					
CO4	2	2	3	2	2							
CO5	2	2	2	2	3		2					
CO6	2	2	2	3	1	2	2					
AVG	**2**	**2.5**	**2.1**	**2.5**	**1.8**	**0,3**	**1.1**					

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P41				
Course Name : DATABASE MANAGEMENT SYSTEM LAB				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
			4	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Working expertise of DDL and DML commands with their application on solving real time problems.
2. Ability to apply filters using where clause and nested queries, integrity constraints at table level and column level and to use built-in functions including numeric, character and date functions.
3. Adequate knowledge to fetch data from multiple tables using different types of JOIN operations.
4. Knowledge of the generic structure of PL/SQL programs.

Course contents

1. SQL queries for Data Definition and Data Manipulation Language.

2. SQL queries using logical operations (=,<,>,etc)

3. SQL queries using SQL operators

4. SQL query using character, number, date and group functions

5. SQL queries for relational algebra

6. SQL queries for extracting data from more than one table

7. SQL queries for sub queries, nested queries

COURSE OUTCOMES (COs):

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

CO #	Detailed Statement of the CO
CO1	Defining the databases, tables and query a database using SQL DML/DDL commands.
CO2	Understanding the sub languages used in SQL to work with database
CO3	Demonstrate the use of constraints, relational algebra operations and Grouping.
CO4	Analyse the knowledge of SQL queries in while developing database applications.
CO5	Evaluate the concept of Views, Rollback, Commit, Grant and Revoke Permission.

CO6	Design solutions for real world problems/case studies by creating efficient database schema.

Mapping of PO and CO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	2	3	2	1					
CO2	2	1	2	1	2	1		1				
CO3	3	1		1	1	1	2					
CO4	1	1	3	2	1		3	1			2	1
CO5	1	1	2			1	2	2			3	
CO6		3	3	1	1	1	1					
AVG	**1.6**	**1.3**	**2.6**	**1.4**	**1.6**	**1.2**	**1.8**	**1.3**			**2.5**	**1.0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P42				
Course Name : LAB UNIX				
Semester /Year : IVth Semester				
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Objectives:
The objectives of this course are

1. To learn basic knowledge about architecture of Unix and different basic Commands of Unix
2. To learn how to use process management.
3. To learn basic structure and various commands of UNIX system.
4. To learn the importance of system administration tasks.
5. To learn the shell programming.
6. To learn basics of filter commands and Tools of UNIX system

COURSE CONTENTS:

- How to apply basic commands of UNIX
- How to apply filter commands.
- How to apply UNIX system administration commands
- Unix shell program based on conditional statements
- Unix shell program based on loops
- Unix shell program based on filters
- Unix shell program based on arrays

Course Outcomes (COs):
After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Able to acquire knowledge and remember basic commands of UNIX and shell programming constructs
CO2	Able to understand basic commands of UNIX and shell programming constructs.
CO3	To apply basic commands of UNIX and shell programming constructs.
CO4	To analyse difference between basic commands of UNIX and shell programming constructs
CO5	Able to evaluate expressions using basic commands of UNIX and shell programming constructs.
CO6	Able to create applications/software using shell programming constructs

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1		1			1				
CO2	3	1	2	1		2	1					
CO3	1	1	3		1		2		2			
CO4	2	1	1	1		2				1	2	
CO5	2	1	2		1		1					2
CO6		1				2						2
AVG	**2.2**	**1**	**1.8**	**0.4**	**0.6**	**1**	**0.8**	**0.2**	**0.4**	**0.2**	**0.4**	**0.66**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-DSE1.1				
Course Name : PYTHON PROGRAMMING				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Master the core of writing Python scripts
2. Understand decision-making and functions in python
3. Interpret Object-oriented programming features in python
4. Gain knowledge of data structures in python
5. Explore file handling and database operations in python

COURSE CONTENTS

Unit I **[No. of Hours: 10]**

Introduction: History, Features, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator, Conditional Statements: If, If- else, Nested if-else, Looping: For, While, Nested loops, Control Statements: Break, Continue, Pass

Unit II **[No. of Hours: 11]**

String: Accessing Strings, Basic Operations, String slices, Function and Methods. **Lists**: Introduction, Accessing list, Operations, Working with lists, Function and Methods, sorting, searching. **Tuple**: Introduction, Accessing tuples, Operations, Working, Functions and Methods **Sets**: Introduction, Accessing sets, Operations, Working, Functions and Methods. **Dictionaries**: Introduction, Accessing values in dictionaries, Working with dictionaries, Properties, Functions. **Sets:** Introduction, Accessing values in sets, Working with dictionaries, Properties, Functions

Unit III **[No. of Hours: 7]**

Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables, Python Lambda, recursion. Modules: Importing module, Math module, Random module, Packages, Composition

Unit IV **[No. of Hours: 7]**

Input-Output: Printing on screen, Reading data from keyboard, **File Handling:** Opening and closing file, Reading and writing files. **Database handling using SQLite3. Exception Handling:** Exception, Except clause, Try, finally clause, User Defined Exceptions

Unit V **[No. of Hours: 5]**

OOPs concept: Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding.

Text Books:

TB1. Budd T A, "Exploring Python", McGraw-Hill Education, 1st Edition, 2011.
TB2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2013.
TB3. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 1st Edition,2013.

Reference Books:

RB1. Kenneth A. Lambert, "The Fundamentals of Python: First Programs", Cengage Learning, 1st Edition, 2011.
RB2. Allen Downey, "Think Python: How to Think Like a Computer Scientist", O'Reilly, 2ndEdition, 2015.
RB3. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University Press, 1st Edition, 2017.
RB4. Joel Grus, "Data Science from Scratch", O'Reilly, 2nd Edition, 2019.
RB5. Tony Gaddis, "Starting out with Python", Pearson, 3rd Edition, 2014.

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Knowledge and remember the programming constructs used in python.
CO2	Understanding the facts behind the sequences, functions, modules, files, database and object oriented etc. used in Python
CO3	Apply data structure primitives like strings, lists, tuples, sets and dictionaries on various types of data with or without using functions, object-oriented concepts to the programs in Python etc.
CO4	Distinguish and analyze basic constructs of Python and how constructs can be used all together.
CO5	Evaluate the programming constructs of Python to provide verdict on findings.
CO6	Create python programs using various programming constructs of Python.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1		2				2		
CO2	3	3	3	2	1	1				2		
CO3	3	3	3	2	1	1						
CO4	3	3	3	2	1	1	1	1		2	1	
CO5	3	3	3	2	1	1			2			2
CO6	3	3	3	3	1	1	1	1	1	1	1	1
AVG	**3**	**5.3**	**5.3**	**2**	**0.8**	**1.2**	**0.3**	**0.3**	**0.5**	**1.2**	**0.3**	**0.5**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-DSE1.2**			
Course Name	**: ANDROID PROGRAMMING**			
Semester /Year	**: IV**			
	L	**T**	**P**	**C**
	3	**1**	**2**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. This course facilitates classroom and laboratory learning.
2. Letting students develop competence and confidence in android programming.
3. Understand the entire Android Apps Development Cycle.
4. Enable the students to independently create Android Applications.
5. Access and work with databases under the Android operating system.

COURSE CONTENT

Unit I **[No. of Hours:10]**

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.

Unit II **[No. of Hours:8]**

Overview of object-oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

Unit III **[No. of Hours:6]**

Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating an android project-Running on emulator, Deploy it on USB-connected Android device.

Unit IV **[No. of Hours:10]**

User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes. User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners (Combo boxes), Images, Menu, Dialog.

Unit V **[No. of Hours:6]**

Database: Understanding of SQLite database, connecting with the database.

Text Books:

TB1. Sayed Y Hashimi and Satya Komatineni, “Pro Android”, Wiley India Pvt. Ltd.
TB2. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.

Reference Books:

RB1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education2nd edition.
RB2. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
RB3. Mark L Murphy, "Beginning Android", Wiley India Pvt. Ltd.

Course Outcome (COs):

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Knowledge and remember the basics of Java and Android
CO2	Describe the life cycles of Activities, Applications etc.
CO3	Apply the major components of Android API set to make apps. Use the development tools in the Android development environment.
CO4	Classifying and finding uses of UI –components and java Constructs.
CO5	Make UI-rich apps using all the major UI components.
CO6	Create Android apps using Java programming language.

Mapping of PO and CO:

CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1	3	2	3	2	1					
CO2	1	2	3	2	2	1	2	1			1	
CO3	2	1		1		2	1					
CO4	1	1	3	2	3	1		1			1	
CO5	1	1	3	2	2		1	2			1	
CO6	1	1	2				1		1	1		
AVG	1	1.16	2.33	1.5	1.66	1	1	0.66	0.16	0.16	0.5	0

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlat

Course code : BCA-DSE1.3				
Course Name : WEB PROGRAMMING USING HTML & CSS				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:

1. To learn the basic concepts of world wide web.
2. To learn the basic concepts and syntax of HTML and CSS programming.
3. To be able to develop logics which help them to create programs and applications using HTML & CSS language.
4. To use the types of CSS and CSS Overriding in a web site.
5. To learn the skills that will help the students in creating websites with great look and feel using CSS.

COURSE CONTENTS

Unit-I **[No. of Hours: 4]**

Introduction- Introduction to the Internet, Introduction to HTML Terminology, Designing a Webpage: Design Considerations and Planning, Basic Tags and Document Structure, HTML Tags, Head Tags, Title Tags, Body Tags, Metadata, Saving an HTML Page

Unit II **[No. of Hours: 8]**

Page Formatting- Adding a New Paragraph, Adding a Line Break, Inserting Blank Space, Preformatted Text, Changing a Page's Background Color, Div Element. Text Items and Objects: Headings, Comments, Block Quotes, Horizontal Lines. Special Characters, Creating Lists-Numbered (Ordered) Lists, Bulleted (Unordered) Lists, Nested Lists, Definition Lists.

Unit III **[No. of Hours: 10]**

Links-What are Links?, Text Links, Image Links, Opening a Page in a New Window or Tab, Setting all Links on a Page to Open in a New Window or Tab, Linking to an Area on the Same Page (Bookmarks), Linking to an E-mail Address, Linking to Other Types of Files, Images-Introduction to Images for Webpages, Adding Images to Webpages, Resizing an Image, Alternative (ALT) Text, Image Labels.

Unit IV **[No. of Hours: 8]**

Basic Tables-Inserting a Table, Table Borders, Table Headers, Col and row span, IFrames: What is an Iframe, Inserting Iframes, Setting Height and Width, Using an Iframe for a link target. Forms: About Forms, Text Boxes, Text Areas, Check Boxes, Menu Lists, Radio Buttons, The Submit Button, The Reset Button, Changing the Tab Order, Sending to E-mail, event handling

Unit V **[No. of Hours: 10]**

Cascading Style Sheets- CSS Introduction, CSS Syntax, Creating an External CSS, Linking to a CSS, Adding Comments and Notes to a CSS, Creating an Internal Style Sheet, ID and Class, Inline Styling. Working With Text in CSS: Emphasizing Text (Bold and Italic), Decoration, Indentation, Transformation, Text Alignment, Fonts, Font Sizes, Letter Spacing, Text Color, Margins, Padding, Borders, Styling Links, Number and Bullet Styles, Sizing Elements, Text Wrapping, Shadowing.

Text Books:

TB1. HTML & CSS: The Complete Reference, Fifth Edition, Thomas A. Powell.
TB2. IvanBayross, "Web Technologies Part-I" BPB Publications

Reference Books:

RB1. Burdman, "Collaborative Web Development", Addison Wesley
RB2. Sharma & Sharma, "Developing E-Commerce Sites" Addison Wesley

Course Outcomes (COs):

After completion of the course, a student will be able to

CO#	DESCRIPTION
CO1	Define Internet and basic internet and HTML terminology
CO2	Explain the basic concepts and write HTML programs.
CO3	Develop various programming problems using CSS programming concepts.
CO4	Discover the change in look-n-feel of the multiple web pages from single source using CSS.
CO5	Decide which type of style sheet is suitable to use in particular case by analyzing the inline, internal and external type of CSS.
CO6	Create and evaluate the websites with professional look and feel using both HTML and CSS.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1								
CO2	3	2	3	1	1		1		2			
CO3	2	2	3	1			1		1			
CO4	1	3	3						2			
CO5	2	3	3									
CO6	3	3	1									
AVG	**2.3**	**2.6**	**2.6**	**0.5**	**0.1**	**0**	**0.3**	**0**	**0.8**	**0**	**0**	**0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest

Course code : BCA-DSE2.1				
Course Name : C# PROGRAMMING WITH DOT NET FRAMEWORK				
Semester /Year : IV				
	L	**T**	**P**	**C**
	3	**1**	**2**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To study the features of .NET Technologies and to understand the framework and environment.
2. To learn C# programming fundamentals for console application development.
3. To learn use of C# libraries and exception handling techniques.
4. To learn ADO. NET and advance features of C#.
5. To learn .NET assemblies and attributes

Course Content

UNIT 1 **[No. of Hours:07]**

Introduction to .NET Framework- .NET framework, MSIL, CLR, CLS, CTS, Just in time (JIT) Compiler, Base class library, Namespaces, Assemblies, DLL Hell -Problem, Garbage Collection.

UNIT 2 **[No. of Hours:11]**

C# Object oriented programming- OOPs, Classes and objects, loops, Array, Encapsulation, Inheritance, Polymorphism, Interface ,Constructor and Destructors, Method Overloading ,Method overriding, Operator Overloading, Modifiers, Indexers , Collections Namespaces, Delegates, Exception Handling.

UNIT 3 **[No. of Hours:07]**

Microsoft .NET IDE- Creating a Project and solution, Building project, Debugging project, Solution Explorer, Toolbox, Server Explorer, Property Window, Windows Forms and Controls in details-The Windows Forms Model, Creating Windows Forms Windows Forms Properties and Events, Windows Form Controls .

UNIT 4 **[No. of Hours:08]**

ADO.Net, C# windows forms for data control: Grid, Datasource and databinding controls, Connected and disconnected scenarios, Dataset, connections, Adapters, commands, datareaders.

UNIT 5 **[No. of Hours:08]**

ASP.net-Introduction to ASP.NET, Architecture, Working with Web and HTML Controls, Web forms, Using Rich Server Controls, Overview of ASP.NET Validation Controls, Data base connectivity using ASP.net.

Text Books

TB1. A Guide to the Project Management Body of Knowledge (PMBOK), Project Management Institute, PA, (2004).

TB2. Harold Kerzner, Frank P. Saladis, Project Management Workbook and PMP/CAPM Exam Study Guide , Wiley Publishers (2006)
TB3. Addison Wesley –C# Developers Guide to ASP.Net
TB4. Wiley," Beginning Visual C# 2008", Wrox

Reference Books

RB1. Claudia M. Baca, Patti, PMP: Project Management Professional Workbook, Sybex, Workbook (2003).
RB2. C#.Net Developers Guide- Greg Hack, Jason Werry, SaurabhNandu. (SyngRess)
RB3. Wrox Press Professional C# 3rd Edition – Simon Robinson, Jay Glynn

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Knowledge and remember.NET Framework, its runtime environment and application development IDE of Visual Studio.
CO2	Understand the concept of object oriented for making programs.
CO3	Implement C# language constructs in the form of stand-alone console and window form applications.
CO4	Analyze and Understand database concepts in ADO.NET and apply the knowledge to implement distributed data-driven applications.
CO5	Design, document, debug ASP.NET web forms with server and validation controls and implement ASP.NET web services.
CO6	Create the programs based on console, windows and web application.

Mapping of PO and CO:

CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	3	-	3	1	1	-	-	-	-	-
CO2	1	-	3	-	-	-	1	-	-	-	-	-
CO3	-	-	3	-	2	-	-	-	-	-	-	-
CO4	2	-	2	-	2	-	-	-	-	-	-	-
CO5	-	-	3	-	-	-	1	-	-	-	-	-
CO6	2	2	1	4				1	1	1		
AVG	1.16	0.33	2.5	0.66	1.16	0.16	0.5	0.16	0.16	0.16	0	0

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-DSE2.2				
Course Name : PHP PROGRAMMING				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:

- To learn the advance concepts of websites.
- To learn the basic concepts and syntax of HTML and PHP programming.
- To be able to develop interactive programs using PHP.
- To use the types of CSS and CSS Overriding in a web site.
- To learn the skills that will help the students in creating websites with great look and feel using CSS.

COURSE CONTENTS

UNIT I Introduction to PHP **[No. of Hours: 10]**

History of PHP, basic syntax, variable and constant, datatypes, operators and expressions. Decision making- if-else, switch case, loops, nesting control statements. PHP and HTML together.

UNIT II Function in PHP **[No. of Hours: 10]**

Define a function, call-by-value and call-by-reference, recursive functions, strings and its operations- searching, replacing, formatting, string library functions. PHP arrays- index based and associative arrays, array looping- index and associative based using each () and foreach(). Useful PHP library functions.

UNIT III HTML Forms and Files **[No. of Hours: 10]**

Handling Html form with PHP- capturing form, generating file uploaded form, form redirection. Working with file and directories- opening, closing, copying, renaming and deleting a file. Working with directories- creating and deleting directories. File uploading and downloading.

UNIT IV Session and Cookies **[No. of Hours: 10]**

Session handling in PHP- creating and destroying sessions, session variables. Cookies and session handling, deleting cookies.

UNIT V Database Connectivity **[No. of Hours: 10]**

Introduction to RDBMS, Connection with MySql Database, Performing basic database operation(DML) (Insert, Delete, Update, Select), Setting query parameter, Executing queryJoin (Cross joins, Inner joins, Outer Joins, Self joins) , Exception Handling Understanding Exception and error, Try, catch, throw, Error tracking and debugging.

Text Books:

TB1. Learning PHP, MySQL, books by ' O' riley Press

Course Outcomes (COs):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Understand the basic concepts of PHP and write PHP programs.
CO2	Design and develop interactive websites.
CO3	Implement concepts like session handling, database operations etc.
CO4	Develop professional websites using various PHP tools such as PHP Super Global, Exception handling and other PHP programming constructs.
CO5	Serve the society by creating and evaluating the websites with professional look and feel and use these skills to build successful career.
CO6	Create the connection between PHP with MySql Database2

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	1		1		2			
CO2	2	2	3	1			1		1			
CO3	1	3	3						2			
CO4	2	3	3			2				2		
CO5	3	3	1								3	1
CO6	2	2	2									
AVG	**2.1**	**2.5**	**2.5**	**0.3**	**0.1**	**0.3**	**0.3**		**.8**	**0.3**	**0.5**	**0.1**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-DSE2.3				
Course Name : SQL & PL/SQL				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To interpret the features of PL/SQL with a general understanding of where and how this language can be used.
2. To understand the structure of PL/SQL program
3. To use expressions, operators, control structures, records and SQL within PL/SQL
4. To understand different built-in SQL Functions and how, where they can be used
5. To define different Cursor types and how they can be used in PL/SQL
6. To implement error handling in PL/SQL code
7. To create Procedures, Functions and Packages
8. To describe different types of database triggers and how they should be used

COUSE CONTENTS

UNIT I SQL and Advance SQL [No. of Hours: 10]

SQL Commands and Data types, Operators and Expressions, Introduction to SQL * Plus, Managing Tables and Data, Creating and Altering Tables (Including constraints), Data Manipulation Command like Insert, update, delete, SELECT statement with WHERE, GROUP BY and HAVING clause, ORDER BY, DISTINCT, Special operator like IN, ANY, ALL BETWEEN, EXISTS, LIKE, Join and its types (Non EuqiJoin, EquiJoin,Outer Join, Natural Join, Self Join), subqueries , Built in functions. Advance SQL: View, Synonyms, Index ,Sequence.

UNIT II Introduction to PL/SQL & Cursors [No. of Hours: 10]

SQL v/s PL/SQL , PL/SQL Block Structure , Language construct of PL/SQL (Variables, Basic and Composite Data type, Conditions looping etc.), % TYPE and % ROWTYPE , Implicit Cursor, Cursor Attributes, Writing Explicit Cursors (Cursor function, declaring, opening, fetching data from cursor), Cursor FOR loop. Advanced Explicit Cursors (Cursor with Parameter).

UNIT III Error handling, Transaction control & Security in PL/SQL [No. of Hours: 6]

Exception Types, Predefined Exception, User Defined Exception, Raise Application Error, Locks, Types of locks, Application of Locks, Transaction Control Statements, Commit, Rollback, Savepoint, Application of Save Point,

UNIT IV PL/SQL Database Objects [No. of Hours: 7]

Anonymous PL/SQL and named Block, developing stored Procedures, formal and actual parameters, IN, OUT and INOUT parameters, Creating Functions, Stored Functions, User Defined Functions. Creating Packages, Component of Package, Developing Package, Overloading procedures and Functions

UNIT V Triggers and Collection **[No. of Hours: 7]**

Triggers Types of triggers, Create DML Triggers (Row trigger, Statement triggers, Before and after triggers, using OLD and NEW qualifier), Firing (Timing), Statement Level Triggers and Row Level Triggers, Create Instead of and Disabled Triggers, Manage, Test and Remove Triggers. Collection in PL/SQL Object Types, Nested Tables, Variable Arrays, Associative Arrays/ Index by table Array.

Text Books:

TB1. Baron Schwartz , High Performance MySQL, O'Reilly.
TB2. Ivan Bayross ,PL/SQL Programming ,TMH.

Reference Books:

RB1. Vikram Vaswani , The Complete Reference MySQL , McGraw Hill Educations.
RB2. Oracle Complete Reference, Oracle Press

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Knowledge and remembering the SQL and programming constructs used in PL/SQL.
CO2	Understanding the PL/SQL structure, basic programming attributes, cursors, error handling, procedure & functions, packages, and triggers.
CO3	Apply data structure primitives like cursors, triggers etc. on various types of data with or without using functions or procedures. Handling the errors to make the program robust.
CO4	Analyze the effect of applying cursors, triggers, and other primitives.
CO5	Evaluate the effect on the data base after applying SQL query and PL/SQL constructs.
CO6	Create PL/SQL programs using various programming constructs of Python.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1		2			2	2		
CO2	3	3	3	2	1	1			2	2		
CO3	3	3	3	2	1	1			3			
CO4	3	3	3	2	1	1	1	1	2	2	1	
CO5	3	3	3	2	1	1			2			2
CO6	3	3	3	3	1	1	1	1	3	1	1	1
AVG	**3**	**2.7**	**2.7**	**2**	**0.8**	**1.2**	**0.3**	**0.3**	**2.3**	**1.2**	**0.3**	**0.5**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-DSE3.1				
Course Name : INTRODUCTION TO IOT				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. **To understand the basic concept of Internet of Things (IOT), its standards and components.**
2. Learn the Network and Communication protocols for IoT.
3. Identify the role of controllers and sensors in IoT.

COURSE CONTENTS

Unit I IOT concepts **[No. of Hours: 8]**

Technologies that led to the evolution of IoT, IOT and SCADA, IOT and M2M, IoT and Big data

Unit II IoT Standards and Components **[No. of Hours: 8]**

IOT standards in practice, Operating platforms /systems. **IoT Components:** Design of IoT systems, Development of prototypes.

Unit III Challenges in IoT implementation. **[No. of Hours: 8]**

Big Data Management, Connectivity challenges, Mission-critical applications. Security issues in IOT

Unit IV IoT Applications (Case studies) **[No. of Hours: 8]**

Lighting as a service, Intelligent Traffic systems, Smart Parking, Smart water management etc.

Unit V Relevance of IoT for the future. **[No. of Hours: 8]**

IOT in everyday life, Internet of Everything, IOT and Individual Privacy. **IoT in Indian Scenario:** IOT and Aadhaar, IOT for health services, IOT for financial inclusion, IOT for rural empowerment.

Text Books:

TB1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.
TB2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
TB3. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.
TB4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key Applications and Protocols", Wiley, 2012.

Reference Books:

RB1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014
RB2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
RB3. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1- 4493-9357-1

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	**Detailed Statement of the CO**
CO1	Explain what IoT is and how it works.
CO2	Identify the factors that contributed to the emergence of IoT
CO3	Understand the Security of the elements of an IoT device
CO4	Understand the application areas of IOT
CO5	Understand building blocks of Internet of Things and characteristics.
CO6	Future Relevance of IoT

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3		3			2					
CO2	2	3		3								
CO3	2	3	2	2								
CO4	2	2	2	3		3				2		
CO5	2	3		2			3					
CO6		1			2		2			3		
AVG	**1.6**	**2.5**	**0.6**	**2.2**	**0.3**	**0.5**	**1.2**			**0.8**		

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

L - Lecture T – Tutorial P – Practical C – Credit

Course code : BCA-DSE3.2				
Course Name : INTRODUCTION TO BLOCKCHAIN				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

Course Objectives: The objectives of this course are

In this course, the learners will be able to develop expertise related to the following:-

- To provide Knowledge and concept of cryptography and blockchain.
- To make familiar with Bitcoin and cryptocurrency with its various impact on blockchain.
- To know about the Ethereum technology with its multiple aspects.
- To provide an understanding about and Smart Contracts.
- To develop an understanding about the various applications of Blockchain.

Course Content

Unit-I **[No. of Hours 10]**

Distributed systems, Blockchain, Generic elements of a blockchain, Benefits and limitations of blockchain, Tiers of blockchain technology, Features of a blockchain, Types of blockchain, Consensus,

Unit-II **[No. of Hours 10]**

Decentralization: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized Organizations,

Unit-III **[No. of Hours 10]**

Cryptography: Symmetric Cryptography, Confidentiality, Integrity, Authentication, Non-repudiation, Public Key Cryptography: Asymmetric cryptography, Public and private keys, Hash functions

Unit-IV **[No. of Hours 10]**

Introduction to Bitcoin and Ethereum

Text Books:

TB1. Imran Bashir, Mastering Blockchain, Packt, 2018

Reference Books

RB1. Daniel Drescher, Block chain basics A non-technical introduction in 25 steps, Apress , 2017.

RB2. Paul Vigna and Michael J.Casey. The Age of Cryptocurrency, 2015.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	To make capable to handle the cryptographic issues and its proper implementation in various fields.
CO2	To understand the Ethereum Virtual Machine and Bitcoin Wallets and related transactional blocks implementation.
CO3	To understand and implement the Consensus Mechanism.
CO4	To make capable to check Structure of Smart Contracts and its performance.
CO5	To understand various applications of Blockchain and its various future aspects.
CO6	Create application for blockchain

CO-PO MAPPING:

CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	2	2	1	1					
CO2	3		2	1		1		1				
CO3	2	1	3	1	2	1	1					
CO4	1	1	2	2		1		1				
CO5	3	2		2	1		1	1				
CO6	2	2	1	1					1	1		
AVG	2.16	1.16	1.83	1.5	0.83	0.66	0.5	0.5	0.16	0.16	0	0

Course code : BCA-DSE3.3				
Course Name : ARTIFICIAL INTELLIGENCE				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To impart knowledge about Artificial Intelligence.
2. To give understanding of the main abstractions and reasoning for intelligent systems.
3. To enable the students to understand the basic principles of Artificial Intelligence in various

COURSE CONTENT

Unit I **[No. of Hours: 8]**

Introduction:- Definition and meaning of artificial intelligence, A.I. techniques, pattern recognition, Level of, speech recognition representation in A.I. properties of internal representation.

Unit II **[No. of Hours: 8]**

Production System:- Different types of tracing, strategies, graph search strategies, Heuristic graph, search procedure, AND/OR graph, relationship between decomposional and compatible systems, searching Gate Tree, min-max search game playing, actual game playing.

Unit III **[No. of Hours: 8]**

Introduction to Predicate Calculus:- Predicates and Arguments, connectives, Simplifications of strategies, extracting answers from Resolution Refutation. Control strategies.

Unit IV **[No. of Hours: 8]**

Rule Based Deduction Systems: Forward and backward deduction system, resoling with AND/OR graph, computation, deduction and program synthesis, central knowledge for rules based deduct systems.

Unit V **[No. of Hours: 8]**

Structural Object Representation: Semantic networks semantic market matching deductive operations on structured objects. Architectural for A.I. Systems: Knowledge, acquisitions representation, Natural language processing.

Text Books:

TB1. Introduction to artificial Intelligence Eugene Charnik Drew MC mott
TB2. Artificial Intelligence Elaine Rice.

Reference Books:

RB1. Principal of Artificial Intelligence, Nelson, Springer-Verlag.
RB2. Artificial Intelligence Application Programming: Tim Jones, Wiley dreamtech

Course Outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Demonstrate fundamental understanding of the history of AI
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception
CO3	Demonstrate awareness and a fundamental understanding of various applications of AI
CO4	Apply different search algorithms
CO5	Understand Natural Language Processing
CO6	Plan heuristic algorithm

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1			2						
CO2	2	3	2		2							
CO3	2			2		2	1					
CO4			2		2							
CO5	2	2		2		2						
CO6	1	1	1	2			2	2				
AVG	**1.66**	**1.33**	**1**	**1.0**	**0.8**	**1.2**	**0.5**	**0.33**				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : DSE 3.4				
Course Name : ALGORITHMS ANALYSIS & DESIGN				
Semester /Year : V				
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

COURSE OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:-

1. Understand the important concepts of algorithms design and their analysis.
2. Analyze the efficiency of alternative algorithmic solutions to the problem.
3. Understand different algorithm paradigms like Divide and Conquer, Greedy, Dynamic,Backtracking and Branch and Bound.
4. Identify the appropriate data structures, algorithm design techniques and assess theirimpact on the performance of programs.

COURSE CONTENTS

UNIT-I **[No. of Hours: 09]**

Algorithms, Analysis of Algorithms, Design of Algorithms, and Complexity of Algorithms Growth of Functions: Asymptotic notations, Mathematical Analysis of Non-Recursive and Recursive Algorithms**.** Recurrences and Solution of Recurrence Equations- The Substitution method, The Recurrence–Tree Method, The Master Method.

UNIT-II **[No. of Hours: 09]**

Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort, Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort. Red-Black Trees, Augmenting Data Structure.

UNIT-III **[No. of Hours: 09]**

Greedy Technique: Fractional Knapsack Problem, Activity Selection Problem, Dynamic Programming: 0/1 Knapsack Problem, Matrix-Chain Multiplication. Backtracking: Hamiltonian Circuit Problem; Branch-and-Bound: Assignment Problem, Traveling Salesperson Problem;

UNIT-IV **[No. of Hours:09]**

Graph: Introduction, Representation of Graph, BFS, DFS, Minimum Spanning Tree: Prims Algorithm, Kruskal Algorithm, Single Source.

Shortest Paths: Bellman-Ford Algorithm, Dijkstra Algorithm, All Pair Shortest Paths: Floyd-Warshall Algorithm,

Text Books:

TB1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI, 2nd Edition, 2006

TB2. S. Dasgupta, C. Papadimitriou and U.Vazirani, "Algorithms", McGraw Hill Higher Education, 1st Edition, 2017.

TB3. J. Kleinberg and E. Tardos, "Algorithm Design", Pearson Education, 2nd Edition, 2009.

Reference Books:

RB1. T. H Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3rd Edition, Prentice-Hall of India,
RB2. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of ComputerAlgorithms, 2nd Edition, Universities press,
RB3. Anany Levitin: Introduction to The Design & Analysis of Algorithms, 2nd Edition,Pearson Education.
RB4. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning.
RB5. Baase: Computer Algorithms: Introduction to Design and Analysis, 2nd ed., Addis

Course Outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Remember the basic concepts and complexities for various algorithms. Demonstrate P and NP complexity classes of the Problem.
CO2	Understand the concepts of asymptotic notations to explain the complexities of various algorithms.
CO3	Apply and solve various sorting and tree-based algorithms.
CO4	Finding efficient solutions using various algorithms for given problems.
CO5	Evaluate and checking innovative solutions for real-world problems using different paradigms.
CO6	Construct the solution for real-world problems using various problem-solving techniques

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	2	3	3	2	-	-	-	-	-	-	-	-
CO3	3	2	3	2	1	-	-	-	-	-	-	-
CO4	2	2	2	3	2	1	-	-	-	2	-	-
CO5	2	3	2	2	3	2	1	-	2	1	2	2
CO6	2	2	2	1	-	-	1	1	1	1	-	-
AVG	2.33	2.33	2.16	1.66	1	0.5	0.33	0.16	0.5	0.66	0.33	0.33

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**:**	**BCA-SEC3.1**			
Course Name	**:**	**DATA WAREHOUSE AND DATA MINING**			
Semester /Year	**:**	**Vth Semester**			
		L	**T**	**P**	**C**
		4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Be familiar with mathematical foundations of data mining tools.
2. Understand and implement classical models and algorithms in data warehouses and data mining
3. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
4. Master data mining techniques in various applications like social, scientific and environmental context.
5. Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

COURSE CONTENTS

UNIT – I **[No. of Hours: 10]**

Data Warehouse: Introduction to Data Ware House, Differences between operational data base systems and data Ware House, Data Ware House characteristics, Data Ware House Architecture and its components, Extraction-Transformation-Loading, Logical (Multi- Dimensional), Data Modeling, Schema Design, star and snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; Fact- Less-Facts, Dimension Table characteristics; Fact-Less-Facts, Dimension Table characteristics; OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

UNIT –II **[No. of Hours: 10]**

Introduction to Data Mining: Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing- Data Cleaning, Missing Data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation, Data Transformation; Measures of similarity and dissimilarity-Basics.

UNIT – III **[No. of Hours: 12]**

Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation, APRIORI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of
Frequent Item Set-Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT -IV **[No. of Hours: 10]**

Classification: Problem definition, General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision trees-Decision Tree Construction, Methods for expressing attribute test conditions, Measures for Selecting the Best split, Algorithm for Decision tree Induction, Naïve-Bayes Classifier, Bayesian Belief Networks; K-nearest neighbor classification-Algorithm and characteristics.

UNIT – V **[No. of Hours: 10]**

Clustering: Problem Definition, Clustering overview, Evaluation of clustering algorithms, Partitioning clustering K-Means Algorithm, K-Means Additional Issues, PAM Algorithm, Hierarchical Clustering-Algorithm- Agglomerative Methods and Divisive Methods, Basic Agglomerative Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and weakness, Outlier Detection

Text Books:

TB1. Data Mining-Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.
TB2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education

Reference Books:

RB1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
RB2. Data Ware Housing Fundamentals, Pualraj Ponnaiah, Wiley Student Edition.
RB3. The Data Ware House Life Cycle Toolkit- Ralph Kimball, Wiley Student Edition.
RB4. Data Mining, Vikaram Pudi, P Radha Krishna, Oxford University.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Define, list, label, relate and show the functionality of the various data mining and data warehousing component
CO2	Explain, compare, classify, outline strengths and limitations of various data mining and data warehousing models
CO3	Identifying , develop, construct choose, build and apply the various analyzing techniques of various data
CO4	Analyze, compare, simplify or list different methodologies used in data mining and data ware housing.
CO5	Compare, deduct, determine, mark or criticize different approaches of data ware housing and data mining with various technologies
CO6	Improve, change, develop, design, modify or propose new applications or tools for data mining

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2		2										
CO3			2	3								
CO4				3				2				
CO5	2	2										
CO6	1											
AVG	**0.5**	**1.16**	**0.3**	**1**				**0.3**				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-SEC3.2				
Course Name : MANAGEMENT INFORMATION SYSTEM				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making.
2. Analyse and synthesize business information systems to facilitate evaluation of strategic alternatives.
3. Effectively communicate strategic alternatives to facilitate decision making.
4. Understand entire spectrum of issues related to managing information systems in an ethical manner

COURSE CONTENTS

UNIT 1 **[No. of Hours: 8]**

Organization & Types, Decision Making, Data & information, Characteristics & Classification of information, Cost & value of information, various channels of information & MIS.

UNIT 2 **[No. of Hours: 8]**

Foundation of Information System: Introduction to Information System in Business Fundamentals of Information System, Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria. Tool and Techniques of MIS- dataflow diagram, flow chart etc.

UNIT 3 **[No. of Hours: 8]**

Business application of information technology: electronic commerce Internet, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage.

UNIT 4 **[No. of Hours: 8]**

Managing Information Technology, Enterprise & Global Management, Security & Ethical Challenges, Planning & Implementing Change. Reports: Various types of MIS reports, GUI & Other Presentation tools.

UNIT 5 **[No. of Hours: 8]**

Advanced concepts in information system: Enterprise Resource Planning: introduction, various modules like Human Resources, Finance, Accounting, Production& Logistics. Supply Chain Management, CRM, Procurement, Management System Object Oriented modeling case studies.

Text Books:

TB1. O.Brian, "Management Information System", TMH.
TB2. O.Brian, "Introduction to Information System", McGraw Hill.

Reference Books:

RB1. Alter, "Information Systems: A Management Perspective", Addison Wesley.
RB2. Arora& Bhatia, "Information Systems for Managers", Excel
RB3. Bansal, "Information System Analysis & Design", TMH.
RB4. Jawadegar, "Management Information System", TMH.
RB5. Murdick, "Information System for Modern Management", PHI.
RB6. Alexis Leon, "Enterprise Resource Planning", TMH.

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Define information, types of Information value and importance of information.
CO2	Explain the usage, of Information system and their tools.
CO3	Apply the techniques of strategic design of information system .
CO4	Classify the different types of Information System
CO5	Appraise the Business Applications of Information System
CO6	Construct the required Information Systems in an ethical way

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3		3			2	3	1		2	
CO2	2	3		3	3						2	
CO3	2	3	3	3								
CO4	2	2	3	2	3	3						
CO5	2	2	3	2	3		3			2	2	
CO6	2	2	3	2	1		3			2	2	
AVG	**2**	**2.5**	**2**	**2.5**	**1.6**	**0.5**	**1.3**	**0.5**	**0.1**	**0.6**	**1.3**	**0**

Course code : BCA-SEC3.3				
Course Name : ENTERPRISE RESOURCE PLANNING				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To learn the need and evolution of ERP Systems and related technologies.
2. To learn ERP benefits and classification and implementation of ERP Life Cycle
3. To learn Analytical Hierarchy Process & its applications and ERP implementation approaches and its strategies.
4. To learn factors affecting ERP success and effectiveness.
5. To learn extend ERP and its learning and emerging issues.

COURSE CONTENTS

Unit-I **[No. of Hours: 10]**

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 **[No. of Hours: 6]**

ERP Domain, ERP Benefits classification, Present global and Indian market scenario, milestones and pitfalls, Forecast, Market players and profiles, Evaluation criterion for ERP product.

Unit-III **[No. of Hours: 6]**

ERP Life Cycle: Adoption Decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement phases, ERP Modules

Unit- IV **[No. of Hours: 10]**

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 vendor's evaluation criterion, ERP Implementation approaches and methodology, ERP Implementation strategies, ERP Customization,

Unit- V **[No. of Hours: 8]**

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.

Text Books:

TB1. Enterprise Resource Planning, Alexis Leon
TB2. ERP Concepts & Planning, V.K. Garg & N.K. Venkita Krishnan

Reference Books:

RB4. ERP Ware: ERP Implementation Framework, V.K. Garg &N.K. Venkita Krishnan

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Defining basic use of enterprise software and its role in integrating business functions, reengineered business processes, phases of ERP implementation life cycle, domains of ERPs, implementation cost etc.
CO2	Understanding the work done during the ERP implementation life cycle.
CO3	Illustrate the Analytical Hierarchy Processes (AHP) for the selection of ERP system. Apply the customization to ERP system as per user's requirement.
CO4	Analyse the role of consultant, vendors and users in ERP implementation.
CO5	Evaluate critical success and failure factors for implementation, Hidden cost during ERP implementation.
CO6	Formulate methodology for the implementation of ERP system.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	1	1	1					
CO2	2	2	2	2	1	1	2	1	1	1	1	1
CO3	2	2	1	3	1		1					
CO4		1	3	1	3		1					
CO5	1	2	1	2	1		1					
CO6	2	2	2	2	1	2	2	2	1	1	1	1
AVG	**1.5**	**1.7**	**1.8**	**2**	**1.3**	**0.7**	**1.3**	**0.5**	**0.3**	**0.3**	**0.3**	**0.3**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-SEC3.4				
Course Name : ADVANCE RDBMS				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

- To understand the concept of processing transactions by DBMS.
- To study the concurrency and ways of controlling concurrent transactions.
- To study the recovery techniques used after transaction failure.
- To study concept of distributed DBMS and how the transactions are executed in the distributed scenario.
- To understanding basic concept of Object-oriented DBMS

COURSE CONTENTS

UNIT I **[No. of Hours: 12]**

Transaction Processing Concepts: Transaction system, testing of serializability, Serializability of Schedules Conflict & view serializable schedule

UNIT II **[No. of Hours: 6]**

Recoverability, Recovery from transaction failures, log based recovery, Checkpoints, deadlock handling

UNIT III **[No. of Hours: 12]**

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version Schemes, Recovery with concurrent transaction.

UNIT IV **[No. of Hours: 8]**

Distributed DBMS Concepts and design: Introduction, functions and architecture of a DDBMS, transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database,

UNIT V **[No. of Hours: 2]**

Introduction to OODBMS.

Text Books:

TB1. Adv. DBMS by V.K. Jain, Cyber Tech Publication, 5A/13 Ansari Road, Daryagang, N.Delhi.-110002

TB2. Date C.J. "An Introduction to Database System". Addision Wesley

References Books:

RB1. Korth, Silbertz, Sudarshan, "Database Concepts" McGraw Hill
RB2. Elmasri, Navathe, "Fundamentals of Database Systems" Addision Wesley

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Defining the concept of transactions, serializability, recovery, concurrency, and distributed & object-oriented DBMS.
CO2	Understanding the concept of transaction in database, significance of serializability in transaction execution. Recovery of failed transactions.
CO3	Illustrate the serializability and concurrency problems and methods for controlling it.
CO4	Apply and comparing the locking techniques for controlling concurrent transaction execution.
CO5	Evaluate distributed DBMS concepts and architectures. Understanding concept of OODBMS.
CO6	Case studies based on serializability and locking protocols.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	1	1					
CO2	2	1		1								
CO3	2	2		2	1	1		1				
CO4	3	2	1	1			1					
CO5	2	1	1				1					
CO6	2	2	1	2								
AVG	**2.2**	**1.5**	**0.7**	**1.2**	**0.3**	**0.2**	**0.5**	**0.2**				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P51.1 (Lab based on DSE1)				
Course Name : PYTHON PROGRAMMING LAB				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Basic programming constructs and functions in python.
2. Understand the applicability of data structures like lists, tuples, sets and dictionaries inpython applications.
3. Use object-oriented programming features of python to develop applications.
4. Learn how to use exception handling in applications for error handling.
5. Database and file based programming

COURSE CONTENTS

- Working with Jupyter notebook.
- Programs based on loops and conditional statements.
- Programs based on string manipulations.
- Programs based on List.
- Programs based on tuples.
- Programs based on sets.
- Programs based on dictionary.
- Working with user defined functions.
- Working with lambda, map, filter and reduce functions.
- Programs based on recursion.
- Programs for file handling in Python.
- Programs for Sorting and searching.
- Database handling in Python using SQLite3.
- Working with in built and user defined modules,
- Working with Object Oriented Programming in Python.

Course Outcomes (COs):
Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Describe the program creation in Python through usage of appropriate constructs
CO2	Demonstrate the working of basic programming constructors in Python.
CO3	Apply data structure primitives like strings, lists, tuples, sets and dictionaries on various types of data with or without using functions, object-oriented

	concepts to the programs in Python etc.
CO4	Analyze basic constructs of Python and how constructs can be used all together.
CO5	Evaluate the programs and its logic.
CO6	Develop programs using methods of constructs define in Python.

CO-PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1			3	1	2				
CO2	3	1	2	3		3	2	3				
CO3	3	2	3	3	1	2	2	3				
CO4	2	1	3	3	2	3	2	3				
CO5	3	1	3	1	2	3	2	3				
CO6	3	2	2	3	1	2	2	3	1	1		1
AVG	**2.8**	**1.3**	**2.3**	**2.2**	**1**	**2.7**	**1.8**	**2.8**	**0.2**	**0.2**		**0.2**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P51.2				
Course Name : ANDROID PROGRAMMING Lab				
Semester /Year : V				
	L	**T**	**P**	**C**
			4	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Install and configure Android application development tools.
2. Design and develop user Interfaces for the Android platform.
3. Apply Java programming concepts to Android application development.
4. Apply essential Android Programming concepts.
5. Develop various Android applications related to layouts & rich uses interactive interfaces

COURSE CONTENTS

1. Program to show method overloading in java.
2. Program to show method overriding in java.
3. Program to use abstract class in java.
4. Program to implement interface in java.
5. Program to use the concept of multithreading in java.
   a)using Thread class
   b)using Runnable interface.
6. Program to multilevel inheritance in java.
7. Write an Android App to create dialog box.
8. Program to use final keyword in java.
9. Program to use super in java.
10. Program to handle exceptions encountered in java.
11. Android program to print hello world
12. Android program to print addition of two numbers.
13. Android program to create a calculator.
14. Android program to create implicit intent.
15. Android program to create explicit intent.
16. Android program to create toggle button.
17. Android program to create spinner.
18. Android program to create EMI calculator.
19. Android program to use image view.
20. Android program to use different type of layouts.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

CO #	Detailed Statement of the CO
CO1	Understand the basics of Java programming, different graphics tools and their use.
CO2	Development of static and dynamic web APPs using standard tools and learn various properties of the tools.
CO3	Develop interactive and user-friendly APPs using front end and back end programming.
CO4	Develop simple applications using tools available in android studio.
CO5	Implement interactive graphics applications that use graphics tools, using android studio.
CO6	Create Android apps using Java programming language.

CO-PO MAPPING:

CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1			3	1	2				
CO2	3	1	2	3		3	2	3				
CO3	3	2	3	3	1	2	2	3				
CO4	2	1	3	3	2	3	2	3				
CO5	3	1	3	1	2	3	2	3				
CO6	3	2	2	2			1	1	2	1		
AVG	2.83	1.33	2.33	2	0.83	2.33	1.66	2	0.33	0.16	0	0

Course code : BCA-P51.3 (Lab based on DSE1)				
Course Name : WEB PROGRAMMING USING HTML & CSS LAB				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:

1. To implement the HTML to develop webpages.
2. To write the websites using HTML and CSS programming altogether.
3. To be able to apply logics for better look and feel for websites.
4. To use the types of CSS and CSS Overriding in a web site.
5. To learn the skills that will help the students in creating websites with great look and feel using CSS.

Course Outcomes (COs):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Identify HTML tags and programs and thereby website.
CO2	Illustrate programming solutions using CSS programming concepts.
CO3	Apply concepts like changing look-n-feel of the multiple web pages from single source using CSS.
CO4	Compare style sheet and decide which is suitable to use in particular case by analyzing the inline, internal and external type of CSS.
CO5	Appraise the websites with professional look and feel.
CO6	Create Professional websites using both HTML and CSS

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1		1					
CO2	2	3	2	1			1					1
CO3	1	3	3									
CO4	2	3	3									
CO5	3	2	2							2		1
CO6	3	2	2							2		1
AVG	**2.1**	**2.5**	**2.3**	**0.3**	**0.1**	**0**	**0.3**	**0**	**0**	**0.6**	**0**	**0.5**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P52.1				
Course Name : C# PROGRAMMING WITH DOT NET FRAMEWORK				
Semester /Year : IV				
	L	**T**	**P**	**C**
			4	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To learn and understand different types of statements in C#.
2. Use of data base for making dynamic websites using C# programming
3. Programming concepts in .Net Framework.
4. Data base connectivity using ADO.net
5. Understand and use of different graphical tools for the development of web page and website using C# programming.

COURSE CONTENTS

1. Program to generate prime numbers between 1 to200 and also print to the console. (ex. 1,2,3,5.....199).
2. Program to print ARMSTRONG number.
3. Program using loop that examines all the numbers between 2 and 1000, and displays only Perfect numbers.(A perfect number is the one whose sum of their divisors equals the number itself).For example given the number 6, the sum of its divisors is 6(1+2+3).Hence, 6 is a perfect number.
4. Program to accept an array of integers (10) and sort them in ascending order.
5. Program to implement the concept of abstract class.
6. Program to implement the concept of sealed class.
7. Program for jagged array and display its item through foreach loop.
8. Program in C Sharp using a class that gets the information about employee's such as Emp Id, First Name, Last Name, Basic Salary,Grade,Address, Pin Code and Contact Number. Write a method that calculates the Gross Salary (Basic +DA+HRA) and returns to the calling program and another method for the Net salary (Gross - (P.F + Income Tax)).Finally write a method that prints, a pay slip of an employee, containg all the above components in a proper format to the console.(Grade A = 20,000 , B=15,000 and C=10,000) DA=56% and HRA=20%., Pf=780, ITax.
9. Program to demonstrate boxing and unboxing.
10. Program to find number of digit, character, and punctuation in entered string.
11. Program using C# for exception handling.
12. Program to implement multiple inheritances using interface.
13. Program in C# using a delegate to perform basic arithmetic operations like addition, subtraction, division, and multiplication.
14. Program to get the user’s name from the console and print it using different namespace.

15. Demonstrate the concept of Multithreading using locks in C Sharp
16. Program to implement Indexer.
17. Program to design two interfaces that are having same name methods how we can access these methods in another class.
18. Program to implement method overloading.
19. Program to implement method overriding
20. Program in C sharp to create a calculator in windows form.
21. Create a front end interface in windows that enables a user to accept the details of an employee like EmpId ,First Name, Last Name, Gender, Contact No, Designation, Address and Pin. Create a database that stores all these details in a table. Also, the front end must have a provision to Add, Update and Delete a record of an employee.
22. Create a database named MyDb (SQL or MS Access).Connect the database with your window application to display the data in List boxes using Data Reader.
23. Program using ADO.net to insert, update, delete data in back end
24. Display the data from the table in a DataGridView control using dataset.
25. Create a registration form in ASP.NET and use different types of validation controls.
26. Display the data from the table in a Repeater control using dataset in ASP.net.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Remember the basics of C# programming, different graphics tools and their use.
CO2	Understand of static and dynamic web pages using standard tools and learn various properties of the tools.
CO3	Develop interactive and user friendly websites using front end and back end programming.
CO4	To develop, implement and creating Applications with ADO.NET and SQL server
CO5	Create user interactive web pages using ASP.Net.
CO6	Create console, windows and wed applications

Mapping of PO and CO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1			3	1	2				
CO2	3	1	2	3		3	2	3				
CO3	3	2	3	3	1	2	2	3				
CO4	2	1	3	3	2	3	2	3				
CO5	3	1	3	1	2	3	2	3				
CO6	2	3	2	2			1	1	2	1		
AVG	**2.66**	**1.5**	**2.33**	**2**	**0.83**	**2.33**	**1.66**	**2**	**0.33**	**0.16**		

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P52.2 (Lab based on DSE2)				
Course Name : PHP PROGRAMMING LAB				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:

1. To implement the advance concepts in the basic websites.
2. To create and implement the basic concepts and syntax of HTML and PHP programming together.
3. To be able to develop interactive programs using PHP.
4. To apply the various website governing tools such as session handling, exception handling, super globals etc.
5. To learn the skills that will help the students in creating websites with great look and feel using PHP programming constructs.

Course Outcomes (COs):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Understand the basic concepts of PHP and write PHP programs.
CO2	Design and develop interactive websites.
CO3	Implement concepts like session handling, database operations etc.
CO4	Develop professional websites using various PHP tools such as PHP Super Globals, Exception handling and other PHP programming constructs.
CO5	Serve the society by creating and evaluating the websites with professional look and feel and use these skills to build successful career.
CO6	Create the connection between PHP with MySql Database

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	1		1		2			
CO2	2	2	3	1			1		1			
CO3	1	3	3						2			
CO4	2	3	3			2				2		
CO5	3	3	1								3	1
CO6	2	1	1									
AVG	**2.2**	**2.6**	**2.6**	**0.4**	**0.2**	**0.4**	**0.4**	**0**	**1**	**0.4**	**0.6**	**0.2**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P52.3 (Lab based on DSE2)				
Course Name : SQL & PL/SQL Lab				
Semester /Year : Vth Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To use expressions, operators, control structures, records and SQL within PL/SQL
2. To understand different built-in SQL Functions and how, where they can be used
3. To define different Cursor types and how they can be used in PL/SQL
4. To implement error handling in PL/SQL code
5. To create Procedures, Functions and Packages
6. To describe different types of database triggers and how they should be used

COURSE CONTENTS

- Creating tables and query a database using SQL DDL/DML commands.
- Programs using cursors.
- Exceptional handling in PL/SQL.
- Programs using functions and procedures.
- Using triggers in PLSQL programs.

Course Outcomes (COs):
Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Knowledge of Creating Databases, tables and query a database using SQL DML/DDL commands.
CO2	Understand the programming constructs of PL/SQL.
CO3	Apply data structure primitives like cursors, triggers etc. on various types of data with or without using functions or procedures. Handling the errors to make the program robust.
CO4	Analyze the effect of applying cursors, triggers, and other primitives.
CO5	Evaluate the effect on the data base after applying SQL query and PL/SQL constructs.
CO6	Create PL/SQL programs using various programming constructs of Python.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1		2			2	2		
CO2	3	3	3	2	1	1			2	2		
CO3	3	3	3	2	1	1			3			
CO4	3	3	3	2	1	1	1	1	2	2	1	
CO5	3	3	3	2	1	1			2			2
CO6	3	3	3	3	1	1	1	1	3	1	1	1
AVG	**3**	**2.7**	**2.7**	**2**	**0.8**	**1.2**	**0.3**	**0.3**	**2.3**	**1.2**	**0.3**	**0.5**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-DSE4.1				
Course Name : ADVANCE JAVA PROGRAMMING				
Semester /Year : VIth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.
2. Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
3. Design and develop Web applications
4. Designing Enterprise based applications by encapsulating an application's business logic.
5. Designing JDBC connectivity.

COURSE CONTENTS

UNIT I **[No. of Hours: 8]**

Applets and Layout managers- Applets in java, AWT controls- Labels, Buttons, Check Box, Choice, Text Field, Text Area, Lists, Scroll Bar, Progress Bar, Window, Frame, Menu, Menu Bar etc. Layout Managers- Flow Layout, Border Layout, grid layout, Card Layout, Grid Bag Layout.

UNIT II **[No. of Hours: 8]**

Java Swing and Event Handling-Working with JFrame, JApplet, JPanel, JTextField, JPasswordField, JButton,JCheckBox, JRadioButton, JList, JScrollPane, JComboBox,JMenu, JMenuBar,JMenultem. Event Handling- Event delegation model or event class hierarchy, all classes and interfaces of event delegation model, programs related to event.

UNIT III **[No. of Hours: 8]**

Servlets- Servlet Overview and Architecture, Servlet Life Cycle, GET and POST methods, HTTPServletRequest and HTTPServletResponse objects, Developing an interactive servlet using an HTML page, HTTPSession object.

UNIT IV **[No. of Hours: 8]**

Java Beans- Preparing a Class to be a Java Bean, Creating a JavaBean, JavaBean Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean.

UNIT V **[No. of Hours: 8]**

JDBC Connectivity- Database concepts and HTML Forms. JDBC driver types, JDBC-ODBC Bridge, SQL Statements, Prepared Statements. Using JDBC in servlets.

Text Books:

TB1. Herbert Schildt (2006), "The Complete Reference Java 2 (Updated to Cover J2SE 1.4)", Ed. 05, Tata McGraw-Hill publishing company Ltd. New Delhi, India.

TB2. Cay S. Horstmann Gary Cornell, " Core Java 2 Volume-I Fundamentals", Ed-07, PEARSON Education, Singapore Pte.Ltd., Indian Branch, New Delhi, India 2005.

Reference Books:

RB1. Michael Morgan, "Java 2 for Professionals Developers", Ed. 01, SAMS, Techmedia, New Delhi, India,2000.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Learn java AWT and Swing
CO2	Understand Event handling in Java
CO3	Design java servlets
CO4	Understand java bean and its properties.
CO5	Design JDBC connection using MySQL
CO6	Plan JDBC Programs

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1			2						
CO2	2	3	2		2							
CO3	2			2		2	1					
CO4			2		2							
CO5	2	2		2		2						
CO6	1	2	2			2	2					
AVG	1.66	1.5	1.16	0.8	0.8	1.13	0.5					

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-DSE4.2				
Course Name : DATA SCIENCE USING PYTHON				
Semester /Year : VIth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

- Understating the concept of Data Science
- Using the data science using Python
- Understanding the use of NumPy in data science and how it is different from Python List
- To understand the dataframe, reading csv, tsv file and working on it.
- Handling the missing value and data cleansing
- Understanding the concept of visualize the numbers in graphs using the Python libraries Metplotlib and Seaborn

COURSE CONTENTS

Unit I **[No. of Hours: 12]**

NumPy: Introduction, NumPy Array, NumPy Array Size, NumPy Array Shape, NumPy Mathematical Functions, NumPy Trigonometric Functions, NumPy Random, NumPy String Operations

Unit II **[No. of Hours: 12]**

Pandas: Pandas Series, Pandas DataFrame, Pandas Read_csv, Pandas Write csv File, Data Cleansing, Pandas Handling Missing Values, Pandas concat(), Pandas join(), Pandas append(), Pandas GroupBy

Unit III **[No. of Hours: 10]**

Metplotlib: Matplotlib Line Plot, Matplotlib Histogram, Matplotlib Bar Chart, Matplotlib Pie Chart, Matplotlib Scatter Plot, Matplotlib Subplot, Matplotlib Save Figure, Matplotlib Image Show

Unit IV **[No. of Hours: 6]**

Seaborn: Introduction, Seaborn Line Plot, Seaborn Histogram, Seaborn Barplot

Text Books

TB1. Pandas for everyone, Python Data Analysis by Daniel Y. Chen, Pearson publication
TB2. Laura Igual, Santi Seguí, "Introduction to Data Science - A Python Approach to Concepts,

Reference book:

RB1. Techniques and Applications", Springer
RB2. Wes McKinney, "Python for Data Analysis", O'Reilly
RB3. Luca Massaron, John Paul Mueller, "Python for Data Science for Dummies"

Course Outcomes (COs):
Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Defining the fundamental of data science and libraries used.
CO2	Understanding the scientific computing in Python, data analysis and plotting.
CO3	Applying data science functions on data
CO4	Analyzing data through plots.
CO5	Evaluate the output produced by the different data science constructs.
CO6	Designing programs based on data science concepts.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1		1						
CO2	2	1	2	2		1		1				
CO3	2	2	2	2		1	2	3		1		
CO4	1	3	2	2			1	3				
CO5	1	3	3	2								
CO6	2	3	3	3		1	2	3	1	1		
AVG	**1.7**	**2.2**	**2.2**	**2**		**0.7**	**0.8**	**1.7**	**0.2**	**0.3**		

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-DSE4.3				
Course Name : MICROPROCESSORS				
Semester /Year : VI Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To introduce students with the architecture and operation of typical microprocessors and microcontrollers.
2. To familiarize the students with the programming and interfacing of microprocessors and microcontrollers.
3. To provide strong foundation for designing real world applications using microprocessors and microcontrollers.

COURSE CONTENTS

Unit 1 **[No. of Hours: 8]**

Introduction to Microprocessor, History of Microprocessors, Micro-Computers and Micro-Controllers, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing & Address Decoding.

Unit 2 **[No. of Hours: 8]**

Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Peripheral Mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting.

Unit 3 **[No. of Hours: 8]**

Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, Stack, Subroutine, Restart, Conditional call and return instructions, 8085 Interrupts, 8085 vector interrupts, RIM & SIM Instruction.

Unit 4 **[No. of Hours: 8]**

Program: Addition, subtraction, multiplication & division of 8-bit numbers, finding largest & smallest numbers in an array, sorting of array, BCD-to-Binary conversion, Binary-to-BCD conversion.

Unit 5 **[No. of Hours: 8]**

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, Direct Memory Access and 8237 DMA controller.

Text Books:

TB1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications

with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
TB2. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill.

Reference Books:

RB1. Yu-Cheng Liu, Glenn A Gibson, "Microcomputer Systems: The 8086/8088 Family: Architecture, Programming, and Design", PHI Learning, 2nd Edition, 2009.
RB2. Barry B Brey, "The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Architecture, Programming and Interfacing", Pearson Prentice Hall, 8th Edition, 2009.Bloom Taxonomy

Course Outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system.
CO2	Explain detailed s/w & h/w structure of the Microprocessor.
CO3	Illustrate how the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.
CO4	Analyze the behaviour of digital circuits.
CO5	Compare and understand various addressing modes and data transfer instructions of the target microprocessor.
CO6	Design and develop assembly language programs using software interrupts, subroutines using instruction set of 8085.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1		2	1	1				2		
CO2	3	2	1		1		1			2		
CO3	2	1		1	1	1				1		
CO4	2	1	2			2	1			1		
CO5		2	3	1	1	1	2			1		
CO6	2	1		1	1	1				1		
AVG	**1.8**	**1.3**	**1.0**	**0.8**	**0.8**	**1.0**	**0.7**	**0.0**	**0.0**	**1.3**	**0.0**	**0.0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-DSE5.1				
Course Name : ADVANCE SOFTWARE ENGINEERING				
Semester /Year : VIth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Develop models using the UML notation.
2. Analyse requirements with use cases.
3. Create domain models.

COURSE CONTENTS:

UNIT I **[No. of Hours: 10]**

Unified Modelling Language, Basic structures and modelling classes, common modelling techniques, relationships, common mechanism, class diagrams.

UNIT II **[No. of Hours: 10]**

Advanced structured modelling, advanced classes and relationships, interfaces, types and roles, instances and object diagram. Basic idea of behavioural modelling.

UNIT II **[No. of Hours: 10]**

Object- oriented concepts and principles. Identifying the elements of an object model. Object oriented projects metrics and estimation. Design for object – oriented systems. The system design process. Object – oriented testing – testing OOA and OOD models. The object – oriented testing strategies. Inter class testing.

UNIT IV **[No. of Hours: 10]**

Technical metrics for O-O systems. Class oriented metrics and metrics for O-O projects. Advanced topics in software engineering. Component based software engineering and development. Classifying and retrieving components

Text Books:

TB1. Object oriented Modelling and Design with UML - James Rumbaugh. Micheal Blaha (second edition)

TB2. Object Oriented Analysis & Design, Satinger. Jackson, Burd Thomson

Reference Books:

RB1. The Unified Modelling Language User Guide - Grady Booch, James Rumbaugh, Ivar Jacobson.

Course Outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Define or name various analysis and design principles at different levels and various views in different domains of software systems.
CO2	Classify, compare, demonstrate or explain of the diagrams in Unified Modelling Language
CO3	Identify, utilize, make use of Static and Dynamic Diagrams
CO4	Analyse, categorize, compare, design Use case diagram, Sequence diagrams, State Chart diagrams.
CO5	Explain or compare component and deployment diagrams.
CO6	Develop various UML diagrams.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1		2								
CO2	2		1									
CO3	2	1		3								
CO4	3		1									
CO5	3	1		2								
CO6	2	2	2				2					
AVG	**2.5**	**0.8**	**0.6**	**1.16**			0.33					

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-DSE5.2				
Course Name : COMPUTER GRAPHICS				
Semester /Year : VIth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. introduces the basic concepts of computer graphics
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.

COURSE CONTENT

Unit I **[No. of Hours: 8]**

Graphics Primitives: Display Devices: Refresh Cathode Ray Tube, Raster Scan Display, Plasma display, Liquid Crystal display Plotters, Printers. Input Devices: Keyboard, Trackball, Joystick, Mouse, Light Pen, Tablet, and Digitizing Camera.

Unit II **[No. of Hours: 8]**

Input Techniques: Positioning techniques, Potentiometers, Constraints, Scales & Guidelines, Rubber-Band techniques, Dragging Dimensioning techniques and Graphical Potentiometers, Pointing and Selection: the use of selection points defining a boundary rectangle, multiple selections, Menu selection.

Mathematics for Computer Graphics: Point representation, Vector representation, Matrices and operations related to matrices, Vector addition and vector multiplication, Scalar product of two vectors, Vector product of two vectors.

Unit III **[No. of Hours: 8]**

Line Drawing Algorithms: DDA Algorithms, Bresenham's Line algorithm. Segment & Display files: Segments, Functions for segmenting the display file, Posting and posting a segment, segment naming schemes, Default error conditions, Appending to segments, Refresh concurrent with reconstruction, Free storage allocation, Display file structure.

Unit IV **[No. of Hours: 8]**

Graphics Operations: Clipping, Point Clipping, Line Clipping, Polygon Clipping. Filling: Inside Tests, Flood fill algorithm, Boundary-Fill Algorithm and scan-line polygon fill algorithm. Conics, Curves and Surfaces: Quadric surfaces: Sphere, Ellipsoid, and Torus. Superquadrics: Superellipse, superellipsoid, Spline & Bezier Representations: Interpolation and approximation splines, parametric continuity conditions, Geometric Continuity Conditions, Spline specifications. Bezier curves and surfaces.

Unit V **[No. of Hours: 8]**

Transformation: 2D transformation, Basic Transformations, Composite transformations: Reflection, Shearing, Transformation between coordinate systems. 3D Graphics: 3D Display Methods, 3D transformations, Parallel projection, Perspective projection, Visible lines and surfaces identification, Hidden surface removal. Animation: Introduction to Animation to Animation, Principles of Animation, Types of Animation, Types of Animation Systems: Scripting, Procedural, Representational, Stochastic, etc. Animation Tools: Hardware-SGI, PC's Amiga etc.

Text Books:

TB1. Donald Hearn and M Pauline Baker, "Computer Graphics" PHI
TB2. Steven Harrington, "Computer Graphics: A Programming Approach" TMH
TB3. Prajapati A.K. "Computer Graphics" PPM Ed2

References Books:

RB1. Foley James D, "Computer Graphics" AW Ed2
RB2. Newman and Sprould, "Principle of to Interactive Computer Graphics" McGraw Hill
RB3. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
RB4. Rogers and Adams, "Mathematical Elements of Computer Graphics" McGraw Hill

Course Outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Define working of CRT
CO2	Understand line drawing algorithm
CO3	Apply 2D and 3D Transformations
CO4	Analyze parallel and perspective projections
CO5	Understanding basic concepts of animation
CO6	Plan Computer Graphics Programs

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		1	2	2		1					
CO2		2		1				1				
CO3			2	2			2					
CO4				2								
CO5			2	2								
CO6	2	2	1	1	2	1						
AVG	0.7	0.7	1	1.7	0.7	0.2	0.5	0.2				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-DSE5.3				
Course Name : COMPUTER BASED NUMERICAL TECHNIQUES				
Semester /Year : VIth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Overview of some of the issues and problems that arise in scientific computation, such as (non-)linear systems, numerical and symbolic integration, differential equation and simulation.
2. Suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.
3. Problems in the field of Applied Mathematics, Theoretical Physics and Engineering which requires computing of numerical results using certain raw data.
4. To solve complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations.
5. To deal with various topics like finding roots of equations, solving systems of linear algebraic equations, interpolation and regression analysis, numerical integration & differentiation, solution of differential equation, boundary value problems, solution of matrix problems.

COURSE CONTENT

Unit I **[No. of Hours: 10]**

Floating point Arithmetic: Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation, Errors in numerical computation.

Unit II **[No. of Hours: 10]**

Iterative Methods: Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.

Unit III **[No. of Hours: 10]**

Simultaneous Linear Equations: Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, III conditioned system of equations, Refinement of solution. Gauss Seidal iterative method, Rate of Convergence. Interpolation and approximation: Finite Differences, Difference tables. Polynomial Interpolation: Newton's forward and backward formula. Interpolation with unequal intervals: Language's Interpolation, Newton Divided difference formula.

Central Difference Formulae: Gauss forward and backward formula, stirling's Bassel's Everett's formula. Approximation of function by Taylor’s series and Chebyshev polynomial.

Unit IV **[No. of Hours: 10]**

Numerical Differentiation and Integration: Introduction, Numerical Differentiation, Numerical Integration, Trapazoidal rule, Simpon's rules, Boole's Rule Euler-Maclaurin Formula, Solution of Differential Equations: Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods.

Text Books:

TB1. Rajaraman V., :Computer Oriented Numerical Methods". PHI

TB2. Grewal B.S., "Numerical methods in Engineering and Science. Khanna Publishers, Delhi.

References Books:

RB1. Gerald and Wheatley, "Applied Numerical Analyses", AW

RB2. Jain, Lyengar and Jain, "Numerical Methods for Scientific and Engineering Computations:, New Ager Int.

RB3. T.Veerarajan, T Ramchandran, "Theory and Problems of Numerical Methods", TMH

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Illustrate the basic understanding of commonnumerical methods used to obtainapproximate solutions to otherwiseintractable mathematical problems.
CO2	Understand and interpret Numerical analysis which has enormous applications in the field of Science and some fields of Engineering.
CO3	Solve numerical methods for various mathematical operations and tasks.
CO4	Analyse and evaluate the accuracy of common numerical methods.
CO5	Evaluate calculation and interpret of errors in numerical method.
CO6	Design and able to solve the problem by Numerical Differentiation and Integration etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	1	3	2	1	1							
CO3	1	3		1								
CO4		3	2	1	1					1		
CO5	1	2	1	1						1		
CO6	1	2	3	1	3	1	1	1	1	3	2	1
AVG	1.1	2.5	1.3	0.8	0.8	0.1	0.1	0.1	0.1	0.8	0.3	0.1

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-SEC4.1				
Course Name : STATISTICS				
Semester /Year : VIth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:

1. To study methods of collection, classification, tabulation of data.
2. To apply various statistical methods and analyses the data
3. To find correlation between the data.
4. To study probability and probability distribution to solve various real life problems
5. To test hypothesis using various statistical test.

COURSE CONTENTS

UNIT 1: Data & Its Diagrammatic Representation [No. of Hours: 8]
Definition of Statistics, Data, Primary data & secondary data, classification of data, tabulation of data, individual series, Discrete frequency Distribution, continuous frequency distribution, Exclusive and inclusive continuous series, Diagrammatic representation of data, Tabular form, 1D (All Bar Diagrams), Histogram, Frequency polygon, frequency curve, Ogive.

UNIT 2: Measure of Central Tendency & Dispersion [No. of Hours: 8]
Mean (Arithmetic Mean, Weighted Mean, Harmonic Mean, Geometric Mean), Median, Mode, Histogram & Mode, Relationship between mean, median, mode. Definition of dispersion, Range, Quartile deviation & its coefficient, Inter Quartile deviation, Mean deviation & its coefficient, Standard deviation.

UNIT 3:**Correlation & Regression Analysis [No. of Hours: 8]**
Correlation definition, types of correlation, Karl Pearson coefficient of correlation, Spearman coefficient of correlation, repeated rank. **Regression Analysis** Regression lines, Regression line of Yon X & X on Y, Regression coefficient, Relationship between correlation & regression coefficient.

UNIT 4: Probability & Probability Distributions [No. of Hours: 8]
probability & probability distribution: probability, Sample space & events, types of events, conditional probability, Bayes theorem, Mathematical expectation

UNIT 5: Sampling, Hypothesis Testing & Statistical Test [No. of Hours: 8]
Sampling & its type, Probability & Non probability sampling, Hypothesis, Null hypothesis, Alternative hypothesis, Type I & Type II Errors, Statistical **Test:** Parametric test & non parametric test, F test, T test, ANOVA -1, ANOVA 2, Chi square test as a goodness of fit, Chi square test as test of independence.

Text Books:

TB1. Gerald Keller : Managerial Statistics 9th Edition.

Reference Books:

RB1. Richard Levin & David Rubin : Statistics for management, Prentice Hall.
RB2. Anderson, Sweeny & Williams: Statistics for Business and Economics, South W

Course Outcomes (CO):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	To gain knowledge of statistical method like Average, Correlation, Regression, dispersion probability and probability distribution
CO2	To understand statistical method like Average, Correlation, Regression, dispersion probability and probability distribution
CO3	To apply statistical method and probability distribution
CO4	To analyze various statistical method and probability distribution
CO5	To apply statistical method probability distribution and statistical test to test the hypothesis
CO6	To create new statistical method probability distribution and statistical test

.

CO –PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	1	1	2	1					
CO2	3	1		2		1	2	1				
CO3	3	2	1	1		2	1		2			
CO4	2	1	2	2	1	2	3	1		2	1	
CO5	1	2	1	3	2	2	2				1	1
CO6	1						2					1
AVG	**2**	**1.4**	**1.4**	**1.8**	**0.8**	**1.8**	**1.83**	**0.4**	**0.4**	**0.4**	**0.4**	**.33**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-SEC4.2				
Course Name : CLOUD COMPUTING				
Semester : VIth Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:The objectives of this course are

1. To explore Cloud Computing basic concepts and its applications.
2. To understand Virtualization and its role in the implementation of cloud computing.
3. To Data centre overview and its architecture.
4. To demonstrate popular public clouds and their features.
5. To discuss security issues in cloud and available counter measures.

COURSE CONTENTS

Unit 1 **[No. of Hours: 8]**

Introduction to Cloud Computing: Definition, Evolution & Characteristics, Service Modelsof cloud computing Iaas, PaaS, SaaS and their Comparisons, Issues & Challenges of Cloud Computing, Applications of Cloud computing, Overview of Cloud Computing Security Configurations.

Cloud Computing Architecture: Introduction, Cloud Architecture, Deployment of Models - (Public, Private, Community, and Hybrid Clouds) and their comparisons, IDaaS, Over View of Data intensive computing through Map Reduce.

Unit 2 **[No. of Hours: 8]**

Virtualization in Cloud: Virtualization, Implementation of Virtualization, MiddlewareSupport for Virtualization, Advantages & Applications of Virtualization, Virtualization Implementation Techniques, Hardware Virtualization, Types of Virtualization.

Unit 3 **[No. of Hours: 8]**

Data Centre Architecture and Technologies: Architectural Building Blocks of Data center, Industry Direction and Operational and Technical Phasing, Industry Direction and Overview of Operational and Technical Phasing (Overview of 5 Phases).

Unit 4 **[No. of Hours: 10]**

Computing with Titans: Google, Microsoft, Amazon, IBM, Accessing the Cloud-Platformsthrough a brief overview of Web Applications, Web API's, Web Browsers.

Implementation of Cloud Using Any Cloud Platform: Introduction to Web Services**,** Structure, Objective, Cloud Portals, Groups, Mobile Apps, Setting up of Cloud Services, Containers, Handling Cloud Shell, Setting up of projects, Building Virtual Infrastructure, Deployment of Virtual Machine, Configuring Load Balancing.

Unit 5 **[No. of Hours: 6]**

Security Issues in Cloud Computing: Introduction, Security Challenges in Cloud Computing, Information Security, Privacy and Trust in Cloud Computing.

Text Books:

TB1. V.K. Pachghare ,"Cloud Computing "PHI Learning, 1st Edition,2016.

TB2. Venkata Josyula, Malcom Orr, Greg Page, "Cloud Computing Automating the Virtualized Data Center", Cisco Press,1st Edition,2016.

TB3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing a Practical Approach", McGraw Hill,1st Edition,2015.

Reference Books:

RB1. Erl Thomas, Puttini Ricardo, Mahmood Zaigham, "Cloud Computing-Concepts, Technology and Architecture", Pearson India,1st Edition, 2014.Srinivas Cheemalapti Yi-an Chang, Shahir Daya, Matthieu Debeaux, Odilon

RB2. Magroski Goulart, VasfiGucer, Rahul Gupta, Shamim Hossain, David Kwock, Jordan T Moore, David N Nguyen, Bobby Woolf, "Hybrid Cloud Data and API Integration: Integrate Your Enterprise and Cloud with Bluemix Integration Services", IBM Redbooks, 2nd Edition,2016.

Course Outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	To understand Cloud Computing concepts, classifications, and the basic cloud architecture. Exploring various Cloud services and applications currently used in industry.
CO2	Understanding abstraction and virtualization techniques. And Security in the cloud computing environment.
CO3	Analyze the concept of Data Centres with Cloud Computing and examine the Use cases
CO4	Exploring major Cloud service platforms currently ruling the industry.
CO5	To have knowledge on various standards used and cloud security features.
CO6	Compose Privacy and Trust in Cloud Computing.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2		1			1		
CO2	2	3		3	3							
CO3	3		2		2		2			1		
CO4	3	3		3	2							1
CO5	1	1	1	1	1		1					
CO6	2	2	1		1			1		1		1
AVG	**2.3**	**1.8**	**0.8**	**1.5**	**1.8**		**0.6**	**0.1**		**0.5**		**0.3**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-SEC4.3				
Course Name : OPERATIONS RESEARCH				
Semester : VI Semester				
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To impart knowledge in concepts and tools of Operations Research
2. To understand mathematical models used in Operations Research
3. To apply these techniques constructively to make effective business decisions.
4. To be capable of analysing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.
5. To enable the student to understand and analyse managerial and engineering problems to equip him to use the resources such as capitals, materials, productions, controlling, directing, staffing, and machines more effectively.

COURSE CONTENTS

Unit 1 **[No. of Hours: 6]**

Introduction to OR: Meaning and scope of O.R, Definition of O.R, LPP (Linear Programming Problem). Formulation of LPP, graphical solution of LPP- Problems

Unit 2 **[No. of Hours: 8]**

LPP: IBFS, Basic and Non-basic variable, Slack variable, Surplus variable and Artificial variable, Simplex method, Big M, two phase simplex methods and problems

Unit 3 **[No. of Hours: 10]**

Transportation problem: Definition, feasible solution by North-West corner rule, LCM, VAM, Optimal solution through MODI & stepping stone method for balanced and unbalanced transportation problem.

Assignment problem: Meaning of assignment problem, unbalanced assignment problem, travelling salesman problem, Hungarian method for optimal solution.

Unit 4 **[No. of Hours: 8]**

Game Theory: Concept of game; Two-person zero-sum game; Pure and Mixed Strategy Games; Saddle Point

Unit 5 **[No. of Hours: 8]**

Sequencing problem: Optimal sequencing of N Jobs on 2 and 3 machines.

Project Management: Rules for drawing the network diagram, Applications of CPM and PERT techniques in Project planning and control

Text Books:

TB1. Apte - Operation Research and Quantitative Techniques (Excel Books)
TB2. S Kalawathy - Operation Research (Vikas IV Edition)

Reference Books:

RB1. Natarajan - Operation Research(Pearson)
RB2. Singh & Kumar - Operation Research(UDH Publisher edition 2013)

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Recognize LPP as a tool used to construct a mathematical model of a real-world problem which has many alternative solutions.
CO2	Interpret simplex method and duality to solve linear programming problems.
CO3	Solve transportation and assignment problems. Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods.
CO4	Simplify and optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.
CO5	Employ the principles of game theory in practical situations.
CO6	Formulate Network models for service and manufacturing systems and learn about project scheduling by PERT/CPM.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1								1	1
CO2	3	3	1								1	1
CO3	3	3	1								1	1
CO4	3	3	1								1	1
CO5	3	3	1								1	1
CO6	3	3	1								1	1
AVG	**3.0**	**3.0**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**1.0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-SEC4.4**			
Course Name	**: NETWORK SECURITY AND CRYPTOGRAPHY**			
Semester /Year	**: VIth Semester**			
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:

1. Understand the basic Knowledge of Network Security Concepts & the Challenges and Scope of Information Security
2. Understand the basic Concept of Block Cipher, stream ciphers &the Importance of Cryptographic Algorithms and their Uses.
3. Learn and Understand Encryption Techniques & Access Control Mechanism Used for User Authentication and Authorization.
4. Understand the concept of authentication of message in network by using different techniques.
5. Aware and Learn the Usages of Sockets Layer (SSL), Secure Internet Protocol (IP) and HTTPS, Secure Electronic transaction.

COURSE CONTENTS:

UNIT 1: Introduction to security: **[No. of Hours: 10]**

Basic aspects of Network security, Attacks active & passive attacks, Types of attack, VIRUS and its categories, Conventional Encryption, Conventional Encryption Model, Substitution & transposition techniques, Bit level encryption and operations .Block Cipher Design(Fiestel and SP Network), Block Cipher Modes of Operations.

UNIT 2: Conventional Encryption Algorithms **[No. of Hours: 10]**

DES,DES Algorithm, DES standard, ,DES strength ,2DES, 3 DES, Men in Middle attack, AES, Blowfish, International Data Encryption Algorithm IDEA, RC-5, CAST-128, RSA, Key Distribution, Deffie Hellmen Key Exchange Algorithm.

.

UNIT 3: Message Authentication & Hash Functions **[No. of Hours: 10]**

Authentication Requirements, Authentication Functions, Message Authentication Codes MAC,HMAC, Hash Function , Message Digest Algorithm : MD5 & SHA, Digital Signature, Standard (DDS), Proof of Digital Signature Algorithm, Digital certificate, X.509, X.25, Secure Electronic Transaction,, Authentication Protocol, Authentication Applications: Kerberos.

UNIT4: Email, Internet Protocol Security **[No. of Hours: 10]**

Secure Socket Layer, Electronic Mail Security : PEM, Pretty Good Privacy (PGP), IP security Authentication Header, Encapsulating Security Payloads.

Text Book:

TB1. William Stallings, "Cryptography and Network Security: Principles and Practice", Prentice hall, New Jersey

Reference Books:

RB1. Johannes A. Buchmann, "Introduction to Cryptography" Springer-Verlag
RB2. Atul Kahate, "Cryptography and Network Security" TMH3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated.

Course Outcomes (OCs)
After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Able to understand & remember basics of cryptography &security like active and passive attacks and encryption and decryption techniques
CO2	Able to understand and apply the concept of linear and differential crypt analysis
CO3	Able to understand & remember basics of conventional encryption techniques like DES, Blowfish etc.
CO4	Able to understand basics of message authentication like digital signature, SET Authentication protocol like Kerberos etc.
CO5	Able to understand & remember the concept of SSL.
CO6	To design and compose Email security, Authentication Header, & Encapsulating Payload etc.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1			1	1						
CO2	1	2	1	2	1							
CO3	2	2		2	1	1		1				
CO4	1	2	2	1		2	1					
CO5		2	1	2	1	2		1				
CO6	1	2	1	2	1							
AVG	**1.1**	**1.8**	**0.8**	**1.5**	**0.8**	**1**	**0.1**	**0.3**				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P61.1 (Lab based on DSE4)				
Course Name : ADVANCE JAVA PROGRAMMING LAB				
Semester /Year : VIth Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.
2. Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
3. Design and develop Web applications
4. Designing Enterprise based applications by encapsulating an application's business logic.
5. Designing applications using pre-built frameworks.

Course Outcomes (COs):

After completion of the course, a student will be able to

CO#	Detailed Statement of the CO
CO1	Implement GUI program using AWT and Swing
CO2	Implement Action Event and Item Event
CO3	Design java servlets
CO4	Understand java bean and its properties.
CO5	Design JDBC connection using MySQL
CO6	Design java bean

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	2						
CO2	2	3	2	1	1							
CO3	2	2	1	1	1	2	1					
CO4			2	1	1							
CO5	2	2	1	1	1	2						
CO6	2	2	1	2	1	2		1				
AVG	**1.83**	**1.83**	**1.33**	**1.16**	**1**	**1.33**	**0.16**	**0.16**				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P61.2 (Lab based on DSE4)				
Course Name : DATA SCIENCE USING PYTHON LAB				
Semester /Year : VIth Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Using the data science using Python
2. Understanding the use of NumPy in data science
3. To understand the dataframe, reading csv, tsv file and working on it.
4. Handling the missing value and data cleansing
5. Understanding the concept of visualize the numbers in graphs using the Python libraries Metplotlib and Seaborn

COURSE CONTENTS

- Programs based using NumPy.
- Programs based on using series and dataframe using Pandas.
- Reading CSV files in Panadas
- Handling missing values in Panadas
- Using concat(), join(), append() and groupby in Panadas
- Plotting line plot, histogram, bar chart, pie chart, scatter plot, subplot etc. using Matplotlib and saving the figure.
- Plotting line plot, histogram, bar plot, scatter plot, heatmap, etc. using Seaborn

Course Outcomes (COs):
Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Design algorithms involving more complex data structures, and can implement it.
CO2	Understanding the performance of multiple methods and models, recognize the connections between how the data were collected and the scope of conclusions from the resulting analysis
CO3	Apply models and use different measures of model to assess outputs.
CO4	Analyse the data model applied using the data science tools.
CO5	Evaluate the data from disparate sources, cleaning the data and transform data from one format to another
CO6	Developing the program using various tools of data science.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1		1						
CO2	2	1	2	2		1		1				
CO3	2	2	2	2		1	2	3		1		
CO4	1	3	2	2			1	3				
CO5	1	3	3	2								
CO6	2	3	3	3		1	2	3	1	1		
AVG	**1.7**	**2.2**	**2.2**	**2**		**0.7**	**0.8**	**1.7**	**0.2**	**0.3**		

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P61.3 (Lab based on DSE4)				
Course Name : MICROPROCESSOR LAB				
Semester /Year : VI				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To develop assembly language program in 8085/8086 processor.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. To familiarize the students with the programming and interfacing of microprocessors.
4. Write and debug assembly language programs using the Microsoft Macro Assembler (TASM)/Turbo Assembler(TASM).

COURSE CONTENTS

1. To study 8085 microprocessor system.
2. Write a Program Using 8085 & Verify for :

a. Addition of Two 8-Bit Numbers.
b. Addition of Two 16-Bit Numbers. (With Carry)

3. Write a Program Using 8085 & Verify for :

a. Subtraction of Two 8-Bit Numbers. (Display Of Borrow)
b. Subtraction of Two 16-Bit Numbers. (Display Of Borrow)

4. Write a program using 8085 and verify for: Addition of two 16 bit number using register pair.
5. Write a program using 8085 and verify for: Addition of two 16 bit number directly.
6. Write a program using 8085 to multiply an 8 bit numbers stored in 200A by two (decimal) & store result in 200BH.
7. Write a program to divide an 8-bit number stored in location 200A by two (decimal) & store result in 200BH.
8. Write a program using 8085 to store 16 bit of data in memory location at 2050 to 205F. Transfer the entire block of data to new memory location starting at 2070H.
9. Write a Program to Arrange Number in Ascending Order Using 8085 & Verify.
10. Write a program in which six bytes of data are stored in memory location starting at 2050H and add all data bytes. And use register B to save any carry generated while adding data bytes.
11. INPUT DATA=A2,FA,DF,E5,98,8B.
12. Programming using arithmetic, logical and bit manipulation instructions of 8051
13. Program and verify Timer/Counter in 8051.
14. Program and verify interrupt handling in 8051
15. Interfacing matrix or keyboard to 8051. 17. Data transfer from peripheral to memory through DMA controller 8237/8257

Note: Minimum of 12 experiments to be conducted.

Text Books:

TB1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
TB2. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill.

Reference Books:

RB1. Yu-Cheng Liu, Glenn A Gibson, "Microcomputer Systems: The 8086/8088 Family: Architecture, Programming, and Design", PHI Learning, 2nd Edition, 2009.
RB2. Barry B Brey, "The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Architecture, Programming and Interfacing", Pearson Prentice Hall, 8th Edition, 2009.Bloom Taxonomy

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Recall and define internal architecture of microprocessor 8085.
CO2	Summarize the concepts of Assembly level language programming and its applications. Build a program on a microprocessor using instruction set of 8085.
CO3	Apply the fundamentals of assembly level programming of microprocessors.
CO4	Analyze different types of instructions and examine different addressing modes of 8085 instruction set.
CO5	Contrast how different I/O devices can be interfaced to processor and will explore several techniques of interfacing.
CO6	Train their practical knowledge through laboratory experiments.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1		2	1	1				2		
CO2	3	2	1		1		1			2		
CO3	2	1		1	1	1				1		
CO4	2	1	2			2	1					
CO5		2	3	1	1	1	2			1		
CO6	2	1	2			2	1					
AVG	**1.8**	**1.3**	**1.3**	**0.7**	**0.7**	**1.2**	**0.8**	**0.0**	**0.0**	**1.0**	**0.0**	**0.0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**: BCA-P62.1 (Lab based on DSE5)**			
Course Name	**: ADVANCE SOFTWARE ENGINEERING LAB**			
Semester /Year	**: VIth Semester**			
L	**T**	**P**	**C**	
0	**0**	**4**	**2**	

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Develop models using the UML notation.
2. Analyse requirements with use cases.
3. Create domain models.

COURSE CONTENTS

- To create a UML diagram of ATM APPLICATION
- To create a UML diagram of LIBRARY MANAGEMENT SYSTEM
- To create a UML diagram of ONLINE BOOK SHOP
- To create a UML diagram of RAILWAY RESERVATION SYSTEM
- To create a UML diagram of BANKING SYSTEM

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Define different views and create use case view of an application.
CO2	Classify class and object diagrams in UML.
CO3	Build interaction, use case diagrams
CO4	Analyze Sequence and activity diagrams.
CO5	Explain component and deployment diagrams
CO6	Create, develop and design all 9 UML diagrams for real life problems.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	1	2	2						
CO2	3	1	3		2							
CO3	1	2		3		2						
CO4		1			2							
CO5	3	1				2						
CO6			1	2				1				
AVG	**1.33**	**1**	**1**	**1**	**1**	**1**		0.16				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P62.2 (Lab based on DSE5)				
Course Name : COMPUTER GRAPHICS LAB				
Semester /Year : VIth Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To teach the students line algorithm DDA.
2. To teach the students Brenham Line Algorithm.
3. To make the students understand circle generation algorithm.
4. To make the students understand curve generation.
5. To make the students understand flood fill and boundary fill.
6. To teach the student, simple animation examples

Course Outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	**Detailed Statement of the CO**
CO1	Identify difference between DDA and Bresenham line
CO2	Implement Mid-Point circle algorithm
CO3	Apply Translation on line, objects etc.
CO4	Implement digital clock
CO5	Implement Analog Clock
CO6	Design line algorithm

CO-PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2				2	2		2				
CO2		3				2	2					
CO3		2	3	2		2						
CO4					2							
CO5						1						
CO6	2	1		2	1	2	2	2				
AVG	**0.66**	**1**	**0.5**	**0.66**	**0.83**	**1.5**	**0.66**	**0.66**				

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P62.3 (Lab based on DSE5)				
Course Name : COMPUTER BASED NUMERICAL TECHNIQUES LAB				
Semester /Year : VIth Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Overview of some of the issues and problems that arise in scientific computation, such as (non-)linear systems, numerical and symbolic integration, differential equations and simulation.
2. Application of the algorithms covered in the course.

COURSE CONTENT

- Programs based on the iterative methods like Bisection Method, Iteration method, Regula-Falsi method, Newton Raphson method, Secant method etc.
- Programs based on the liner equations like Gauss Elimination, Gauss Seidal iterative method etc.
- Programs based on the interpolation like Newton's forward and backward formula, Newton Divided difference formula etc.
- Programs based on the Central Difference Formulae like Gauss forward and backward formula, stirling's Bassel's Everett's formula etc.
- Programs based on Differentiation like Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods.
- Programs based on Numerical Integration, Trapazoidal rule, Simpon's rules, Boole's Rule Euler-Maclaurin Formula

Course Outcomes (COs):
Upon successful completion of the course a student will be able to

CO #	Detailed Statement of the CO
CO1	Illustrate properties for numerical methods and mathematical models by using the analysis methods.
CO2	Understand an algorithm by structuring and dividing a computational problem into sub-problems and formulating an algorithm.
CO3	Apply and analyze various numerical methods and implement them in problem solving.
CO4	Illustrate and evaluate the accuracy of common numerical methods.
CO5	Evaluate and assess the limitations, advantages, anddisadvantages of different numerical methods.
CO6	Design and modify various problem using Differentiation and Integration etc.

CO-PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2		2							
CO2	1	3	2		1							
CO3	1	2	2	2	2	1						
CO4		3		2	1				1	1		
CO5		2				1			1	1		
CO6	1	2	2	3	2	3	2	3	2	3	2	1
AVG	**1**	**2.3**	**1.3**	**1.1**	**1.3**	**0.8**	**0.3**	**0.5**	**0.6**	**0.8**	0.3	0.1

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-P63				
Course Name : PROJECT				
Semester /Year : VIth Semester				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

In this course, the learners will be able to develop working expertise of solving complex computing problems through project based learning approach using real world case studies by implementing the concepts studied in the theory courses of this semester.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Identify the problem and describing it.
CO2	Understand the requirements of the chosen project.
CO3	Apply the collected requirements to define the describe the project in a systematic and comprehensive approach.
CO4	Analyze the technical aspects of the chosen project to find the possible solutions for development of the project.
CO5	Evaluate the effective reports and documentation for all project related activities and solutions.
CO6	Create plan for the project development.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1						1	2		2	1
CO2	1	3		2	1	2			1			
CO3	1	1	3	2	1	1	1			2		1
CO4	1	1	1	1	1	1	2	1	1	2	2	3
CO5	2			1	3	1	2	1	2	1	3	1
CO6	2	3	3	3	1	1	1	3	1	1	1	1
AVG	**1.7**	**1.8**	**2.3**	**1.8**	**1.4**	**1.2**	**1.5**	**1.5**	**1.4**	**1.5**	**2.0**	**1.4**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code : BCA-SM				
Course Name : Seminar				
Semester /Year : VI				
	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Identify and compare technical and practical issues related to the area of course specialization.
2. Outline annotated bibliography of research demonstrating scholarly skills.
3. Prepare a well-organized report employing elements of technical writing and critical thinking.
4. Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO#	Detailed Statement of the CO
CO1	Recite and speak cogently with or without notes on the topic using audio-visual aids.
CO2	Utilize technical resources.
CO3	Acquire the confidence in presenting the topic.
CO4	Analyze technically relevant current topics on computer science/information technology/research.
CO5	Create audience-centered presentations.
CO6	Create technical documents and give oral presentations related to the work completed.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3							2		2		
CO2			3									2
CO3			3									2
CO4						2					3	
CO5				2							3	
CO6	2									2	2	
AVG	**0.8**	**0.0**	**1.0**	**0.3**	**0.0**	**0.3**	**0.0**	**0.3**	**0.0**	**0.7**	**1.3**	**0.7**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated