Bachelor of Computer Application (Honours)

L T P - Indicates Theory Lectures (L), Tutorial(T) and Practical (P) classes per week.
1L Earns 1 credits
1P Earns 0.5 credits
1T Earns 1 Credit

Semester I							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	**CC1**	**BCAC101 BCAC191**	**Programming for Problem Solving**	**4**	**0**	**4**	**6**
2	CC2	BCAC102 BCAC192	Digital Electronics	4	0	4	6
3	**AEC-1**	**BCAA101**	**Soft Skills**	**2**	**0**	**0**	**2**
4	GE-1	GE-Basket	Any one from GE-Basket	4/5	0/1	4/0	**6**
						Total Credit	20

Semester II							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC3	BCAC201	Discrete Structures	5	1	0	**6**
2	**CC4**	**BCAC202 BCAC292**	**Operating Systems**	**4**	**0**	**4**	**6**
3	CC5	BCAC203 BCAC293	Computer Architecture	4	0	4	**6**
4	**AECC-2**	**BCAA201**	**Environmental Science**	**2**	**0**	**0**	**2**
5	GE-2			4/5	0/1	4/0	**6**
Practical							
6	SEC-1	BCAS281	Minor Project and Entrepreneurship I	0	0	4	**2**
						Total Credit	28

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Semester III							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory							
1	CC6	BCAC301 BCAC391	Object Oriented Programming	4	0	4	**6**
2	CC7	BCAC302 BCAC392	Database Management System	4	0	4	**6**
3	**CC8**	**BCAC303 BCAC393**	**Data Structure and Algorithm using Python**	**4**	**0**	**4**	**6**
4	GE-3			4/5	0/1	4/0	**6**
Practical							
5	SEC-2	BCAS391	Web Design and Development	0	0	4	2
						Total Credit	26

Semester IV							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	**CC9**	**BCAC401 BCAC491**	**Computer Networking**	**4**	**0**	**4**	**6**
2	**CC10**	**BCAC402 BCAC492**	**Software Engineering**	**4**	**0**	**4**	**6**
3	CC11	BCAC403 BCAC493	Design and Analysis of Algorithms	4	0	4	6
4	GE-4			4/5	0/1	4/0	**6**
Practical							
5	**SEC-3**	**BCAS481**	**Minor Project and Entrepreneurship II**	**0**	**0**	**4**	**2**
						Total Credit	26

Semester V							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	**CC12**	**BCAC501**	**Internet Technology**	**4**	**0**	**4**	**6**

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		BCAC591					
2	CC13	BCAC502	Theory of Computation	5	1	0	6
3	DSE-I	BCAD501	A. Information Security B. Cloud Computing C. Information and coding theory	5/4	1/0	0/4	6
4	DSE-2	BCAD502	A. Numerical and statistical Methods (Lab with R programming) B. Combinatorial Optimization C. Soft Computing	4/5	0/1	4/0	6
Sessional							
5	SEC-4	BCAS501	Industrial Training and Internship	0	0	0	**2**
						Total Credit	26

Semester VI							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory							
1	CC14	BCAC601 BCAC691	Advanced Database and PL-SQL	4	0	4	6
2	DSE-3	BCAD601	A. Digital Image Processing B. Introduction to AI and Machine Learning C. Introduction to Data Science	4	0	4	6
Sessional							
3	SEC-3	BCAS601	Grand Viva	0	0	2	**1**
4	DSE-4	BCAD681	Major Project and Entrepreneurship	0	0	8	**4**
5	SEC-4	BCAS602	Seminar	0	0	4	**2**
						Total Credit	19

Semester	**Credit**
I	20
II	28
III	26
IV	26
V	26
VI	19
TOTAL	**145**

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L T P - Indicates Theory Lectures (L), Tutorial(T) and Practical (P) classes per week.
1L Earns 1 credits
1P Earns 0.5 credits
1T Earns 1 Credit

Semester I							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	**CC1**	**BCAC101 BCAC191**	**Programming for Problem Solving**	**4**	**0**	**4**	**6**
2	CC2	BCAC102 BCAC192	Digital Electronics	4	0	4	6
3	**AEC-1**	**BCAA101**	**Soft Skills**	**2**	**0**	**0**	**2**
4	GE-1	GE-Basket	Any one from GE-Basket	4/5	0/1	4/0	**6**
			Total Credit				20

CC: Core Course
GE: General Electives (To be selected from GE Basket)
AEC: Ability Enhancement Course
SEC: Skill Enhancement Course

Bachelor of Computer Application
Semester-1

Name of the Course: BCA **Subject:** Programming for Problem Solving	
Course Code: BCAC101 + BCAC191	**Semester: 1st**
Duration: 36 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5

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Practical: 4		Continuous Assessment: 25	
Credit: 4 + 2		Practical Sessional internal continuous evaluation: 40	
		Practical Sessional external examination: 60	
Aim:			
Sl. No.			
1	In-depth understanding of various concepts of programming language.		
2	Ability to read, understand and trace the execution of programs		
3	Skill to debug a program.		
4	Skill to write program code in C to solve real world problems.		
Objective:			
Sl. No.			
1	To introduce students to a powerful programming language		
2	To understand the basic structure of a program		
3	To gain knowledge of various programming errors.		
4	To enable the students to make flowchart and design an algorithm for a given problem.		
5	To enable the students to develop logics and programs		
Pre-Requisite:			
Sl. No.			
1	Understanding of basic mathematical logic.		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**

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01	Introduction to Computers Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. Number Systems: Binary, Octal, Decimal, Hexadecimal Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.	6	10
02	Conditional Control Statements Bitwise Operators, Relational and Logical Operators, If, If- Else, Switch-Statement and Examples. Loop Control Statements: For, While, DoWhile and Examples. Continue, Break and Goto statements Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. Recursion- Recursive Functions.. Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.	8	10
03	Preprocessors and Arrays Preprocessor Commands Arrays - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.	8	10
04	Pointers Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, Lvalue and Rvalue, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command Line Arguments. Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.	**8**	**20**
05	Structures and File Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types. Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.	**6**	**20**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**
Practical			

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Course Code: BCAC191
Credit: 2
Skills to be developed:
Intellectual skills:

1. Ability to read, understand and write computer programs.
2. Ability to analyze problems and provide program based solutions.

List of Practical:

1. Write a c program to display the word "welcome".
2. Write a c program to take a variable int and input the value from the user and display it.
3. Write a c program to add 2 numbers entered by the user and display the result.
4. Write a c program to calculate the area and perimeter of a circle.
5. Write a C program to find maximum between two numbers.
6. Write a C program to check whether a number is divisible by 5 and 11 or not.
7. Write a C program to input angles of a triangle and check whether triangle is valid or not.
8. Write a C program to check whether a year is leap year or not.
9. Write a C program to input basic salary of an employee and calculate its Gross salary according to following:
   Basic Salary <= 10000 : HRA = 20%, DA = 80%
   Basic Salary <= 20000 : HRA = 25%, DA = 90%
   Basic Salary > 20000 : HRA = 30%, DA = 95%
10. Write a c program to print “welcome” 10 times.
11. Write a c program to print first n natural numbers using while loop.
12. Write a c program to print all the odd numbers in a given range.
13. Write a c program to add first n numbers using while loop.
14. Write a c program to print all numbers divisible by 3 or 5 in a given range.
15. Write a c program to add even numbers in a given range.
16. Write a c program to find the factorial of a given number.
17. Write a c program to find whether a number is prime or not.
18. Write a c program to print the reverse of a number.
19. Write a c program to add the digits of a number.
20. Write a c program to print the fibonacci series in a given range.
21. Write a c program to check whether a number is an Armstrong number or not.
22. Write a c program to find g.c.d. and l.c.m. of two numbers.

Assignments:
Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
E. Balaguruswamy	Programming in ANSI C		Tata McGraw-Hill
Gary J. Bronson	A First Book of ANSI	4th Edition	ACM

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	C		
Reference Books:			
Byron Gottfried	Schaum's Outline of Programming with C		McGraw-Hill
Kenneth A. Reek	Pointers on C		Pearson
Brian W. Kernighan and Dennis M. Ritchie	The C Programming Language		Prentice Hall of India

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1.	Computer with moderate configuration
2.	A programming language compiler

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A B	1 to 5 1 to 5	10	10	5	3	5	70

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C	1 to 5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Name of the Course: BCA
Subject: Digital Electronics

Course Code: BCAC102 + BCAC192	**Semester: 1st**
Duration: 48 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**

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Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To gain skill to build and troubleshoot digital logic circuits
2	To gain skill to use the methods of systematic reduction of Boolean expressionusingK-Map
3	To be able to interpret logic gates and its operations
4	Familiarization with semiconductor memories in electronics.

Objective:	
Sl. No.	
1	To gain basic knowledge of digital electronics circuits and its levels.
2	To understand and examine the structure of various number system and its conversation.
3	To learn about the basic requirements for a design application
4	To enable the students to understand,analyze and design various combinational and sequential circuits
5	To understand the logic functions, circuits, truth table and Boolean algebra expression

Pre-Requisite:	
Sl. No.	**None**

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Number Systems & Codes**	**5**	**10**

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	Decimal Number, Binary Number, Octal Number, Hexadecimal Number, Conversion – Decimal to Binary, Binary to Decimal, Octal to Binary, Binary to Octal, Hexadecimal to Binary, Binary to Hexadecimal, Octal to Binary to Hexadecimal, Hexadecimal to Binary to Octal; Floating Point Number Representation, Conversion of Floating Point Numbers, Binary Arithmetic, 1's and 2's Complement, 9's and 10's Complement, Complement Arithmetic, BCD, BCD addition, BCD subtraction, Weighted Binary codes, Non-weighted codes, Parity checker and generator, Alphanumeric codes.		
02	**Logic Gates** OR, AND, NOT, NAND, NOR, Exclusive – OR, Exclusive – NOR, Mixed logic.	**2**	**10**
03	**Boolean Algebra** Boolean Logic Operations, Basic Law of Boolean Algebra, Demorgan's Theorem, Principle of Duality.	**4**	**10**
04	**Minimization Techniques** Sum of Products, Product of Sums, Karnaugh Map [up to 4 variables].	**3**	**10**
05	**Multilevel Gate Network** Implementation of Multilevel Gate Network, Conversion to NAND-NAND and NOR-NOR Gate Networks.	**2**	**5**
06	**Arithmetic Circuits** Half Adder, Full Adder, Half Subtractor, Full Subtractor, Carry Look Ahead Adder, 4-Bit Parallel Adder	**5**	**5**
07	**Combinational Circuits** Basic 2-input and 4-input multiplexer, Demultiplexur, Basic binary decoder, BCD to binary converters, Binary to Gray code converters, Gray code to binary converters, Encoder.	**5**	**5**

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08	**Sequential Circuits** Introduction to sequential circuit, Latch, SR Flip Flop, D Flip Flop, T Flip Flop, JK Flip Flop, Master Slave Flip Flop	**5**	**5**
09	**Basics of Counters** Asynchronous [Ripple or serial] counter, Synchronous [parallel] counter	**2**	**5**
10	**Basics of Registers** SISO, SIPO, PISO, PIPO, Universal Registers	**3**	**5**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Assignments:

Based on the curriculum as covered by subject teacher.

Practical
Course Code: BCAC192
Credit: 2

List of Practicals:-

1. Realization of basic gates using Universal logic gates.
2. Code conversion circuits- BCD to Excess-3 and vice-versa.
3 Four-bit parity generator and comparator circuits.
4. Construction of simple Decoder and Multiplexer circuits using logic gates.
5. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display using multiplexer.
6. Construction of simple arithmetic circuits-Adder, Subtractor.
7. Realization of RS-JK and D flip-flops using Universal logic gates.
8. Realization of Universal Register using JK flip-flops and logic gates.
9. Realization of Universal Register using multiplexer and flip-flops.
10. Realization of Asynchronous Up/Down counter.
11. Realization of Synchronous Up/Down counter.
12. Realization of Ring counter and Johnson's counter.
13. Construction of adder circuit using Shift Register and full Adder.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

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Salivahan	Digital Circuit & Design		VIKAS
M. Morris. Mano & Michael D. Ciletti	Digital Design		PEARSON
Anand Kumar	Fundamentals of Digital Circuits		PHI
Reference Books:			
Tokheim	Digital Electronics		TMH
S. Rangnekar	Digital Electronics		ISTE/EXCEL

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 10**	**10**	**10**				
B	**1 to 10**			**5**	**3**	**5**	**70**
C	**1 to 10**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**

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C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject: Soft Skills**	
Course Code: BCAA101	**Semester: 1st**
Duration: 36 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 2	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 0	Continuous Assessment: 25
Credit: 2	Practical Sessional internal continuous evaluation: 0
	Practical Sessional external examination: 0

Aim:

Sl. No.	
1.	Ability to read English with ability to read English with understanding and decipher paragraph patterns, writer techniques and conclusions
2.	Skill to develop the ability to write English correctly and master the mechanics of writing the use of correct punctuation marks and capital letter
3.	Ability to understand English when it is spoken in various contexts.

Objective:

Sl. No.	
1.	To enable the learner to communicate effectively and appropriately in real life situation
2.	To use English effectively for study purpose across the curriculum
3.	To use R,W,L,S and integrate the use of four language skills, Reading, writing , listening and speaking.
4.	To revise and reinforce structures already learnt.

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Aim:			
Pre-Requisite:			
Sl. No.			
1.	Basic knowledge of English Language.		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
02	**Grammar** Correction of sentence, Vocabulary / word formation, Single word for a group of words, Fill in the blank, transformation of sentences, Structure of sentences – Active / Passive Voice – Direct / Indirect Narration.	**6**	**10**
03	**Essay Writing** Descriptive – Comparative – Argumentative – Thesis statement- Structure of opening / concluding paragraphs – Body of the essay.	**5**	**10**
04	**Reading Comprehension** Global – Contextual – Inferential – Select passages from recommended text .	**5**	**10**
05	**Business Correspondence** Letter Writing – Formal.Drafting.Biodata- Resume′- Curriculum Vitae.	**5**	**10**
06	**Report Writing** Structure , Types of report – Practice Writing.	**5**	**10**
07	**Communication skills** Public Speaking skills , Features of effective speech, verbal-nonverbal.	**5**	**10**
08	**Group discussion** Group discussion – principle – practice .	**5**	**10**
	Sub Total:	**36**	**70**

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	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Mark MaCormack	Communication		
John Metchell	How to write reports		
S R Inthira & V Saraswathi	Enrich your English – a) Communication skills b) Academic skills		CIEFL & OUP
Reference Books:			
R.C. Sharma and K.Mohan	Business Correspondence and Report Writing		Tata McGraw Hill
L.Gartside	Model Business Letters		Pitman
List of equipment/apparatus for laboratory experiments:			
Sl. No.			
1	Computer with moderate configuration		
2	Audio visual Setup.		
End Semester Examination Scheme.	**Maximum Marks-70.**		**Time allotted-3hrs.**

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Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 8**	**10**	**10**				
B	**1 to 8**			**5**	**3**	**5**	**70**
C	**1 to 8**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

** General Electives to be chosen from MOOCs basket based on availability of courses.

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Semester II							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC3	BCAC201	Discrete Structures	5	1	0	**6**
2	**CC4**	**BCAC202 BCAC292**	**Operating Systems**	**4**	**0**	**4**	**6**
3	CC5	BCAC203 BCAC293	Computer Architecture	4	0	4	**6**
4	**AECC-2**	**BCAA201**	**Environmental Science**	**2**	**0**	**0**	**2**
5	GE-2			4/ 5	0/ 1	4/ 0	**6**
Practical							
6	SEC-1	BCAS281	Minor Project and Entrepreneurship I	0	0	4	**2**

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			Total Credit	28

Bachelor of Computer Application
Semester-2

Name of the Course:BCA **Subject: Discrete Structures**	
Course Code: BCAC201	**Semester: 2nd**
Duration: 60 Hrs	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	End Semester Exam: 70
Tutorial:1	Attendance: 5
Practical: 0	Continuous Assessment: 25
Credit:6	Practical Sessional internal continuous evaluation: NA
	Practical Sessional external examination: NA

Aim:	
Sl. No.	
1.	The aim of this course is to introduce you with a new branch of mathematics which is discrete mathematics, the backbone of Computer Science.
2.	In order to be able to formulate what a computer system is supposed to do, or to prove that it does meet its specification, or to reason about its efficiency, one needs the precision of mathematical notation and techniques. The Discrete Mathematics course aims to provide this mathematical background.
Objective: Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following	
Sl. No.	
1.	Use mathematically correct terminology and notation.

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2.	Construct correct direct and indirect proofs.		
3.	Use division into cases in a proof.		
4.	Use counterexamples.		
5.	Apply logical reasoning to solve a variety of problems.		
Pre-Requisite:			
Sl. No.			
1.	**Knowledge of basic algebra**		
2.	**Ability to follow logical arguments.**		
Contents		**6 Hrs./ Week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Set Theory** Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle. Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation. Function: Definition and types of function, composition of functions, recursively defined functions.	**8**	**14**
02	**Propositional logic** Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradictions, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.	**12**	**14**
03	**Combinatorics** Mathematical induction, recursive mathematical definitions,	**12**	**14**

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	basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (nth order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)		
04	**Algebraic Structure** Binary composition and its properties definition of algebraic structure, Groyas Semi group, Monoid Groups, Abelian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).	**12**	**10**
05	**Graphs** Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number. Tree: Definition, types of tree(rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder, post order). Finite Automata: Basic concepts of Automation theory, Deterministic finite Automation (DFA), transition function, transition table, Non Deterministic Finite Automata (NDFA), Mealy and Moore Machine, Minimization of finite Automation.	**12**	**18**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

Assignments:
Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

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Kenneth H. Rosen	Discrete Mathematics and its Applications		Tata Mc.Graw Hill
seymour Lipschutz, M.Lipson	Discrete Mathematics		Tata Mc.Graw Hill
Reference Books:			
V. Krishnamurthy	Combinatorics:Theory and Applications		East-West Press
Kolman, Busby Ross	Discrete Mathematical Structures		Prentice Hall International

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 5**	**10**	**10**				
B	**1 to 5**			**5**	**3**	**5**	**60**
C	**1 to 5**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**

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B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Operating Systems	
Course Code: BCAC202 + BCAC292	**Semester: 2nd**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To understand the principles and tasks of operating systems.
2	Ability to apply CPU scheduling algorithms to manage tasks.
3	Initiation into the process of applying memory management methods and allocation policies.
4	Knowledge of methods of prevention and recovery from a system deadlock.
Objective:	
Sl. No.	
1	To deliver a detailed knowledge of integral software in a computer system –Operating System.
2	To understand the working of operating system as a resource manager.
3	To familiarize the students with Process and Memory management.

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4	To describethe problem of process synchronization and its solution.
5	
Pre-Requisite:	
Sl. No.	**None**

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction Importance of OS,Basic concepts and terminology,Types of OS,Different views,Journey of a command execution,Design and implementation of OS	**6**	**10**
02	Process Concept and views, OS view of processes, OS services for process management, Scheduling algorithms,Performance evaluation; Inter-process communication and synchronisation, Mutual exclusion, Semaphores, Hardware support for mutual exclusion, Queuing implementation of semaphores, Classical problem of concurrent programming, Critical region and conditional critical region, Monitors, Messages, Deadlocks	**10**	**20**
03	Resource Manager Memory management,File management,Processor management,Device management	**8**	**20**
04	Security and related Issues Security and protection,Authentication,Protection and access control,Formal models of protection ,Worms and viruses	**8**	**5**
05	**Multiprocessor System** Multiprocessor system,Classification and types,OS functions and	**6**	**10**

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	Requirements, Introduction to parallel computing,Multiprocessor interconnection synchronization		
06	Distributed OS Introduction to distributed processing	**6**	**5**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Practicals:

1. Basics of UNIX commands.
2. Shell programming
3. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
5. Implement Semaphores
6. Implement ll File Organization Techniques a
7. Implement Bankers algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement the all page replacement algorithms a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique f memory management.
12. Implement Threading & Synchronization Applications

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
A Silberschatz, P.B. Galvin, G. Gagne	Operating Systems Concepts	8th Edition	John Wiley Publications
A.S. Tanenbaum	Modern Operating Systems	3rd Edition	Pearson Education
Reference Books:			
G. Nutt	Operating Systems: A Modern Perspective	2nd Edition	Pearson Education

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End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A **B** **C**	**1 to 6** **1 to 6** **1 to 6**	**10**	**10**	**5** **5**	**3** **3**	**5** **15**	**70**

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA
Subject: Computer Architecture

Course Code: BCAC203 + BCAC293	**Semester: 2nd**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25

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Credit: 4 + 2		Practical Sessional internal continuous evaluation: 40	
		Practical Sessional external examination: 60	
Aim:			
Sl. No.			
1	To be able to understand the functionality,organization and implementation of computer system.		
2	To gain Skill to recognize the instruction codes and formats.		
3	Knowledge of the internal working of main memory, cache memory, associative memory and various modes of data transfer.		
Objective:			
Sl. No.			
1	To enable the students to understand the functionality and implementation of computer system.		
2	To familiarize with the various instruction codes and formats of different CPUs.		
3	To introduce the students to I/O and memory organization of computer system		
4	To deliver an overview of Control Unit of a computer system		
5	To learn the usage of parallel and vector processing.		
Pre-Requisite:			
Sl. No.			
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Data Representation:** Number Systems – decimal, binary, octal, hexadecimal, alphanumeric representation, 2. Complements – 1's complement, 2' complement, 9's complement, 10' complement, [r-1]'s complement, r's complement, 3. Fixed point representation – Integer representation, arithmetic addition, arithmetic subtraction, overflow, decimal fixed point representation, 4. Floating point representation, 5. IEEE 754 floating point representation	**4**	**5**

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02	**Computer arithmetic:** Addition algorithm of sign magnitude numbers, Subtraction algorithm of sign magnitude numbers, Addition algorithm of signed 2's complement data, Subtraction algorithm of signed 2's complement data, Multiplication algorithm, Booth's algorithm, Division algorithm	**4**	**5**
03	**Register transfer and micro-operations:** Register transfer language, Register transfer, Bus system for registers, Memory transfers – memory read, memory write, Micro operations – register transfer micro operations, arithmetic micro operations, logic micro operations, shift micro operations, Binary adder, binary adder subtractor, binary incrementer, arithmetic circuit for arithmetic micro operations, One stage logic circuit,Selective set, Selective complement, Selective clear, Mask, Insert, Clear	**4**	**5**
04	**Basic Computer organization and design:** Instruction codes, Direct address, Indirect address & Effective address, List of basic computer registers, Computer instructions: memory reference, register reference & input – output instructions,Block diagram & brief idea of control unit of basic computer, 6. Instruction cycle	**4**	**5**
05	**Micro programmed control:** Control memory, Address sequencing,Micro program examples	**4**	**5**
06	**Central processing unit:** General register organization,Stack organization, Register stack, Memory stack, Stack operations – push & pop, Evaluation of arithmetic expression using stack, Instruction format, Types of CPU organization [single accumulator, general register & stack organization] & example of their instructions, 6. Three, two, one & zero address instruction, 7. Definition and example of data transfer, data manipulation & program control instructions, 8. Basic idea of different types of interrupts [external, internal & software interrupts], 9. Difference between RISC & CISC	**6**	**5**
07	**Pipeline and vector processing:** Parallel processing, Flynn's classification, Pipelining, Example of pipeline, space time diagram, speedup, Basic idea of arithmetic pipeline, example of floating point addition/ subtraction using pipeline	**6**	**10**
08	**Input – output organization:** Peripheral devices,Input – output interface, Isolated I/O, Memory mapped I/O, Asynchronous data transfer: strobe & handshaking, Programmed I/O, Interrupt initiated I/O, Basic idea of DMA & DMAC 8. Input – output processor	**6**	**10**

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09	**Memory organization:** Memory hierarchy, Main memory definition, types of main memory, types of RAM, ROM, difference between SRAM & DRAM, Cache memory, Cache memory mapping – Direct, Associative, Set Associative, CAM, hardware organization of CAM, Virtual memory, mapping using pages, page fault, mapping using segments, TLB, Auxiliary memory, diagrammatic representation of magnetic disk & hard disk drive, Definitions of seek time, rotational delay, access time, transfer time, latency	**6**	**20**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC293
Credit: 2
Skills to be developed:
Intellectual skills:

1. Ability to understand the functionality,organization and implementation of computer system.
2. Skill to recognize the instruction codes and formats.
3. Knowledge of the internal working of main memory, cache memory, associative memory and various modes of data transfer.
4. Familiarization with the working of parallel processing and vector processing

List of Practical:

1. Basic gates and Universal gates. Implementation of Half & full adder. Half & full subtractor,
2. 4 bit logical unit, 4 bit arithmetic unit, BCD adder, 4 bit adder/ subtractor, Carry look ahead adder, Design of ALU for multi bit operation, comparators.
3. 8:1 MUX IC verification, 16:1 MUX using IC 74151, dual 2 to 4 Decoder/ Demultiplexer IC evaluation. Priority encoder.
4. Read/ write operation using RAM IC, Cascading RAM ICs

Assignments:
Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
M. Morris Mano	Computer System Architecture		PEARSON
William Stallings	Computer Organization & Architecture – Designing For		PEARSON

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	Performance		
J.P. Hayes	Computer Architecture & Organisation		TATA MCGRAW HILL
Reference Books:			
T. K. Ghosh	Computer Organization and Architecture		TATA MCGRAW-HILL
Behrooz Parhami	Computer Architecture		OXFORD UNIVERSITY PRESS

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1	**Simulator and/or required kit.**

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 9**	**10**	**10**				
B	**1 to 9**			**5**	**3**	**5**	**70**
C	**1 to 9**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

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Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**
Examination Scheme for Practical Sessional examination:				
Practical Internal Sessional Continuous Evaluation				
Internal Examination:				
Five No of Experiments				
External Examination: Examiner-				
Signed Lab Note Book(for five experiments)			**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)			**10**	
Viva voce			**5**	

Name of the Course: BCA **Subject: Environmental Science**	
Course Code: BCAA201	**Semester: 2nd**
Duration: 24 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 2	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 0	Continuous Assessment: 25
Credit: 2	Practical Sessional internal continuous evaluation: NA

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	Practical Sessional external examination: NA
Aim:	
Sl. No.	
1	To enable critical thinking in relation to environmental affairs.
2	Understanding about interdisciplinary nature of environmental issues
3	Independent research regarding environmental problems in form of project report
4	Understand social interactions by which human behave and cultural values that underlay behaviors.
Objective:	
Sl. No.	
1	To create awareness about environmental issues.
2	To nurture the curiosity of students particularly in relation to natural environment.
3	To develop an attitude among students to actively participate in all the activities regarding environment protection
4	To develop an attitude among students to actively participate in all the activities regarding environment protection
Pre-Requisite:	
Sl. No.	
	None

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Introduction to environment and ecology Components of the environment, environmental degradation, natural cycles of environment.	**3**	**10**
02	**Ecology** Elements of Ecology, Ecological balance, Effects of Afforestation and deforestation.	**3**	**10**

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03	**Air Pollution and Control** Atmospheric composition, Segments of atmosphere climate, weather, Atmospheric Stability, dispersion of pollutants , Sources and effects of air pollutants, primary and secondary pollutants**,** Criteria Pollutants:PM10, Source, Effect, Control , CO, NO x, **Source, Effect,** Control , SO x, Source, Effect, Control ,Lead, Ozone, Source, Effect, Control , Green house effect, Control Measures ,Depletion of ozone layer, Effects of UV exposer, Control Measures	**5**	**10**
04	**Water Pollution and Control** Hydrosphere, natural water resources and reserves, Pollutants: their origin and effects ,COD and BOD test, NBOD and CBOD , River / lake / ground water pollution , Control Measures of water pollution , Drinking water and waste water treatment	**3**	**15**
05	**Land Pollution** Lithosphere, pollutants [municipal, industrial, commercial, agricultural, hazardous solid wastes] their origin and effects , Collection and disposal of solid waste, recycling and treatment methods	**3**	**15**
06	**Noise Pollution** Sources, effects, standards and control	**3**	**10**
	Sub Total:	**20**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**24**	**100**

Assignments:

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Basu, M. and Xavier, S.	Fundamentals of Environmental Studies		Cambridge University Press,

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			2016
Mitra, A. K and Chakraborty, R.	Introduction to Environmental Studies,		Book Syndicate, 2016.
Enger, E. and Smith, B.	Environmental Science: A Study of Interrelationships,	12th edition	McGraw-Hill Higher Education
Basu, R.N	Environment		,University of Calcutta
Reference Books:			
Agrawal, KM, Sikdar, PK and Deb	A Text book of Environment		Macmillan Publication

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 6**	**10**	**10**				
B	**1 to 6**			**5**	**3**	**5**	**70**
C	**1 to 6**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

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Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation			
Internal Examination:			
Five No of Experiments			
External Examination: Examiner-			
Signed Lab Note Book(for five experiments)		**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)		**10**	
Viva voce		**5**	

Name of the Course: BCA **Subject: Minor Project and Entrepreneurship I**	
Course Code: BCAS281	**Semester: 2nd**
Duration: 48 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	End Semester Exam: 0
Tutorial: 0	Attendance : NA
Practical: 4	Continuous Assessment: NA
Credit: 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	Learning teamwork, project planning and building application, encouraging entrepreneurship

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Objective:			
Sl. No.			
1	To learn teamwork.		
2	To work with real life projects.		
3	To apply theoretical knowledge into practical field.		
4	To encourage entrepreneurship.		
Pre-Requisite:			
Sl. No.			
1	Knowledge of computer programming, reasoning and thinking ability.		
Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation 40			
Internal Examination:			
Project demonstration	**40**		
Viva	**20**		

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L T P - Indicates Theory Lectures (L), Tutorial(T) and Practical (P) classes per week.
1L Earns 1 credits
1P Earns 0.5 credits
1T Earns 1 Credit

Semester I							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	**CC1**	**BCAC101 BCAC191**	**Programming for Problem Solving**	**4**	**0**	**4**	**6**
2	CC2	BCAC102 BCAC192	Digital Electronics	4	0	4	6
3	**AEC-1**	**BCAA101**	**Soft Skills**	**2**	**0**	**0**	**2**
4	GE-1	GE-Basket	Any one from GE-Basket	4/5	0/1	4/0	**6**
			Total Credit				20

CC: Core Course
GE: General Electives (To be selected from GE Basket)
AEC: Ability Enhancement Course
SEC: Skill Enhancement Course

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Semester-1

Name of the Course: BCA **Subject:** Programming for Problem Solving	
Course Code: BCAC101 + BCAC191	**Semester: 1st**
Duration: 36 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5

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Practical: 4		Continuous Assessment: 25	
Credit: 4 + 2		Practical Sessional internal continuous evaluation: 40	
		Practical Sessional external examination: 60	
Aim:			
Sl. No.			
1	In-depth understanding of various concepts of programming language.		
2	Ability to read, understand and trace the execution of programs		
3	Skill to debug a program.		
4	Skill to write program code in C to solve real world problems.		
Objective:			
Sl. No.			
1	To introduce students to a powerful programming language		
2	To understand the basic structure of a program		
3	To gain knowledge of various programming errors.		
4	To enable the students to make flowchart and design an algorithm for a given problem.		
5	To enable the students to develop logics and programs		
Pre-Requisite:			
Sl. No.			
1	Understanding of basic mathematical logic.		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**

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01	Introduction to Computers Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. Number Systems: Binary, Octal, Decimal, Hexadecimal Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.	6	10
02	Conditional Control Statements Bitwise Operators, Relational and Logical Operators, If, If- Else, Switch-Statement and Examples. Loop Control Statements: For, While, DoWhile and Examples. Continue, Break and Goto statements Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. Recursion- Recursive Functions.. Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.	8	10
03	Preprocessors and Arrays Preprocessor Commands Arrays - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.	8	10
04	Pointers Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, Lvalue and Rvalue, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command Line Arguments. Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.	**8**	**20**
05	Structures and File Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types. Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.	**6**	**20**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**
Practical			

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Course Code: BCAC191
Credit: 2
Skills to be developed:
Intellectual skills:

1. Ability to read, understand and write computer programs.
2. Ability to analyze problems and provide program based solutions.

List of Practical:

1. Write a c program to display the word "welcome".
2. Write a c program to take a variable int and input the value from the user and display it.
3. Write a c program to add 2 numbers entered by the user and display the result.
4. Write a c program to calculate the area and perimeter of a circle.
5. Write a C program to find maximum between two numbers.
6. Write a C program to check whether a number is divisible by 5 and 11 or not.
7. Write a C program to input angles of a triangle and check whether triangle is valid or not.
8. Write a C program to check whether a year is leap year or not.
9. Write a C program to input basic salary of an employee and calculate its Gross salary according to following:
   Basic Salary <= 10000 : HRA = 20%, DA = 80%
   Basic Salary <= 20000 : HRA = 25%, DA = 90%
   Basic Salary > 20000 : HRA = 30%, DA = 95%
10. Write a c program to print “welcome” 10 times.
11. Write a c program to print first n natural numbers using while loop.
12. Write a c program to print all the odd numbers in a given range.
13. Write a c program to add first n numbers using while loop.
14. Write a c program to print all numbers divisible by 3 or 5 in a given range.
15. Write a c program to add even numbers in a given range.
16. Write a c program to find the factorial of a given number.
17. Write a c program to find whether a number is prime or not.
18. Write a c program to print the reverse of a number.
19. Write a c program to add the digits of a number.
20. Write a c program to print the fibonacci series in a given range.
21. Write a c program to check whether a number is an Armstrong number or not.
22. Write a c program to find g.c.d. and l.c.m. of two numbers.

Assignments:
Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
E. Balaguruswamy	Programming in ANSI C		Tata McGraw-Hill
Gary J. Bronson	A First Book of ANSI	4th Edition	ACM

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	C		
Reference Books:			
Byron Gottfried	Schaum's Outline of Programming with C		McGraw-Hill
Kenneth A. Reek	Pointers on C		Pearson
Brian W. Kernighan and Dennis M. Ritchie	The C Programming Language		Prentice Hall of India

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1.	Computer with moderate configuration
2.	A programming language compiler

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A B	1 to 5 1 to 5	10	10	5	3	5	70

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C	1 to 5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Name of the Course: BCA
Subject: Digital Electronics

Course Code: BCAC102 + BCAC192	**Semester: 1st**
Duration: 48 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**

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Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To gain skill to build and troubleshoot digital logic circuits
2	To gain skill to use the methods of systematic reduction of Boolean expressionusingK-Map
3	To be able to interpret logic gates and its operations
4	Familiarization with semiconductor memories in electronics.

Objective:	
Sl. No.	
1	To gain basic knowledge of digital electronics circuits and its levels.
2	To understand and examine the structure of various number system and its conversation.
3	To learn about the basic requirements for a design application
4	To enable the students to understand,analyze and design various combinational and sequential circuits
5	To understand the logic functions, circuits, truth table and Boolean algebra expression

Pre-Requisite:	
Sl. No.	**None**

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Number Systems & Codes**	**5**	**10**

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	Decimal Number, Binary Number, Octal Number, Hexadecimal Number, Conversion – Decimal to Binary, Binary to Decimal, Octal to Binary, Binary to Octal, Hexadecimal to Binary, Binary to Hexadecimal, Octal to Binary to Hexadecimal, Hexadecimal to Binary to Octal; Floating Point Number Representation, Conversion of Floating Point Numbers, Binary Arithmetic, 1's and 2's Complement, 9's and 10's Complement, Complement Arithmetic, BCD, BCD addition, BCD subtraction, Weighted Binary codes, Non-weighted codes, Parity checker and generator, Alphanumeric codes.		
02	**Logic Gates** OR, AND, NOT, NAND, NOR, Exclusive – OR, Exclusive – NOR, Mixed logic.	**2**	**10**
03	**Boolean Algebra** Boolean Logic Operations, Basic Law of Boolean Algebra, Demorgan's Theorem, Principle of Duality.	**4**	**10**
04	**Minimization Techniques** Sum of Products, Product of Sums, Karnaugh Map [up to 4 variables].	**3**	**10**
05	**Multilevel Gate Network** Implementation of Multilevel Gate Network, Conversion to NAND-NAND and NOR-NOR Gate Networks.	**2**	**5**
06	**Arithmetic Circuits** Half Adder, Full Adder, Half Subtractor, Full Subtractor, Carry Look Ahead Adder, 4-Bit Parallel Adder	**5**	**5**
07	**Combinational Circuits** Basic 2-input and 4-input multiplexer, Demultiplexur, Basic binary decoder, BCD to binary converters, Binary to Gray code converters, Gray code to binary converters, Encoder.	**5**	**5**

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08	**Sequential Circuits** Introduction to sequential circuit, Latch, SR Flip Flop, D Flip Flop, T Flip Flop, JK Flip Flop, Master Slave Flip Flop	**5**	**5**
09	**Basics of Counters** Asynchronous [Ripple or serial] counter, Synchronous [parallel] counter	**2**	**5**
10	**Basics of Registers** SISO, SIPO, PISO, PIPO, Universal Registers	**3**	**5**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Assignments:

Based on the curriculum as covered by subject teacher.

Practical
Course Code: BCAC192
Credit: 2

List of Practicals:-

1. Realization of basic gates using Universal logic gates.
2. Code conversion circuits- BCD to Excess-3 and vice-versa.
3 Four-bit parity generator and comparator circuits.
4. Construction of simple Decoder and Multiplexer circuits using logic gates.
5. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display using multiplexer.
6. Construction of simple arithmetic circuits-Adder, Subtractor.
7. Realization of RS-JK and D flip-flops using Universal logic gates.
8. Realization of Universal Register using JK flip-flops and logic gates.
9. Realization of Universal Register using multiplexer and flip-flops.
10. Realization of Asynchronous Up/Down counter.
11. Realization of Synchronous Up/Down counter.
12. Realization of Ring counter and Johnson's counter.
13. Construction of adder circuit using Shift Register and full Adder.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

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Salivahan	Digital Circuit & Design		VIKAS
M. Morris. Mano & Michael D. Ciletti	Digital Design		PEARSON
Anand Kumar	Fundamentals of Digital Circuits		PHI
Reference Books:			
Tokheim	Digital Electronics		TMH
S. Rangnekar	Digital Electronics		ISTE/EXCEL

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 10**	**10**	**10**				
B	**1 to 10**			**5**	**3**	**5**	**70**
C	**1 to 10**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**

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C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject: Soft Skills**	
Course Code: BCAA101	**Semester: 1st**
Duration: 36 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 2	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 0	Continuous Assessment: 25
Credit: 2	Practical Sessional internal continuous evaluation: 0
	Practical Sessional external examination: 0

Aim:

Sl. No.	
1.	Ability to read English with ability to read English with understanding and decipher paragraph patterns, writer techniques and conclusions
2.	Skill to develop the ability to write English correctly and master the mechanics of writing the use of correct punctuation marks and capital letter
3.	Ability to understand English when it is spoken in various contexts.

Objective:

Sl. No.	
1.	To enable the learner to communicate effectively and appropriately in real life situation
2.	To use English effectively for study purpose across the curriculum
3.	To use R,W,L,S and integrate the use of four language skills, Reading, writing , listening and speaking.
4.	To revise and reinforce structures already learnt.

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Aim:			
Pre-Requisite:			
Sl. No.			
1.	Basic knowledge of English Language.		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
02	**Grammar** Correction of sentence, Vocabulary / word formation, Single word for a group of words, Fill in the blank, transformation of sentences, Structure of sentences – Active / Passive Voice – Direct / Indirect Narration.	**6**	**10**
03	**Essay Writing** Descriptive – Comparative – Argumentative – Thesis statement- Structure of opening / concluding paragraphs – Body of the essay.	**5**	**10**
04	**Reading Comprehension** Global – Contextual – Inferential – Select passages from recommended text .	**5**	**10**
05	**Business Correspondence** Letter Writing – Formal.Drafting.Biodata- Resume′- Curriculum Vitae.	**5**	**10**
06	**Report Writing** Structure , Types of report – Practice Writing.	**5**	**10**
07	**Communication skills** Public Speaking skills , Features of effective speech, verbal-nonverbal.	**5**	**10**
08	**Group discussion** Group discussion – principle – practice .	**5**	**10**
	Sub Total:	**36**	**70**

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	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Mark MaCormack	Communication		
John Metchell	How to write reports		
S R Inthira & V Saraswathi	Enrich your English – a) Communication skills b) Academic skills		CIEFL & OUP
Reference Books:			
R.C. Sharma and K.Mohan	Business Correspondence and Report Writing		Tata McGraw Hill
L.Gartside	Model Business Letters		Pitman
List of equipment/apparatus for laboratory experiments:			
Sl. No.			
1	Computer with moderate configuration		
2	Audio visual Setup.		
End Semester Examination Scheme.	**Maximum Marks-70.**		**Time allotted-3hrs.**

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Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 8**	**10**	**10**				
B	**1 to 8**			**5**	**3**	**5**	**70**
C	**1 to 8**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

** General Electives to be chosen from MOOCs basket based on availability of courses.

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Semester II							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC3	BCAC201	Discrete Structures	5	1	0	**6**
2	**CC4**	**BCAC202 BCAC292**	**Operating Systems**	**4**	**0**	**4**	**6**
3	CC5	BCAC203 BCAC293	Computer Architecture	4	0	4	**6**
4	**AECC-2**	**BCAA201**	**Environmental Science**	**2**	**0**	**0**	**2**
5	GE-2			4/ 5	0/ 1	4/ 0	**6**
Practical							
6	SEC-1	BCAS281	Minor Project and Entrepreneurship I	0	0	4	**2**

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			Total Credit	28

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Semester-2

Name of the Course:BCA **Subject: Discrete Structures**	
Course Code: BCAC201	**Semester: 2nd**
Duration: 60 Hrs	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	End Semester Exam: 70
Tutorial:1	Attendance: 5
Practical: 0	Continuous Assessment: 25
Credit:6	Practical Sessional internal continuous evaluation: NA
	Practical Sessional external examination: NA

Aim:	
Sl. No.	
1.	The aim of this course is to introduce you with a new branch of mathematics which is discrete mathematics, the backbone of Computer Science.
2.	In order to be able to formulate what a computer system is supposed to do, or to prove that it does meet its specification, or to reason about its efficiency, one needs the precision of mathematical notation and techniques. The Discrete Mathematics course aims to provide this mathematical background.
Objective: Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following	
Sl. No.	
1.	Use mathematically correct terminology and notation.

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2.	Construct correct direct and indirect proofs.		
3.	Use division into cases in a proof.		
4.	Use counterexamples.		
5.	Apply logical reasoning to solve a variety of problems.		
Pre-Requisite:			
Sl. No.			
1.	**Knowledge of basic algebra**		
2.	**Ability to follow logical arguments.**		
Contents		**6 Hrs./ Week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Set Theory** Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle. Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation. Function: Definition and types of function, composition of functions, recursively defined functions.	**8**	**14**
02	**Propositional logic** Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradictions, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.	**12**	**14**
03	**Combinatorics** Mathematical induction, recursive mathematical definitions,	**12**	**14**

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	basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (nth order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)		
04	**Algebraic Structure** Binary composition and its properties definition of algebraic structure, Groyas Semi group, Monoid Groups, Abelian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).	**12**	**10**
05	**Graphs** Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number. Tree: Definition, types of tree(rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder, post order). Finite Automata: Basic concepts of Automation theory, Deterministic finite Automation (DFA), transition function, transition table, Non Deterministic Finite Automata (NDFA), Mealy and Moore Machine, Minimization of finite Automation.	**12**	**18**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

Assignments:
Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

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Kenneth H. Rosen	Discrete Mathematics and its Applications		Tata Mc.Graw Hill
seymour Lipschutz, M.Lipson	Discrete Mathematics		Tata Mc.Graw Hill
Reference Books:			
V. Krishnamurthy	Combinatorics:Theory and Applications		East-West Press
Kolman, Busby Ross	Discrete Mathematical Structures		Prentice Hall International

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 5**	**10**	**10**				
B	**1 to 5**			**5**	**3**	**5**	**60**
C	**1 to 5**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**

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B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Operating Systems	
Course Code: BCAC202 + BCAC292	**Semester: 2nd**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To understand the principles and tasks of operating systems.
2	Ability to apply CPU scheduling algorithms to manage tasks.
3	Initiation into the process of applying memory management methods and allocation policies.
4	Knowledge of methods of prevention and recovery from a system deadlock.
Objective:	
Sl. No.	
1	To deliver a detailed knowledge of integral software in a computer system –Operating System.
2	To understand the working of operating system as a resource manager.
3	To familiarize the students with Process and Memory management.

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4	To describethe problem of process synchronization and its solution.
5	
Pre-Requisite:	
Sl. No.	**None**

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction Importance of OS,Basic concepts and terminology,Types of OS,Different views,Journey of a command execution,Design and implementation of OS	**6**	**10**
02	Process Concept and views, OS view of processes, OS services for process management, Scheduling algorithms,Performance evaluation; Inter-process communication and synchronisation, Mutual exclusion, Semaphores, Hardware support for mutual exclusion, Queuing implementation of semaphores, Classical problem of concurrent programming, Critical region and conditional critical region, Monitors, Messages, Deadlocks	**10**	**20**
03	Resource Manager Memory management,File management,Processor management,Device management	**8**	**20**
04	Security and related Issues Security and protection,Authentication,Protection and access control,Formal models of protection ,Worms and viruses	**8**	**5**
05	**Multiprocessor System** Multiprocessor system,Classification and types,OS functions and	**6**	**10**

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	Requirements, Introduction to parallel computing,Multiprocessor interconnection synchronization		
06	Distributed OS Introduction to distributed processing	**6**	**5**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Practicals:

1. Basics of UNIX commands.
2. Shell programming
3. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
5. Implement Semaphores
6. Implement ll File Organization Techniques a
7. Implement Bankers algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement the all page replacement algorithms a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique f memory management.
12. Implement Threading & Synchronization Applications

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
A Silberschatz, P.B. Galvin, G. Gagne	Operating Systems Concepts	8th Edition	John Wiley Publications
A.S. Tanenbaum	Modern Operating Systems	3rd Edition	Pearson Education
Reference Books:			
G. Nutt	Operating Systems: A Modern Perspective	2nd Edition	Pearson Education

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End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A **B** **C**	**1 to 6** **1 to 6** **1 to 6**	**10**	**10**	**5** **5**	**3** **3**	**5** **15**	**70**

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA
Subject: Computer Architecture

Course Code: BCAC203 + BCAC293	**Semester: 2nd**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25

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Credit: 4 + 2		Practical Sessional internal continuous evaluation: 40	
		Practical Sessional external examination: 60	
Aim:			
Sl. No.			
1	To be able to understand the functionality,organization and implementation of computer system.		
2	To gain Skill to recognize the instruction codes and formats.		
3	Knowledge of the internal working of main memory, cache memory, associative memory and various modes of data transfer.		
Objective:			
Sl. No.			
1	To enable the students to understand the functionality and implementation of computer system.		
2	To familiarize with the various instruction codes and formats of different CPUs.		
3	To introduce the students to I/O and memory organization of computer system		
4	To deliver an overview of Control Unit of a computer system		
5	To learn the usage of parallel and vector processing.		
Pre-Requisite:			
Sl. No.			
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Data Representation:** Number Systems – decimal, binary, octal, hexadecimal, alphanumeric representation, 2. Complements – 1's complement, 2' complement, 9's complement, 10' complement, [r-1]'s complement, r's complement, 3. Fixed point representation – Integer representation, arithmetic addition, arithmetic subtraction, overflow, decimal fixed point representation, 4. Floating point representation, 5. IEEE 754 floating point representation	**4**	**5**

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02	**Computer arithmetic:** Addition algorithm of sign magnitude numbers, Subtraction algorithm of sign magnitude numbers, Addition algorithm of signed 2's complement data, Subtraction algorithm of signed 2's complement data, Multiplication algorithm, Booth's algorithm, Division algorithm	**4**	**5**
03	**Register transfer and micro-operations:** Register transfer language, Register transfer, Bus system for registers, Memory transfers – memory read, memory write, Micro operations – register transfer micro operations, arithmetic micro operations, logic micro operations, shift micro operations, Binary adder, binary adder subtractor, binary incrementer, arithmetic circuit for arithmetic micro operations, One stage logic circuit,Selective set, Selective complement, Selective clear, Mask, Insert, Clear	**4**	**5**
04	**Basic Computer organization and design:** Instruction codes, Direct address, Indirect address & Effective address, List of basic computer registers, Computer instructions: memory reference, register reference & input – output instructions,Block diagram & brief idea of control unit of basic computer, 6. Instruction cycle	**4**	**5**
05	**Micro programmed control:** Control memory, Address sequencing,Micro program examples	**4**	**5**
06	**Central processing unit:** General register organization,Stack organization, Register stack, Memory stack, Stack operations – push & pop, Evaluation of arithmetic expression using stack, Instruction format, Types of CPU organization [single accumulator, general register & stack organization] & example of their instructions, 6. Three, two, one & zero address instruction, 7. Definition and example of data transfer, data manipulation & program control instructions, 8. Basic idea of different types of interrupts [external, internal & software interrupts], 9. Difference between RISC & CISC	**6**	**5**
07	**Pipeline and vector processing:** Parallel processing, Flynn's classification, Pipelining, Example of pipeline, space time diagram, speedup, Basic idea of arithmetic pipeline, example of floating point addition/ subtraction using pipeline	**6**	**10**
08	**Input – output organization:** Peripheral devices,Input – output interface, Isolated I/O, Memory mapped I/O, Asynchronous data transfer: strobe & handshaking, Programmed I/O, Interrupt initiated I/O, Basic idea of DMA & DMAC 8. Input – output processor	**6**	**10**

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09	**Memory organization:** Memory hierarchy, Main memory definition, types of main memory, types of RAM, ROM, difference between SRAM & DRAM, Cache memory, Cache memory mapping – Direct, Associative, Set Associative, CAM, hardware organization of CAM, Virtual memory, mapping using pages, page fault, mapping using segments, TLB, Auxiliary memory, diagrammatic representation of magnetic disk & hard disk drive, Definitions of seek time, rotational delay, access time, transfer time, latency	**6**	**20**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC293
Credit: 2
Skills to be developed:
Intellectual skills:

1. Ability to understand the functionality,organization and implementation of computer system.
2. Skill to recognize the instruction codes and formats.
3. Knowledge of the internal working of main memory, cache memory, associative memory and various modes of data transfer.
4. Familiarization with the working of parallel processing and vector processing

List of Practical:

1. Basic gates and Universal gates. Implementation of Half & full adder. Half & full subtractor,
2. 4 bit logical unit, 4 bit arithmetic unit, BCD adder, 4 bit adder/ subtractor, Carry look ahead adder, Design of ALU for multi bit operation, comparators.
3. 8:1 MUX IC verification, 16:1 MUX using IC 74151, dual 2 to 4 Decoder/ Demultiplexer IC evaluation. Priority encoder.
4. Read/ write operation using RAM IC, Cascading RAM ICs

Assignments:
Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
M. Morris Mano	Computer System Architecture		PEARSON
William Stallings	Computer Organization & Architecture – Designing For		PEARSON

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	Performance		
J.P. Hayes	Computer Architecture & Organisation		TATA MCGRAW HILL
Reference Books:			
T. K. Ghosh	Computer Organization and Architecture		TATA MCGRAW-HILL
Behrooz Parhami	Computer Architecture		OXFORD UNIVERSITY PRESS

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1	**Simulator and/or required kit.**

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 9**	**10**	**10**				
B	**1 to 9**			**5**	**3**	**5**	**70**
C	**1 to 9**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

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Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**
Examination Scheme for Practical Sessional examination:				
Practical Internal Sessional Continuous Evaluation				
Internal Examination:				
Five No of Experiments				
External Examination: Examiner-				
Signed Lab Note Book(for five experiments)			**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)			**10**	
Viva voce			**5**	

Name of the Course: BCA **Subject: Environmental Science**	
Course Code: BCAA201	**Semester: 2nd**
Duration: 24 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 2	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 0	Continuous Assessment: 25
Credit: 2	Practical Sessional internal continuous evaluation: NA

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	Practical Sessional external examination: NA
Aim:	
Sl. No.	
1	To enable critical thinking in relation to environmental affairs.
2	Understanding about interdisciplinary nature of environmental issues
3	Independent research regarding environmental problems in form of project report
4	Understand social interactions by which human behave and cultural values that underlay behaviors.
Objective:	
Sl. No.	
1	To create awareness about environmental issues.
2	To nurture the curiosity of students particularly in relation to natural environment.
3	To develop an attitude among students to actively participate in all the activities regarding environment protection
4	To develop an attitude among students to actively participate in all the activities regarding environment protection
Pre-Requisite:	
Sl. No.	
	None

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Introduction to environment and ecology Components of the environment, environmental degradation, natural cycles of environment.	**3**	**10**
02	**Ecology** Elements of Ecology, Ecological balance, Effects of Afforestation and deforestation.	**3**	**10**

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03	**Air Pollution and Control** Atmospheric composition, Segments of atmosphere climate, weather, Atmospheric Stability, dispersion of pollutants , Sources and effects of air pollutants, primary and secondary pollutants**,** Criteria Pollutants:PM10, Source, Effect, Control , CO, NO x, **Source, Effect,** Control , SO x, Source, Effect, Control ,Lead, Ozone, Source, Effect, Control , Green house effect, Control Measures ,Depletion of ozone layer, Effects of UV exposer, Control Measures	**5**	**10**
04	**Water Pollution and Control** Hydrosphere, natural water resources and reserves, Pollutants: their origin and effects ,COD and BOD test, NBOD and CBOD , River / lake / ground water pollution , Control Measures of water pollution , Drinking water and waste water treatment	**3**	**15**
05	**Land Pollution** Lithosphere, pollutants [municipal, industrial, commercial, agricultural, hazardous solid wastes] their origin and effects , Collection and disposal of solid waste, recycling and treatment methods	**3**	**15**
06	**Noise Pollution** Sources, effects, standards and control	**3**	**10**
	Sub Total:	**20**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**24**	**100**

Assignments:

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Basu, M. and Xavier, S.	Fundamentals of Environmental Studies		Cambridge University Press,

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			2016
Mitra, A. K and Chakraborty, R.	Introduction to Environmental Studies,		Book Syndicate, 2016.
Enger, E. and Smith, B.	Environmental Science: A Study of Interrelationships,	12th edition	McGraw-Hill Higher Education
Basu, R.N	Environment		,University of Calcutta
Reference Books:			
Agrawal, KM, Sikdar, PK and Deb	A Text book of Environment		Macmillan Publication

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 6**	**10**	**10**				
B	**1 to 6**			**5**	**3**	**5**	**70**
C	**1 to 6**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

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Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation			
Internal Examination:			
Five No of Experiments			
External Examination: Examiner-			
Signed Lab Note Book(for five experiments)		**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)		**10**	
Viva voce		**5**	

Name of the Course: BCA **Subject: Minor Project and Entrepreneurship I**	
Course Code: BCAS281	**Semester: 2nd**
Duration: 48 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	End Semester Exam: 0
Tutorial: 0	Attendance : NA
Practical: 4	Continuous Assessment: NA
Credit: 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	Learning teamwork, project planning and building application, encouraging entrepreneurship

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Objective:			
Sl. No.			
1	To learn teamwork.		
2	To work with real life projects.		
3	To apply theoretical knowledge into practical field.		
4	To encourage entrepreneurship.		
Pre-Requisite:			
Sl. No.			
1	Knowledge of computer programming, reasoning and thinking ability.		
Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation 40			
Internal Examination:			
Project demonstration	**40**		
Viva	**20**		

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L T P - Indicates Theory Lectures (L), Tutorial(T) and Practical (P) classes per week.
1L Earns 1 credits
1P Earns 0.5 credits
1T Earns 1 Credit

Semester III							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory							
1	CC6	BCAC301 BCAC391	Object Oriented Programming	4	0	4	**6**
2	CC7	BCAC302 BCAC392	Database Management System	4	0	4	**6**
3	**CC8**	**BCAC303 BCAC393**	**Data Structure and Algorithm using Python**	**4**	**0**	**4**	**6**
4	GE-3			4/5	0/1	4/0	**6**
Practical							
5	SEC-2	BCAS391	Web Design and Development	0	0	4	2
						Total Credit	26

CC: Core Course
GE: General Electives (To be selected from MOOCs Basket listed below)
AEC: Ability Enhancement Course
SEC: Skill Enhancement Course

Bachelor of Computer Application
Semester-3

Name of the Course: BCA **Subject:** Object Oriented Programming	
Course Code: BCAC301 + BCAC391	**Semester: 3rd**

Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	In-depth understanding of various concepts of object oriented programming language.
2	Ability to read, understand and trace the execution of programs
3	Skill to debug a program.
4	Skill to write program code in java to solve real world problems.

Objective:	
Sl. No.	
1	To introduce students to a powerful programming language
2	To understand the basic structure of object oriented program
3	To gain knowledge of various programming errors.
4	To enable the students to make flowchart and design an algorithm for a given problem.
5	To enable the students to develop logics and programs

Pre-Requisite:	
Sl. No.	
1	Understanding of basic programming logic.

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Object oriented design** Concepts of object oriented programming language, Major and minor elements, Object, Class, relationships among objects, aggregation, links, relationships among classes-association, aggregation, using, instantiation, meta-class, grouping constructs.	6	10
02	**Object oriented concepts** Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism	6	10
03	**Basic concepts of object oriented programming using Java** Implementation of Object oriented concepts using Java. Language features to be covered:	6	10
04	**Class & Object properties** Basic concepts of java programming – advantages of java, byte-code & JVM, data types, access specifiers, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts- String [discuss charAt[] , compareTo[], equals[], indexOf[], length[] equalsIgnoreCase[], substring[], toCharArray[] , toLowerCase[], toString[], toUpperCase[] , trim[] , valueOf[] methods] & StringBuffer classes [discuss append[], capacity[], charAt[], delete[], deleteCharAt[], ensureCapacity[], getChars[], indexOf[], insert[], length[], setCharAt[], setLength[], substring[], toString[] methods], concept of mutable and immutable string, command line arguments, basics of I/O operations – keyboard input using BufferedReader & Scanner classes.	**8**	**10**
05	**Reusability properties** Super class & subclasses including multilevel hierarchy, process of constructor	**6**	**10**

	calling in inheritance, use of super and final keywords with super[ ] method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages.		
06	**Exception handling & Multithreading [6L]**Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, interthread communication, deadlocks for threads, suspending & resuming threads.	**6**	**10**
07	**Applet Programming [using swing]** Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in applets, use of repaint[], getDocumentBase[], getCodeBase[] methods, layout manager [basic concept], creation of buttons [JButton class only] & text fields.	**6**	**10**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC391
Credit: 2
Skills to be developed:
Intellectual skills:

1. Ability to read, understand and write object oriented programs.
2. Ability to analyze problems and provide program based solutions.

List of Practical:

1. Basic programming structures
2. Class and Objects
3. Constructors
4. Overloading
5. Inheritance
6. Overriding
7. Exception Handling
8. Applets
9. JDBC
10. Mini project

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
E. Balaguruswamy	Object Oriented Modelling and Design		Tata McGraw-Hill
Ali Bahrami	Object Oriented System Development		Mc Graw Hill
Reference Books:			
Patrick Naughton, Herbert Schildt	The complete reference-Java2		TMH
Kenneth A. Reek	Pointers on C		Pearson
R.K Das	Core Java For Beginners		VIKAS PUBLISHING

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer with moderate configuration
2.	A programming language compiler

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 5	10	10				
B	1 to 5			5	3	5	70
C	1 to 5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Name of the Course: BCA
Subject: Database Management System

Course Code: BCAC302 + BCAC392	**Semester: 3rd**

Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	Familiarization with Database Management System.
2	Comprehensive knowledge of database models.
3	Ability to code database transactions using SQL.

Objective:	
Sl. No.	
1	To introduce the students to the database system.
2	To learn how to design a database by using different models.
3	To enable the students to understand the database handling during execution of the transactions.
4	To understand the handling of database by concurrent users.
5	To gain complete knowledge of SQL and PL/SQL.

Pre-Requisite:	
Sl. No.	
	None

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Data Abstraction, Three Schema architecture of DBMS.	**6**	**5**
02	E-R Model Need for E-R Model, Various steps of database design, Mapping Constraints, E-R diagram, Subclass, Generalization, Specialization, Aggregation, Strong Entity-Weak Entity,	**6**	**10**
03	SQL Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Stored procedures,cursors and triggers.	**6**	**10**
04	Relational Model and Relational Database Design Concept of Relational Model, Design Issues, Keys, Closure set, Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multivalued dependencies, 4NF,5NF, Centralized and distributed database.	**8**	**20**
05	File Organization and Query Optimization Concepts of File and Records, Fixed Length-Variable length Record, Query optimization.	**6**	**10**
06	Indexing Primary, secondary, clustering, Multilevel Indexes.	**6**	**5**
07	Transaction Management Transaction definition, properties, transaction state diagram, commit and rollback, Concurrency control,lock based protocols,two phase locking, Recovery management.	**6**	**10**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC392
Credit: 2
Skills to be developed:

List of Practical:

1. Basics of SQL and different types of queries that should cover major portion of DDL,DML structures.

Assignments:
Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Henry F. Korth and Silberschatz Abraham	Database System Concepts		Mc.Graw Hill
Ramez Elmasri, Shamkant B.Navathe	Fundamentals of Database Systems		Addison Wesley

Reference Books:			

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1.	Computer with Oracle/ any other DBMS package installed.

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 7**	**10**	**10**				
B	**1 to 7**			**5**	**3**	**5**	**70**
C	**1 to 7**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Name of the Course: BCA **Subject: Data Structure and Algorithm with Python**	
Course Code: BCAC303 and BCAC393	**Semester: 3**
Duration: 48 Hrs.	**Maximum Marks:** 100 + 100
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam:70
Tutorial: 0	Attendance: 5
Practical: 4	Continuous Assessment: 25
Credit: 4+2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:			
Sl. No.			
1.	The point of this course is to give you a vibe for algorithms and data structures as a focal area of what it is to be a computer science student.		
2.	You ought to know about the way that there are regularly a few calculations for some issue, and one calculation might be superior to another, or one calculation better in certain conditions and another better in others.		
3.	You should have some idea of how to work out the efficiency of an algorithm.		
4.	You will be able to use and design linked data structures		
5.	You will learn why it is good programming style to hide the details of a data structure within an abstract data type.		
6.	You should have some idea of how to implement various algorithm using python programming.		
Objective:			
Sl. No.			
1.	To impart the basic concepts of data structures and algorithms.		
2.	To understand concepts about searching and sorting techniques.		
3.	To understand basic concepts about stacks, queues, lists, trees and graphs.		
4.	To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures		
Pre-Requisite:			
Sl. No.			
1.	Basics of programming language.		
1.	Logic building skills.		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Data Structure** Abstract Data Type.	**1**	**2**
02	**Arrays** 1D, 2D and Multi-dimensional Arrays, Sparse Matrices. Polynomial representation.	**3**	**4**
03	**Linked Lists** Singly, Doubly and Circular Lists, Normal and Circular representation of Self Organizing Lists, Skip Lists, Polynomial representation.	**6**	**7**
04	**Stacks** Implementing single / multiple stack/s in an Array, Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another, Applications of stack,	**6**	**10**

	Limitations of Array representation of stack.		
05	**Queues** Array and Linked representation of Queue, Circular Queue, De-queue, Priority Queues.	**4**	**7**
06	**Recursion** Developing Recursive Definition of Simple Problems and their implementation, Advantages and Limitations of Recursion, Understanding what goes behind Recursion (Internal Stack Implementation)	**6**	**5**
07	**Trees** Introduction to Tree as a data structure, Binary Trees (Insertion, Deletion, Recursive and Iterative Traversals of Binary Search Trees), Threaded Binary Trees (Insertion, Deletion, Traversals), Height-Balanced Trees (Various operations on AVL Trees).	**6**	**15**
08	**Searching and Sorting** Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Merge Sort, Quick sort, Shell Sort, Comparison of Sorting Techniques	**6**	**15**
09	**Hashing** Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collision by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function.	**6**	**5**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. Skill to analyze algorithms and to determine algorithm correctness and their time efficiency.
2. Knowledge of advanced abstract data type (ADT) and data structures and their implementations.

3. Ability to implement algorithms to perform various operations on data structures.

List of Practical:

1. Implementation of array operations.
2. Stacks and Queues: adding, deleting elements.
3. Circular Queue: Adding & deleting elements

4. Merging Problem : Evaluation of expressions operations on Multiple stacks & queues
5. Implementation of linked lists: inserting, deleting, and inverting a linked list.
6. Implementation of stacks & queues using linked lists:
7. Polynomial addition, Polynomial multiplication
8. Sparse Matrices: Multiplication, addition.
9. Recursive and Non Recursive traversal of Trees Threaded binary tree traversal. AVL tree implementation Application of Trees.
10. Application of sorting and searching algorithms Hash tables' implementation: searching, inserting and deleting, searching & sorting techniques.

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Michael H. Goldwasser, Michael T. Goodrich, and Roberto Tamassia	Data Structures and Algorithms in Python	1118476735, 9781118476734	John Wiley & Sons
Rance D Necaise	Data Structures and Algorithms Using Python	9788126562169	John Wiley & Sons
Reference Books:			
Sartaj Sahni	DataStructures, Algorithms and applications in C++	Second Edition	Universities Press

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer with moderate configuration
2.	Python 2.7 or higher and other softwares as required.

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question	Total Marks	No of question to be set	To answer	Marks per	Total Marks

		to be set				question	
A **B** **C**	**1 to 9** **1 to 9** **1 to 9**	**10**	**10**	**5** **5**	**3** **3**	**5** **15**	**60**

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Note Book	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: BCA **Subject: Web Design and Development**	
Course Code: BCAS391	**Semester: 3rd**
Duration: 48 Hrs.	**Maximum Marks:** 100
Teaching Scheme	**Examination Scheme**
Theory: 0	End Semester Exam:
Tutorial: 0	Attendance:
Practical: 4	Continuous Assessment:
Credit: 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60
Practical: **Skills to be developed:** Intellectual skills:	

1. Skill to analyze algorithms and to determine algorithm correctness and their time efficiency.
2. Knowledge of advanced abstract data type (ADT) and data structures and their implementations.

List of Practical:

1. Design basic HTML pages with HTML tags.
2. Enhancing design with CSS
3. Include dynamic contents using javascript.
4. Understanding and working with JQuery.
5. Understanding server side programming.
6. Develop a website with frontend, backend and database connectivity.
7. Mini project.

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1.	Computer with moderate configuration
2.	Javascript enabled browser.
3.	Database package and web service

Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation			
Internal Examination:			
Continuous evaluation			**40**
External Examination: Examiner-			
Signed Lab Note Book	**10**		
On Spot Experiment	**40**		
Viva voce	**10**		**60**

Semester IV							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	**CC9**	**BCAC401 BCAC491**	**Computer Networking**	**4**	**0**	**4**	**6**
2	**CC10**	**BCAC402 BCAC492**	**Software Engineering**	**4**	**0**	**4**	**6**
3	CC11	BCAC403 BCAC493	Design and Analysis of Algorithms	4	0	4	6

4	GE-4			4/5	0/1	4/0	**6**
Practical							
5	**SEC-3**	**BCAS481**	**Minor Project and Entrepreneurship II**	**0**	**0**	**4**	**2**
						Total Credit	26

Bachelor of Computer Application
Semester-4

Name of the Course: BCA **Subject: Computer Networking**	
Course Code: BCAC401 + BCAC491	**Semester: 4th**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60
Aim:	
Sl. No.	
1	To gain Knowledge of uses and services of Computer Network
2	To enhance Ability to identify types and topologies of network.

3	To gain Understanding of analog and digital transmission of data.
4	
Objective:	
Sl. No.	
1	To deliver comprehensive view of Computer Network.
2	To enable the students to understand the Network Architecture,Network type and topologies
3	To understand the design issues and working of each layer of OSI model.
4	To familiarize with the benefits and issues regarding Network Security.
Pre-Requisite:	
Sl. No.	
1.	None

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction Introduction to communication systems, Data, signal and Transmission: Analog and Digital, Transmission modes, components, Transmission Impairments, Performance criteria of a communication system. Goals of computer Network, Networks: Classification, Components and Topology, categories of network [LAN, MAN,WAN];Internet: brief history, internet today; Protocols and standards; OSI and TCP/IP model.	**6**	**10**
02	Data link layer: Types of errors, framing [character and bit stuffing], error detection & correction methods; Flow control; Protocols: Stop & wait ARQ	**8**	**10**
03	Medium access sub layer: Point to point protocol, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols:ALOHA, CSMA,FDMA, TDMA, CDMA; Ethernet	**6**	**10**
04	Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches,	**6**	**10**

	Router, Gateway; Addressing : Internet address, classful address,Routing : techniques,static vs. dynamic routing ,Protocols: IP, IPV6		
05	Transport layer: Process to process delivery; UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token buc ket algorithm, Quality of services [Qos]	**6**	**10**
06	Application Layer DNS, SMTP, FTP, HTTP & WWW; Security: Cryptography [Public, Private Key based], Digital Signature, Firewalls [technology & applications]	**6**	**10**
07	Physical Layer: Overview of data[analog & digital], signal[analog & digital], transmission [analog & digital] & transmission media [guided & unguided]; Circuit switching: time division & space division switch, TDM bus; Telephone Network	**6**	**10**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC491
Credit: 2

List of Practical:
Implementation of practicals are adhered to the theoretical curriculum.

Assignments:
Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
B. A. Forouzan	Data Communications and Networking		TMH
A. S. Tanenbaum	Computer Networks		Pearson Education/PHI
W. Stallings	Data and Computer Communications		PHI/ Pearson Education

Reference Books:	
List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1	Computer with moderate configuration
2	Network simulator package

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 7**	**10**	**10**				
B	**1 to 7**			**5**	**3**	**5**	**70**
C	**1 to 7**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-			
Signed Lab Note Book(for five experiments)		**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)		**10**	
Viva voce		**5**	

Name of the Course: BCA **Subject: Software Engineering**	
Course Code: BCAC402 + BCAC492	**Semester: 4th**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	Familiarization with the concept of software engineering and its relevance.
2	Understanding of various methods or models for developing a software product.
3	Ability to analyze existing system to gather requirements for proposed system.
4	Gain skill to design and develop softwares.
Objective:	
Sl. No.	
1	To introduce the students to a branch of study associated with the development of a software product.
2	To gain basic knowledge about the pre-requisites for planning a software project.

3	To learn how to design of software		
4	To enable the students to perform testing of a software.		
Pre-Requisite:			
Sl. No.			
1.	None		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Overview of Computer Based Information System- TPS, OAS, MIS, DSS, KBS Development Life Cycles- SDLC and its phases Models- Waterfall, Prototype, Spiral, Evolutionary Requirement Analysis and Specification, SRS System analysis- DFD, Data Modeling with ERD	**12**	**20**
02	Feasibility Analysis System design tools- data dictionary, structure chart, decision table, decision tree. Concept of User Interface, Essence of UML. CASE tool.	**12**	**15**
03	Testing- Test case, Test suit, Types of testing- unit testing, system testing, integration testing, acceptance testing Design methodologies: top down and bottom up approach, stub, driver, black box and white box testing.	**10**	**20**
04	ERP, MRP, CRM, Software maintenance SCM, concept of standards [ISO and CMM]	**10**	**15**
	Sub Total:	**44**	
	Internal Assessment Examination & Preparation of Semester Examination	**4**	
	Total:	**48**	**70**

Practical: BCAC492
Credit: 2
List of Practicals:

1: Develop requirements specification for a given problem (The requirements specification

should include both functional and non-functional requirements).

2: Develop Structured Design for a given software in its requirement phase

3: Develop Object Modelling Using UML for a given software in its requirement phase

4: Develop Use Case Diagram for a given software in its requirement phase

5: Develop Class Diagrams for a given software in its requirement phase

6: Develop Interactive Diagram for a given software in its requirement phase

7: Develop Activity and State Chart Diagram for a given software in its requirement phase

8: Use of any testing tool and how to handle it.

9: Use of any configuration management tool and how to handle it

10: Use of any one project management tool and how to handle it

11: Complete documentation of developing the software using SDLC model -1

12: Complete documentation of developing the software using SDLC model -2

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Igor Hawryszkiewycz	System analysis and design		PEARSON
V Rajaraman	Analysis and design of Information System		PHI
Ian Sommerville	Software Engineering		Addison-Wesley

Reference Books:	
List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1	Computer with moderate configuration

2	MS-Project or similar software.

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 4**	**10**	**10**				
B	**1 to 4**			**5**	**3**	**5**	**70**
C	**1 to 4**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Name of the Course: BCA **Subject: Design and Analysis of Algorithms**	
Course Code: BCAC403 + BCAC493	**Semester: 4th**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To gain knowledge of algorithm complexity analysis.
2	To understand and apply several algorithm design strategies.
3	

Objective:	
Sl. No.	
1	To be familiar with algorithm complexity analysis.
2	To understand and apply several algorithm design strategies.
3	
4	

Pre-Requisite:	
Sl. No.	
1.	Basic knowledge of mathematics.
2.	Basic Knowledge of programming.

Contents	

Chapter	Name of the Topic	Hours	Marks
01	Complexity Analysis Time and Space Complexity, Different Asymptotic notations big O,Ω,∅, Little o,,ω and their mathematical significance and proof.	**8**	**10**
02	Algorithm Design by Divide and Conquer Basic concept of divide and conquer, Merge sort, Quick sort ,heap sort and their complexity analysis in best case, worst case and average case.	**8**	**15**
03	Disjoint Set Data Structure Set Manipulation Algorithm by Union-Find, Union by Rank, Path Compression	**8**	**10**
04	Algorithm Design by Greedy Strategy Basic concept, Activity Selection Problem, Fractional Knapsack problem, Job sequencing with deadline,Prims, Kruskal.	**6**	**10**
05	Algorithm Design by Dynamic Programming Basic concept, 0/1 Knapsack Problem, Matrix Chain Multiplication, All Pair Shortest Path - Floyd Warshall Algorithm, Dijkstra's.	**6**	**15**
06	Algorithm Design by Backtracking Basic concept, Use - N-Queen Problem, Graph Coloring Problem, Hamiltonian Path Problem	**8**	**10**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC493
Credit: 2
Skills to be developed:
Intellectual skills:

1. Skill to analyze algorithms and to determine algorithm correctness and their time efficiency.
2. Knowledge of advanced abstract data type (ADT) and data structures and their implementations.
3. Ability to implement algorithms to perform various operations on data structures.

List of Practical:

1. Implement Merge sort, Implement Quicksort.
2. Find maximum and minimum elements from an array of integers using divide and conquer strategy.
3. Implement fractional knapsack,
4. Implement Job sequence with deadline
5. Implement Dijkstra's algorithm,
6. Implement Prim's algorithm
7. Implement Kruskal's algorithm.
8. Implement Matrix Chain Multiplication
9. Implement Floyd Warshall Algorithm
10. Implement Dijkstra's Algorithm

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
E.Horowitz and Sahni	Fundamentals of Computer Algorithms		
T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein	Introduction to Algorithms		

Reference Books:

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1	Computer with moderate configuration
2	Softwares as required.

End Semester Examination Scheme.		**Maximum Marks-70.**		**Time allotted-3hrs.**			
Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A **B** **C**	**1 to 6** **1 to 6** **1 to 6**	**10**	**10**	**5** **5**	**3** **3**	**5** **15**	**70**

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Bachelor of Computer Application

L T P - Indicates Theory Lectures (L), Tutorial(T) and Practical (P) classes per week.
1L Earns 1 credits
1P Earns 0.5 credits
1T Earns 1 Credit

Semester III							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory							
1	CC6	BCAC301 BCAC391	Object Oriented Programming	4	0	4	**6**
2	CC7	BCAC302 BCAC392	Database Management System	4	0	4	**6**
3	**CC8**	**BCAC303 BCAC393**	**Data Structure and Algorithm using Python**	**4**	**0**	**4**	**6**
4	GE-3			4/5	0/1	4/0	**6**
Practical							
5	SEC-2	BCAS391	Web Design and Development	0	0	4	2
						Total Credit	26

CC: Core Course
GE: General Electives (To be selected from MOOCs Basket listed below)
AEC: Ability Enhancement Course
SEC: Skill Enhancement Course

Bachelor of Computer Application
Semester-3

Name of the Course: BCA **Subject:** Object Oriented Programming	
Course Code: BCAC301 + BCAC391	**Semester: 3rd**

Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	In-depth understanding of various concepts of object oriented programming language.
2	Ability to read, understand and trace the execution of programs
3	Skill to debug a program.
4	Skill to write program code in java to solve real world problems.

Objective:	
Sl. No.	
1	To introduce students to a powerful programming language
2	To understand the basic structure of object oriented program
3	To gain knowledge of various programming errors.
4	To enable the students to make flowchart and design an algorithm for a given problem.
5	To enable the students to develop logics and programs

Pre-Requisite:	
Sl. No.	
1	Understanding of basic programming logic.

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Object oriented design** Concepts of object oriented programming language, Major and minor elements, Object, Class, relationships among objects, aggregation, links, relationships among classes-association, aggregation, using, instantiation, meta-class, grouping constructs.	6	10
02	**Object oriented concepts** Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism	6	10
03	**Basic concepts of object oriented programming using Java** Implementation of Object oriented concepts using Java. Language features to be covered:	6	10
04	**Class & Object properties** Basic concepts of java programming – advantages of java, byte-code & JVM, data types, access specifiers, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts- String [discuss charAt[] , compareTo[], equals[], indexOf[], length[] equalsIgnoreCase[], substring[], toCharArray[] , toLowerCase[], toString[], toUpperCase[] , trim[] , valueOf[] methods] & StringBuffer classes [discuss append[], capacity[], charAt[], delete[], deleteCharAt[], ensureCapacity[], getChars[], indexOf[], insert[], length[], setCharAt[], setLength[], substring[], toString[] methods], concept of mutable and immutable string, command line arguments, basics of I/O operations – keyboard input using BufferedReader & Scanner classes.	**8**	**10**
05	**Reusability properties** Super class & subclasses including multilevel hierarchy, process of constructor	**6**	**10**

	calling in inheritance, use of super and final keywords with super[ ] method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages.		
06	**Exception handling & Multithreading [6L]**Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, interthread communication, deadlocks for threads, suspending & resuming threads.	**6**	**10**
07	**Applet Programming [using swing]** Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in applets, use of repaint[], getDocumentBase[], getCodeBase[] methods, layout manager [basic concept], creation of buttons [JButton class only] & text fields.	**6**	**10**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC391
Credit: 2
Skills to be developed:
Intellectual skills:

1. Ability to read, understand and write object oriented programs.
2. Ability to analyze problems and provide program based solutions.

List of Practical:

1. Basic programming structures
2. Class and Objects
3. Constructors
4. Overloading
5. Inheritance
6. Overriding
7. Exception Handling
8. Applets
9. JDBC
10. Mini project

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
E. Balaguruswamy	Object Oriented Modelling and Design		Tata McGraw-Hill
Ali Bahrami	Object Oriented System Development		Mc Graw Hill
Reference Books:			
Patrick Naughton, Herbert Schildt	The complete reference-Java2		TMH
Kenneth A. Reek	Pointers on C		Pearson
R.K Das	Core Java For Beginners		VIKAS PUBLISHING

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer with moderate configuration
2.	A programming language compiler

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 5	10	10				
B	1 to 5			5	3	5	70
C	1 to 5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Name of the Course: BCA
Subject: Database Management System

Course Code: BCAC302 + BCAC392	**Semester: 3rd**

Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	Familiarization with Database Management System.
2	Comprehensive knowledge of database models.
3	Ability to code database transactions using SQL.

Objective:	
Sl. No.	
1	To introduce the students to the database system.
2	To learn how to design a database by using different models.
3	To enable the students to understand the database handling during execution of the transactions.
4	To understand the handling of database by concurrent users.
5	To gain complete knowledge of SQL and PL/SQL.

Pre-Requisite:	
Sl. No.	
	None

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Data Abstraction, Three Schema architecture of DBMS.	**6**	**5**
02	E-R Model Need for E-R Model, Various steps of database design, Mapping Constraints, E-R diagram, Subclass, Generalization, Specialization, Aggregation, Strong Entity-Weak Entity,	**6**	**10**
03	SQL Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Stored procedures,cursors and triggers.	**6**	**10**
04	Relational Model and Relational Database Design Concept of Relational Model, Design Issues, Keys, Closure set, Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multivalued dependencies, 4NF,5NF, Centralized and distributed database.	**8**	**20**
05	File Organization and Query Optimization Concepts of File and Records, Fixed Length-Variable length Record, Query optimization.	**6**	**10**
06	Indexing Primary, secondary, clustering, Multilevel Indexes.	**6**	**5**
07	Transaction Management Transaction definition, properties, transaction state diagram, commit and rollback, Concurrency control,lock based protocols,two phase locking, Recovery management.	**6**	**10**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC392
Credit: 2
Skills to be developed:

List of Practical:

1. Basics of SQL and different types of queries that should cover major portion of DDL,DML structures.

Assignments:
Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Henry F. Korth and Silberschatz Abraham	Database System Concepts		Mc.Graw Hill
Ramez Elmasri, Shamkant B.Navathe	Fundamentals of Database Systems		Addison Wesley

Reference Books:			

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1.	Computer with Oracle/ any other DBMS package installed.

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 7**	**10**	**10**				
B	**1 to 7**			**5**	**3**	**5**	**70**
C	**1 to 7**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Name of the Course: BCA **Subject: Data Structure and Algorithm with Python**	
Course Code: BCAC303 and BCAC393	**Semester: 3**
Duration: 48 Hrs.	**Maximum Marks:** 100 + 100
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam:70
Tutorial: 0	Attendance: 5
Practical: 4	Continuous Assessment: 25
Credit: 4+2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:			
Sl. No.			
1.	The point of this course is to give you a vibe for algorithms and data structures as a focal area of what it is to be a computer science student.		
2.	You ought to know about the way that there are regularly a few calculations for some issue, and one calculation might be superior to another, or one calculation better in certain conditions and another better in others.		
3.	You should have some idea of how to work out the efficiency of an algorithm.		
4.	You will be able to use and design linked data structures		
5.	You will learn why it is good programming style to hide the details of a data structure within an abstract data type.		
6.	You should have some idea of how to implement various algorithm using python programming.		
Objective:			
Sl. No.			
1.	To impart the basic concepts of data structures and algorithms.		
2.	To understand concepts about searching and sorting techniques.		
3.	To understand basic concepts about stacks, queues, lists, trees and graphs.		
4.	To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures		
Pre-Requisite:			
Sl. No.			
1.	Basics of programming language.		
1.	Logic building skills.		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Data Structure** Abstract Data Type.	**1**	**2**
02	**Arrays** 1D, 2D and Multi-dimensional Arrays, Sparse Matrices. Polynomial representation.	**3**	**4**
03	**Linked Lists** Singly, Doubly and Circular Lists, Normal and Circular representation of Self Organizing Lists, Skip Lists, Polynomial representation.	**6**	**7**
04	**Stacks** Implementing single / multiple stack/s in an Array, Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another, Applications of stack,	**6**	**10**

	Limitations of Array representation of stack.		
05	**Queues** Array and Linked representation of Queue, Circular Queue, De-queue, Priority Queues.	**4**	**7**
06	**Recursion** Developing Recursive Definition of Simple Problems and their implementation, Advantages and Limitations of Recursion, Understanding what goes behind Recursion (Internal Stack Implementation)	**6**	**5**
07	**Trees** Introduction to Tree as a data structure, Binary Trees (Insertion, Deletion, Recursive and Iterative Traversals of Binary Search Trees), Threaded Binary Trees (Insertion, Deletion, Traversals), Height-Balanced Trees (Various operations on AVL Trees).	**6**	**15**
08	**Searching and Sorting** Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Merge Sort, Quick sort, Shell Sort, Comparison of Sorting Techniques	**6**	**15**
09	**Hashing** Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collision by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function.	**6**	**5**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. Skill to analyze algorithms and to determine algorithm correctness and their time efficiency.
2. Knowledge of advanced abstract data type (ADT) and data structures and their implementations.

3. Ability to implement algorithms to perform various operations on data structures.

List of Practical:

1. Implementation of array operations.
2. Stacks and Queues: adding, deleting elements.
3. Circular Queue: Adding & deleting elements

4. Merging Problem : Evaluation of expressions operations on Multiple stacks & queues
5. Implementation of linked lists: inserting, deleting, and inverting a linked list.
6. Implementation of stacks & queues using linked lists:
7. Polynomial addition, Polynomial multiplication
8. Sparse Matrices: Multiplication, addition.
9. Recursive and Non Recursive traversal of Trees Threaded binary tree traversal. AVL tree implementation Application of Trees.
10. Application of sorting and searching algorithms Hash tables' implementation: searching, inserting and deleting, searching & sorting techniques.

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Michael H. Goldwasser, Michael T. Goodrich, and Roberto Tamassia	Data Structures and Algorithms in Python	1118476735, 9781118476734	John Wiley & Sons
Rance D Necaise	Data Structures and Algorithms Using Python	9788126562169	John Wiley & Sons
Reference Books:			
Sartaj Sahni	DataStructures, Algorithms and applications in C++	Second Edition	Universities Press

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer with moderate configuration
2.	Python 2.7 or higher and other softwares as required.

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question	Total Marks	No of question to be set	To answer	Marks per	Total Marks

		to be set				question	
A **B** **C**	**1 to 9** **1 to 9** **1 to 9**	**10**	**10**	**5** **5**	**3** **3**	**5** **15**	**60**

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Note Book	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: BCA **Subject: Web Design and Development**	
Course Code: BCAS391	**Semester: 3rd**
Duration: 48 Hrs.	**Maximum Marks:** 100
Teaching Scheme	**Examination Scheme**
Theory: 0	End Semester Exam:
Tutorial: 0	Attendance:
Practical: 4	Continuous Assessment:
Credit: 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60
Practical: **Skills to be developed:** Intellectual skills:	

1. Skill to analyze algorithms and to determine algorithm correctness and their time efficiency.
2. Knowledge of advanced abstract data type (ADT) and data structures and their implementations.

List of Practical:

1. Design basic HTML pages with HTML tags.
2. Enhancing design with CSS
3. Include dynamic contents using javascript.
4. Understanding and working with JQuery.
5. Understanding server side programming.
6. Develop a website with frontend, backend and database connectivity.
7. Mini project.

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1.	Computer with moderate configuration
2.	Javascript enabled browser.
3.	Database package and web service

Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation			
Internal Examination:			
Continuous evaluation			**40**
External Examination: Examiner-			
Signed Lab Note Book	**10**		
On Spot Experiment	**40**		
Viva voce	**10**		**60**

Semester IV							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	**CC9**	**BCAC401 BCAC491**	**Computer Networking**	**4**	**0**	**4**	**6**
2	**CC10**	**BCAC402 BCAC492**	**Software Engineering**	**4**	**0**	**4**	**6**
3	CC11	BCAC403 BCAC493	Design and Analysis of Algorithms	4	0	4	6

4	GE-4			4/5	0/1	4/0	**6**
Practical							
5	**SEC-3**	**BCAS481**	**Minor Project and Entrepreneurship II**	**0**	**0**	**4**	**2**
						Total Credit	26

Bachelor of Computer Application
Semester-4

Name of the Course: BCA **Subject: Computer Networking**	
Course Code: BCAC401 + BCAC491	**Semester: 4th**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60
Aim:	
Sl. No.	
1	To gain Knowledge of uses and services of Computer Network
2	To enhance Ability to identify types and topologies of network.

3	To gain Understanding of analog and digital transmission of data.
4	
Objective:	
Sl. No.	
1	To deliver comprehensive view of Computer Network.
2	To enable the students to understand the Network Architecture,Network type and topologies
3	To understand the design issues and working of each layer of OSI model.
4	To familiarize with the benefits and issues regarding Network Security.
Pre-Requisite:	
Sl. No.	
1.	None

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction Introduction to communication systems, Data, signal and Transmission: Analog and Digital, Transmission modes, components, Transmission Impairments, Performance criteria of a communication system. Goals of computer Network, Networks: Classification, Components and Topology, categories of network [LAN, MAN,WAN];Internet: brief history, internet today; Protocols and standards; OSI and TCP/IP model.	**6**	**10**
02	Data link layer: Types of errors, framing [character and bit stuffing], error detection & correction methods; Flow control; Protocols: Stop & wait ARQ	**8**	**10**
03	Medium access sub layer: Point to point protocol, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols:ALOHA, CSMA,FDMA, TDMA, CDMA; Ethernet	**6**	**10**
04	Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches,	**6**	**10**

	Router, Gateway; Addressing : Internet address, classful address,Routing : techniques,static vs. dynamic routing ,Protocols: IP, IPV6		
05	Transport layer: Process to process delivery; UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token buc ket algorithm, Quality of services [Qos]	**6**	**10**
06	Application Layer DNS, SMTP, FTP, HTTP & WWW; Security: Cryptography [Public, Private Key based], Digital Signature, Firewalls [technology & applications]	**6**	**10**
07	Physical Layer: Overview of data[analog & digital], signal[analog & digital], transmission [analog & digital] & transmission media [guided & unguided]; Circuit switching: time division & space division switch, TDM bus; Telephone Network	**6**	**10**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC491
Credit: 2

List of Practical:
Implementation of practicals are adhered to the theoretical curriculum.

Assignments:
Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
B. A. Forouzan	Data Communications and Networking		TMH
A. S. Tanenbaum	Computer Networks		Pearson Education/PHI
W. Stallings	Data and Computer Communications		PHI/ Pearson Education

Reference Books:	
List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1	Computer with moderate configuration
2	Network simulator package

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 7**	**10**	**10**				
B	**1 to 7**			**5**	**3**	**5**	**70**
C	**1 to 7**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-			
Signed Lab Note Book(for five experiments)		**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)		**10**	
Viva voce		**5**	

Name of the Course: BCA **Subject: Software Engineering**	
Course Code: BCAC402 + BCAC492	**Semester: 4th**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	Familiarization with the concept of software engineering and its relevance.
2	Understanding of various methods or models for developing a software product.
3	Ability to analyze existing system to gather requirements for proposed system.
4	Gain skill to design and develop softwares.
Objective:	
Sl. No.	
1	To introduce the students to a branch of study associated with the development of a software product.
2	To gain basic knowledge about the pre-requisites for planning a software project.

3	To learn how to design of software		
4	To enable the students to perform testing of a software.		
Pre-Requisite:			
Sl. No.			
1.	None		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Overview of Computer Based Information System- TPS, OAS, MIS, DSS, KBS Development Life Cycles- SDLC and its phases Models- Waterfall, Prototype, Spiral, Evolutionary Requirement Analysis and Specification, SRS System analysis- DFD, Data Modeling with ERD	**12**	**20**
02	Feasibility Analysis System design tools- data dictionary, structure chart, decision table, decision tree. Concept of User Interface, Essence of UML. CASE tool.	**12**	**15**
03	Testing- Test case, Test suit, Types of testing- unit testing, system testing, integration testing, acceptance testing Design methodologies: top down and bottom up approach, stub, driver, black box and white box testing.	**10**	**20**
04	ERP, MRP, CRM, Software maintenance SCM, concept of standards [ISO and CMM]	**10**	**15**
	Sub Total:	**44**	
	Internal Assessment Examination & Preparation of Semester Examination	**4**	
	Total:	**48**	**70**

Practical: BCAC492
Credit: 2
List of Practicals:

1: Develop requirements specification for a given problem (The requirements specification

should include both functional and non-functional requirements).

2: Develop Structured Design for a given software in its requirement phase

3: Develop Object Modelling Using UML for a given software in its requirement phase

4: Develop Use Case Diagram for a given software in its requirement phase

5: Develop Class Diagrams for a given software in its requirement phase

6: Develop Interactive Diagram for a given software in its requirement phase

7: Develop Activity and State Chart Diagram for a given software in its requirement phase

8: Use of any testing tool and how to handle it.

9: Use of any configuration management tool and how to handle it

10: Use of any one project management tool and how to handle it

11: Complete documentation of developing the software using SDLC model -1

12: Complete documentation of developing the software using SDLC model -2

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Igor Hawryszkiewycz	System analysis and design		PEARSON
V Rajaraman	Analysis and design of Information System		PHI
Ian Sommerville	Software Engineering		Addison-Wesley

Reference Books:	
List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1	Computer with moderate configuration

2	MS-Project or similar software.

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 4**	**10**	**10**				
B	**1 to 4**			**5**	**3**	**5**	**70**
C	**1 to 4**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Name of the Course: BCA **Subject: Design and Analysis of Algorithms**	
Course Code: BCAC403 + BCAC493	**Semester: 4th**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To gain knowledge of algorithm complexity analysis.
2	To understand and apply several algorithm design strategies.
3	

Objective:	
Sl. No.	
1	To be familiar with algorithm complexity analysis.
2	To understand and apply several algorithm design strategies.
3	
4	

Pre-Requisite:	
Sl. No.	
1.	Basic knowledge of mathematics.
2.	Basic Knowledge of programming.

Contents	

Chapter	Name of the Topic	Hours	Marks
01	Complexity Analysis Time and Space Complexity, Different Asymptotic notations big O,Ω,∅, Little o,,ω and their mathematical significance and proof.	**8**	**10**
02	Algorithm Design by Divide and Conquer Basic concept of divide and conquer, Merge sort, Quick sort ,heap sort and their complexity analysis in best case, worst case and average case.	**8**	**15**
03	Disjoint Set Data Structure Set Manipulation Algorithm by Union-Find, Union by Rank, Path Compression	**8**	**10**
04	Algorithm Design by Greedy Strategy Basic concept, Activity Selection Problem, Fractional Knapsack problem, Job sequencing with deadline,Prims, Kruskal.	**6**	**10**
05	Algorithm Design by Dynamic Programming Basic concept, 0/1 Knapsack Problem, Matrix Chain Multiplication, All Pair Shortest Path - Floyd Warshall Algorithm, Dijkstra's.	**6**	**15**
06	Algorithm Design by Backtracking Basic concept, Use - N-Queen Problem, Graph Coloring Problem, Hamiltonian Path Problem	**8**	**10**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC493
Credit: 2
Skills to be developed:
Intellectual skills:

1. Skill to analyze algorithms and to determine algorithm correctness and their time efficiency.
2. Knowledge of advanced abstract data type (ADT) and data structures and their implementations.
3. Ability to implement algorithms to perform various operations on data structures.

List of Practical:

1. Implement Merge sort, Implement Quicksort.
2. Find maximum and minimum elements from an array of integers using divide and conquer strategy.
3. Implement fractional knapsack,
4. Implement Job sequence with deadline
5. Implement Dijkstra's algorithm,
6. Implement Prim's algorithm
7. Implement Kruskal's algorithm.
8. Implement Matrix Chain Multiplication
9. Implement Floyd Warshall Algorithm
10. Implement Dijkstra's Algorithm

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
E.Horowitz and Sahni	Fundamentals of Computer Algorithms		
T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein	Introduction to Algorithms		

Reference Books:

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1	Computer with moderate configuration
2	Softwares as required.

End Semester Examination Scheme.		**Maximum Marks-70.**		**Time allotted-3hrs.**			
Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A **B** **C**	**1 to 6** **1 to 6** **1 to 6**	**10**	**10**	**5** **5**	**3** **3**	**5** **15**	**70**

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Bachelor of Computer Application

Semester V							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	**CC12**	**BCAC501 BCAC591**	**Internet Technology**	**4**	**0**	**4**	**6**
2	CC13	BCAC502	Theory of Computation	5	1	0	6
3	DSE-I	BCAD501	A. Information Security B. Cloud Computing C. Artificial Intelligence	5/4	1/0	0/4	6
4	DSE-2	BCAD502	A. Numerical Methods B. Combinatorial Optimization C. Soft Computing	4/5	0/1	4/0	6
Sessional							
5	SEC-4	BCAS501	Industrial Training and Internship	0	0	0	**2**
						Total Credit	26

CC: Core Course
GE: General Electives(To be selected from MOOCs Basket listed below)
AEC: Ability Enhancement Course
SEC: Skill Enhancement Course

Bachelor of Computer Application
Semester-5

Name of the Course: BCA **Subject:** Internet Technology	
Course Code: BCAC501 + BCAC591	**Semester: 5th**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To gain comprehensive knowledge of Internet and its working.
2	Ability to use services offered by internet.

3	To enhance skill to develop websites using HTML , CSS, JS.
4	
Objective:	
Sl. No.	
1	To introduce the students to the network of networks -Internet.
2	To enable the students to use various services offered by internet.
3	To gain knowledge about the protocols used in various services of internet.
4	To understand the working and applications of Intranet and Extranet.
5	
Pre-Requisite:	
Sl. No.	
1	Understanding of basic programming logic.

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction to Networking Overview of Networking, Intranet, Extranet and Internet, Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP, Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6, Classful and Classless Addressing, Subnetting. NAT, IP masquerading, IPtables, Routing -Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast, Electronic Mail	8	12
02	Web Programming Introduction to HTML, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Color name, Color value, Image Maps, area, attributes of image area, Extensible Markup Language (XML), CGI Scripts, GET and POST Methods.	8	15
03	Server Side Programming and Scripting Basic PHP Programming, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling, JavaScript basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation, Definition of cookies, Create and Store cookie.	8	15
04	Security Issues Network security techniques, Password and Authentication, VPN, IP Security, security in electronic transaction, Secure Socket Layer(SSL), Secure Shell (SSH), Introduction to Firewall, Packet filtering, Stateful,	**10**	**13**

	Application layer, Proxy.		
05	Advance Internet Technology Internet Telephony (VoIP), Multimedia Applications, Multimedia over IP: RSVP, RTP, RTCP and RTSP. Streamingmedia, Codec and Plugins, IPTV, Search Engine Optimization, Metadata.	**10**	**15**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC591
Credit: 2
Skills to be developed:
Intellectual skills:

1. Ability to understand Web Design and Development.
2. Ability to analyze problems and provide program based solutions.

List of Practical:

1. As compatible to theory syllabus.

Assignments:
Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
N.P. Gopalan and J. Akilandeswari	Web Technology: A Developer's Perspective		PHI
Rahul Banerjee	Internetworking Technologies, An Engineering Perspective		PHI Learning

Reference Books:

List of equipment/apparatus for laboratory experiments:

Sl. No.	

1.	Computer with moderate configuration

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 5	10	10				
B	1 to 5			5	3	5	70
C	1 to 5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Name of the Course: BCA
Subject: Theory of Computation

Course Code: BCAC502	**Semester: 5th**
Duration: 60 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	End Semester Exam: 70
Tutorial: 1	Attendance : 5
Practical: 0	Continuous Assessment: 25
Credit: 6	Practical Sessional internal continuous evaluation: NA
	Practical Sessional external examination: NA

Aim:	
Sl. No.	
1	To gain knowledge of automata theory.
2	To understand the theoretical computer science.
3	
4	

Objective:	
Sl. No.	
1	Study various types of finite automata.
2	Understand the challenge of theoretical computer science and it's application.
3	
4	
5	

Pre-Requisite:	
Sl. No.	**None**

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Languages [Alphabets, string, language, Basic Operations on language, Concatenation, KleeneStar	**11**	**10**
02	Finite Automata and Regular Languages Regular Expressions, Transition Graphs, Deterministics and non-deterministic finite automata, NFA to DFA Conversion, Regular languages and their relationship with finite automata, Pumping lemma and closure properties of regular languages.	**15**	**20**
03	Context free languages Context free grammars, parse trees, ambiguities in grammar and languages, Pushdown automata (Deterministic and Non-deterministic), Pumping Lemma, Properties of context free languages, normal forms.	**15**	**20**

04	Turing Machines and Models of Computation RAM, Turing Machine as a model of computation, Universal Turing Machine, Language acceptability, decidability, halting problem, Recursively enumerable and recursive languages, unsolvability problems.	**15**	**20**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Daniel I.A.Cohen	Introduction to computer theory	8th Edition	John Wiley Publications
Lewis & Papadimitriou	Elements of the theory of computation		PHI
Hoperoft, Aho, Ullman	Introduction to Automata theory, Language & Computation	3 rd Edition	Pearson Education

Reference Books:

P. Linz	An Introduction to Formal Language and Automata	4th edition	Publication Jones Bartlett

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A **B** **C**	**1 to 4** **1 to 4** **1 to 4**	**10**	**10**	 **5** **5**	 **3** **3**	 **5** **15**	 **70**

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject: Information Security**	
Course Code: BCAD501A	**Semester: 5th**
Duration: 60 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: 70**
Tutorial: 1	**Attendance : 5**
Practical: 0	**Continuous Assessment: 25**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA

Aim:	
Sl. No.	
1.	This introductory course is aimed at giving basic understanding about system security.
2.	This entry-level course covers a broad spectrum of security topics and is based on real-life examples to create system security interest in the students
3.	A balanced mix of technical and managerial issues makes this course appealing to attendees who need to understand the salient facets of information security basics and the basics of risk management.

Objective:	
Sl. No.	
1.	Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
2.	Gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.
3.	Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
4.	Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges

Pre-Requisite:	
Sl. No.	
1.	Not Required

Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Information and Network Security fundamentals** Overview of Networking Concepts Basics of Communication Systems, Transmission Media, Topology and Types of Networks, TCP/IP Protocol, Wireless	**15**	**20**

	Networks, The Internet Information Security Concepts Information Security Overview: Background and Current Scenario, Types of Attacks, Goals for Security, E-commerce Security Security Threats and Vulnerabilities Overview of Security threats, Weak / Strong Passwords and Password Cracking, Insecure Network connections, Malicious Code Cybercrime and Cyber terrorism Cryptography Introduction to Cryptography, Digital Signatures, Public Key infrastructure, Applications of Cryptography, Tools and techniques of Cryptography		
02	**Security Management** Security Management Practices Overview of Security Management, Security Policy, Risk Management, Ethics and Best Practices Security Laws and Standards Security Assurance, Security Laws, International Standards, Security Audit	**15**	**10**
03	**Information and Network Security** Server Management and Firewalls User Management, Overview of Firewalls, Types of Firewalls, DMZ and firewall features Security for VPN and Next Generation Technologies VPN Security, Security in Multimedia Networks, Various Computing Platforms: HPC, Cluster and Computing Grids, Virtualization and Cloud Technology and Security	**15**	**20**
04	**System and Application Security** Security Architectures and Models Designing Secure Operating Systems, Controls to enforce security services, Information Security Models System Security Desktop Security, Email security, Database Security	**11**	**20**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
B. A. Forouzan	Data Communications and Networking	3rd Ed	TMH
A. S. Tanenbaum	Computer Networks	4th Ed	Pearson Education/PHI

Reference Books:			
W. Stallings	Data and Computer Communications	5th Ed	PHI/ Pearson Education
Atul Kahate	Cryptography & Network Security		TMH

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1,2,3,4,5	10	10				
B	3, 4, 5			5	3	5	60
C	1,2,3,4,5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

Name of the Course: BCA
Subject: Cloud Computing

Course Code: BCAD501B	**Semester: 5th**
Duration: 60 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	End Semester Exam: 70
Tutorial: 1	Attendance : 5
Practical: 0	Continuous Assessment: 25
Credit: 6	Practical Sessional internal continuous evaluation:
Aim:	Practical Sessional external examination:

1	To gain knowledge of cloud computing.
2	To gain knowledge of several application areas of cloud computing.
3	To understand cloud computing platforms.
4	
Objective:	
Sl. No.	
1	Understand the principles of cloud computing.

2	Understanding SaaS, PaaS etc.
3	To gain knowledge of applications of cloud computing.
Pre-Requisite:	
Sl. No.	None

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Definition of Cloud Computing and its Basics Definition of Cloud Computing: Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model. Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing Cloud Architecture: A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients . Services and Applications by Type IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS – Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service (IDaaS) Compliance as a Service (CaaS)	**15**	**15**
02	Use of Platforms in Cloud Computing Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF) Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development Use of PaaS Application frameworks. Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google	**15**	**15**

	Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service. Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store, Amazon SimpleDB and Relational Database Service Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services		
03	Cloud Infrastructure Cloud Management :An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle) Concepts of Cloud Security Cloud security concerns, Security boundary, Security service boundary Overview of security mapping Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)	**15**	**20**
04	Concepts of Services and Applications Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs Cloud-based Storage: Cloud storage definition – Manned and Unmanned Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services	**11**	**20**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**
Assignments:			

Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Barrie Sosinsky	Cloud Computing Bible		Wiley India Pvt. Ltd
Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi	Mastering Cloud Computing		McGraw Hill Education (India) Private Limited

Reference Books:

Anthony T. Velte	Cloud computing: A practical approach,		Tata Mcgraw-Hill

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 4**	**10**	**10**				
B	**1 to 4**			**5**	**3**	**5**	**70**
C	**1 to 4**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Information and Coding Theory	
Course Code: BCAD501C	**Semester: 6th**
Duration: 60 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: 70**
Tutorial: 1	**Attendance : 5**
Practical: 0	**Continuous Assessment: 25**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**

	Practical Sessional external examination: NA		
Aim:			
Sl. No.			
1	Introduced to the basic notions of information and channel capacity.		
2	To introduce information theory, the fundamentals of error control coding techniques and their applications, and basic cryptography.		
3	To provide a complementary U/G physical layer communication		
	to convolutional and block codes, decoding techniques, and automatic repeat request (ARQ) schemes.		
Objective:			
Sl. No.			
1	Understand how error control coding techniques are applied in communication systems.		
2	Able to understand the basic concepts of cryptography.		
3	To enhance knowledge of probabilities, entropy, measures of information.		
Pre-Requisite:			
Sl. No.			
1.	Probability and Statistics		
Contents		**3 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**INFORMATION ENTROPY FUNDAMENTALS** Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.	**20**	**23**
02	**DATA AND VOICE CODING** Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC). Denial of Service Attacks, DOS-proof network architecture, Security architecture of World Wide Web, Security Architecture of Web Servers, and Web Clients, Web Application Security – Cross Site Scripting Attacks, Cross Site Request Forgery, SQL Injection Attacks, Content Security Policies (CSP) in web, Session Management and User Authentication, Session Integrity, Https, SSL/TLS, Threat Modeling, Attack Surfaces, and other comprehensive approaches to network design for	**20**	**24**

	security		
03	**ERROR CONTROL CODING** Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.	**16**	**23**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Simon Haykin	Communication Systems	4th Edition	John Wiley and Sons, 2001
Fred Halsall	Multimedia Communications, Applications Networks Protocols and Standards		Pearson Education, Asia 2002
Reference Books:			
Mark Nelson	Data Compression Book		Publication 1992
Watkinson J	Compression in Video and Audio		Focal Press, London, 1995

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1,2,3**	**10**	**10**				
B	**1,2,3**			**5**	**3**	**5**	**60**
C	**1,2,3**			**5**	**3**	**15**	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Numerical and statistical Methods			
Course Code: BCAD502A		**Semester: 5th**	
Duration: 60 Hrs.		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 5		**End Semester Exam: 70**	
Tutorial: 1		**Attendance : 5**	
Practical: 0		**Continuous Assessment: 25**	
Credit: 6		**Practical Sessional internal continuous evaluation: NA**	
		Practical Sessional external examination: NA	
Aim:			
Sl. No.			
2.			
3.			
4.			
5.			
Sl. No.			
6.			
7.			
8.			
9. Pre-Requisite:			
Sl. No.			
10.	None		
Contents		**3 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
1	Roots of Equations: Graphical Method -Bisection Method - False-Position Method - Fixed-Point Iteration - Newton-Raphson Method Secant Method - Roots of Polynomials:	**8**	**14**

	Conventional Methods - Muller's Method - Bairstow's Method. Algebraic Equations: Gauss Elimination -Gauss-Jordan - LU Decomposition - Matrix Inverse -Gauss-Seidel		
2	Numerical Differentiation - Integration: Trapezoidal Rule - Simpson's Rule - Romberg Integration - Differential equations: Taylor's method - Euler's method -Runge-Kutta 2nd and 4th order methods Predictor - corrector methods.	**12**	**14**
3	Diagrammatic and Graphical representation of Numerical Data - Formation of frequency distribution - Histogram, Cumulative Frequency - Polygon and Ogives - Measures of central tendencies - Mean, Median, Mode - Measures of dispersion - Mean deviation, Standard deviation, variance, Quartile deviation and coefficient of variation - Moments (upto 4th) - Measures of Skewness and Kurtosis for grouped and ungrouped data.	**12**	**14**
4	Sample space - Events - Definition of probability - combinatorial problems - conditional probability and independence - Random variables, distributions and Mathematical expectations - Discrete distributions - Binomial - Poisson - Continuous distributions - Normal and Exponential distributions - Moments and Moment generating functions.	**12**	**14**
5	Correlation and Regression analysis: product moment correlation -coefficient - rank correlation coefficient - simple regression - method of least squares for estimation of regression coefficient. Concept of sampling and Sampling distributions - Sampling from Normal distributions - Standard error - Tests of significance - Large sample test for population mean and proportions - Test for populations means: single - two sample and paired t - test - Chi square tests for goodness of fit and test for independence of attributes in contingency table.	**12**	**14**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Snedecor G.W. and Cochran W.G. (1989)	Statistical methods	8 ed	Affiliated East West.
Trivedi K.S. (1994)	Probability and Statistics with Reliability, Queueing and computer Science		Prentice Hall of India

	applications		
Reference Books:			
S. C. Chopra and R. P.Canale	Numerical Methods for Engineers	3rd	McGraw Hill International Edition

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
• **A** • • **B** • • **C**	**1,2,3,4,5** **1,2,3,4,5** **1,2,3,4,5**	**10**	**10**	 **5** **5**	 **3** **3**	 **5** **15**	 **60**

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Combinatorial Optimization	
Course Code: BCAD502B	**Semester: 5th**
Duration: 60 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: 70**
Tutorial: 1	**Attendance : 5**
Practical: 0	**Continuous Assessment: 25**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA
Aim:	
Sl. No.	

1.	To Understand Combinatorial Optimization problems
2.	
3.	
4.	
Sl. No.	
5.	
6.	
7.	
Pre-Requisite:	
Sl. No.	
	None

Contents		**6 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
1	Introduction to combinatorial optimization. Matrix multiplication Knapsack problem Tardos, Prof. Ranade's lecture Bipartite matching problem	**12**	**14**
2	Introduction to Linear algebra - Vectors, matrices, row view, column view, matrix multiplication, special matrices: square, symmetric, identity. Inverse of a matrix Row/Column space, rank, orthogonal vectors, null space, fundamental theorem of linear algebra	**12**	**14**
3	Introduction to Linear programming - diet problem example, the LP problem, 2-D geometric view and finding min and max Different LP problems. Feasible solution, basic feasible solution (bfs)	**12**	**14**
4	Existence of basic feasible solution Affine set, affine combination of points, Convex sets - examples, closure properties, Convex Hull of a set	**12**	**14**
5	Traversing from one bfs to another bfs Finding an initial bfs, The simplex algorithm, Proof of correctness	**8**	**14**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Vangelis Th. Paschos	Concepts of Combinatorial Optimization	2nd Edition	Wiley
Reference Books:			

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
• **A** • **B** • **C**	**1,2,3,4,5** **1,2,3,4,5** **1,2,3,4,5**	**10**	**10**	**5** **5**	**3** **3**	**5** **15**	**60**

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Soft Computing	
Course Code:BCAD502C	**Semester: 5th**
Duration: 60	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: 70**
Tutorial: 1	**Attendance : 5**

Practical:0	**Continuous Assessment:25**
Credit: 6	**Practical Sessional internal continuous evaluation:NA**
	Practical Sessional external examination:NA

Aim:

Sl. No.	
1.	Enumerate the theoretical basis of soft computing
2.	Explain the fuzzy set theory
3.	Discuss the neural networks and supervised and unsupervised learning networks
4.	Demonstrate some applications of computational intelligence
5.	Apply the most appropriate soft computing algorithm for a given situation

Objective:

Sl. No.	
1.	Enumerate the strengths and weakness of soft computing
2.	Illustrate soft computing methods with other logic driven and statistical method driven approaches
3.	Focus on the basics of neural networks, fuzzy systems, and evolutionary computing
4.	Emphasize the role of euro-fuzzy and hybrid modeling methods
5.	Trace the basis and need for evolutionary computing and relate it with other soft computing approaches

Pre-Requisite:

Sl. No.	
1	Mathematical knowledge

Contents		**6 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**

01	Introduction: Introduction to soft computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm.	**8**	**5**
02	Fuzzy sets and Fuzzy logic systems: Classical Sets and Fuzzy Sets and Fuzzy relations : Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations. Membership functions : Features of membership functions, standard forms and boundaries, different fuzzification methods. Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods. Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules, Fuzzy InferenceSystem-Mamdani Fuzzy Models – Sugeno Fuzzy Models. Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, GeneralFuzzy Logic controllers, BasicMedical Diagnostic systems and Weather forecasting	**12**	**20**
03	Neural Network Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, BiologicalNeurons and Artificial neural network; model of artificial neuron. Learning Methods : Hebbian, competitive, Boltzman etc., Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Back-propagation and multi layer networks. Competitive learning networks: Kohonenself organizing networks, Hebbian learning; Hopfield Networks. Neuo-Fuzzy modelling:	**12**	**20**

	Applications of Neural Networks: Pattern Recognition and classification		
04	Genetic Algorithms: Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA). Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Imageprocessing and pattern Recognition	**12**	**15**
05	Other Soft Computing techniques: Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO).	**12**	**10**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Timothy J. Ross	Fuzzy logic with engineering applications		John Wiley and Sons.
S. Rajasekaran and G.A.V.Pai,	Neural Networks, Fuzzy Logic and Genetic Algorithms		PHI

Reference Books:

S N Sivanandam, S. Sumathi	Principles of Soft Computing		John Wiley & Sons
David E. Goldberg	Genetic Algorithms in search, Optimization &		Pearson/PHI

	Machine Learning		
Samir Roy &Udit Chakraborty	A beginners approach to Soft Computing		Pearson
Kumar Satish	Neural Networks: A Classroom Approach,1/e		TMH

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 5**	**10**	**10**				**60**
B	**1 to 5**			**5**	**3**	**5**	
C	**1 to 5**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**3**	**3**

Name of the Course: BCA **Subject: Industrial Training and Internship**	
Course Code: BCAS501	**Semester: 5th**
Duration: 4 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	End Semester Exam: NA
Tutorial: 0	Attendance: NA
Practical: 0	Continuous Assessment: NA
Credit: 2	Practical Sessional internal continuous evaluation:40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To develop industrial understanding.
2	To develop understanding of project management.
3	To cope up with industry oriented real time project environment.

Objective:	
Sl. No.	
1	To develop team work.
2	To develop understanding of project management.
3	To be able to implement real life software or hardware based projects.

Pre-Requisite:	
Sl. No.	
1.	None

Bachelor of Computer Application
Semester-6

Semester VI							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory							
1	CC14	BCAC601 BCAC691	Advanced Database and PL-SQL	4	0	4	6
2	DSE-3	BCAD601 BCAD691	A. Digital Image Processing B. Introduction to AI and Machine Learning C. Introduction to Data Science	4	0	4	6

Sessional							
3	SEC-3	BCAS601	Grand Viva	0	0	2	**1**
4	DSE-4	BCAD681	Major Project and Entrepreneurship	0	0	8	**4**
5	SEC-4	BCAS602	Seminar	0	0	4	**2**
			Total Credit				19

Name of the Course: BCA **Subject: Advanced DBMS with PL-SQL**	
Course Code: BCAC601 + BCAC691	**Semester: 6th**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To gain knowledge of advanced database management ideas.
2	To gain knowledge of concurrency control and recovery management procedures.
3	To gain skill to write database programs using SQL or PL-SQL.
4	

Objective:	
Sl. No.	
1	Understand the concept of Database transactions management.
2	Understand the concept of concurrency control techniques and recovery management.
3	Gain idea about distributed DBMS.
4	To gain skill to write PL-SQL.

Pre-Requisite:	
Sl. No.	
1.	None

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Query Optimization Algorithm for Executing Query Operations: External sorting, Select operation, Join operation, PROJECT and set operation, Aggregate operations, Outer join, Heuristics in Query Optimization, Semantic Query Optimization, Converting Query Tree to Query Evaluation Plan, multiquery optimization and application, Efficient and extensible algorithms for multi-query optimization, execution strategies for SQL sub queries, Query Processing for SQL Updates	**6**	**5**

02	ARQQuery Execution: Introduction to Physical-Query-Plan Operators, One-Pass Algorithms for Database, Operations, Nested-Loop Joins, Two-Pass Algorithms Based on Sorting, Two-Pass, Algorithms Based on Hashing, Index-Based Algorithms, Buffer Management, Parallel Algorithms for Relational Operations, Using Heuristics in Query Optimization, Basic Algorithms for Executing Query Operations.	**6**	**5**
03	Concurrency Control Serializability: Enforcing, Serializability by Locks, Locking Systems With Several, Lock Modes, Architecture for a Locking Scheduler Managing Hierarchies of Database Elements, Concurrency Control by Timestamps, Concurrency Control by Validation, Database recovery management	**4**	**20**
04	Transaction processing: Introduction of transaction processing, advantages and disadvantages of transaction processing system, online transaction processing system, serializability and recoverability, view serializability, resolving deadlock, distributed locking. Transaction management in multi-database system, long duration transaction, high-performance transaction system.	**8**	**20**
05	Object Oriented DBMS Overview of object: oriented paradigm, OODBMS architectural approaches, Object identity, procedures and encapsulation , Object oriented data model: relationship ,identifiers, Basic OODBMS terminology, Inheritance , Basic interface and class structure, Type hierarchies and inheritance, Type extents and persistent programming languages, OODBMS storage issues.	**4**	**10**
06	DDB: Distributed Database Introduction of DDB, DDBMS architectures, Homogeneous and Heterogeneous databases, Distributed data storage, Advantages of Data Distribution, Disadvantages of Data Distribution Distributed transactions, Commit protocols, Availability, Concurrency control & recovery in distributed databases, Directory systems, Data Replication, Data Fragmentation. Distributed database transparency features, distribution transparency.	**8**	**5**
07	Database application: Active database: starburst, oracle, DB2, chimera, Applications of active database, design principles for active rules, Temporal database, special, text and multimedia database. Video database management: storage management for video, video preprocessing for content representation and indexing, image and semantic-based query processing, real time buffer management.	**8**	**5**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**
Practical **Course Code: BCAC691**			

Credit: 2

List of Practical:

Implementation of practicals are adhered to the theoretical curriculum.

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Henry F. Korth and Silberschatz Abraham	Database System Concepts		Mc.Graw Hill.
Ramez Elmasri, Shamkant B.Navathe	Fundamentals of Database Systems		Addison Wesleyl
Stefano Ceri	Distributed Databases: Principles and Systems		

Reference Books:

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1	Computer with moderate configuration
2	DBMS Package

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 7**	**10**	**10**				
B	**1 to 7**			**5**	**3**	**5**	**70**
C	**1 to 7**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**
Examination Scheme for Practical Sessional examination:				
Practical Internal Sessional Continuous Evaluation				
Internal Examination:				
Five No of Experiments				
External Examination: Examiner-				
Signed Lab Note Book(for five experiments)		**5*2=10**		
On Spot Experiment(one for each group consisting 5 students)		**10**		
Viva voce		**5**		

Name of the Course: BCA **Subject:** Digital Image Processing	
Course Code: BCAD601 A+ BCAD691A	**Semester: 6th**
Duration: 36 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To gain knowledge of about digital image .
2	To gain knowledge of image processing techniques.
3	To enhance programming skills to implement image processing algorithms.

Objective:	
Sl. No.	
1	To introduce and discuss the fundamental concepts and applications of Digital Image Processing.
2	To discuss various basic operations in Digital Image Processing.
3	To know various transform domains.
4	
5	

Pre-Requisite:	
Sl. No.	

	Knowledge of mathematics and coordinate geometry.		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.	**8**	**10**
02	Digital Image Formation A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.	**10**	**10**
03	Image Enhancement Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.	**8**	**20**
04	Image Restoration Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation - Spatial Transformation, Gray Level Interpolation.	**9**	**15**
05	Image Segmentation Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection- Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding,; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.	**9**	**15**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAD691A
Credit: 2
Skills to be developed:

List of Practical:

1. As compatible with theory syllabus.

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Gonzalves	Digital Image Processing		Pearson
S. Sridhar	Digital Image Processing		Oxford

Reference Books:

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	A computer with moderate configuration.
2.	Matlab/ python opencv libraries

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 5**	**10**	**10**				
B	**1 to 5**			**5**	**3**	**5**	**70**
C	**1 to 5**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			
External Examination: Examiner-			
Signed Lab Note Book(for five experiments)		**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)		**10**	
Viva voce		**5**	

Name of the Course: BCA **Subject: Introduction to AI and Machine Learning**	
Course Code: BCAD601B	**Semester: 6th**
Duration: 48 Hrs.	**Maximum Marks: 100 +100**
Teaching Scheme	**Examination Scheme**
Theory: 4	**End Semester Exam: 70**
Tutorial: 0	**Attendance : 5**
Practical: 4	**Continuous Assessment: 25**
Credit: 4+2	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	Define Artificial Intelligence (AI) and understand its relationship with data
2.	Understand Machine Learning approach and its relationship with data science
3.	Identify the application
4.	Define Machine Learning (ML) and understand its relationship with Artificial Intelligence
Objective:	
Sl. No.	
1.	Gain a historical perspective of AI and its foundations
2.	Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
3.	Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4.	Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool.
5.	Experiment with a machine learning model for simulation and analysis.
6.	Explore the current scope, potential, limitations, and implications of intelligent systems
Pre-Requisite:	
Sl. No.	

1.	**Basic Statistical and Computational knowledge**		
Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Artificial intelligence fundamentals** A.I. systems integrating approaches and methods.- Advanced search- Constraint satisfaction problems - Knowledge representation and reasoning - Non-standard logics - Uncertain and probabilistic reasoning (Bayesian networks, fuzzy sets).- Foundations of semantic web: semantic networks and description logics. - Rules systems: use and efficient implementation.- Planning systems	**9**	**14**
02	**Machine learning** Computational learning tasks for predictions, learning as function approximation, generalization concept. - Linear models and Nearest-Neighbors (learning algorithms and properties, regularization). - Neural Networks (MLP and deep models, SOM). - Probabilistic graphical models. - Principles of learning processes: elements of statistical learning theory, model validation. - Support Vector Machines and kernel-based models. - Introduction to applications and advanced models. Applicative project: implementation and use of ML/NN models with emphasis to the rigorous application of validation techniques	**9**	**14**
03	**Human language technologies** Formal and statistical approaches to NLP. Statistical methods: Language Model, Hidden Markov Model, Viterbi Algorithm, Generative vs Discriminative Models Linguistic essentials (tokenization, morphology, PoS, collocations, etc.). Parsing (constituency and dependency parsing).Processing Pipelines. Lexical semantics: corpora, thesauri, gazetteers. Distributional Semantics: Word embeddings, Character embeddings. Deep Learning for natural language. **Applications:** Entity recognition, Entity linking, classification, summarization. Opinion mining, Sentiment Analysis. Question answering, Language inference, Dialogic interfaces. Statistical Machine Translation. NLP libraries: NLTK, Theano, Tensorflow	**9**	**14**
04	**Intelligent Systems for Pattern Recognition** Particular focus will be given to pattern recognition problems and models dealing with sequential and time-series data-Signal processing and time-series analysis-Image processing, filters and visual feature detectors-Bayesian learning and deep learning for machine vision and signal processing-Neural network models for pattern recognition on non-vectorial data (physiological data, sensor streams, etc)-Kernel and adaptive methods for relational data-Pattern recognition applications: machine vision, bio	**9**	**14**

	informatics, robotics, medical imaging, etc.-ML and deep learning libraries overview: e.g. scikit-learn, Keras, Theano		
05	**Smart applications and Robotics** Common designs for smart applications examples: fuzzy logic in control systems or cloud analysis of field sensors data streams Make or buy: selecting appropriate procurement strategies example: writing your own RRN architecture vs. using cloud services Development platforms for smart objects examples: Brillo (IoT devices) or Android TV (Smart TVs) Development platforms for smart architectures examples: TensorFlow (server-side RNNs), or the Face Recognition API (mobile) Cloud services for smart applications examples: Google Cloud Machine Learning API, Google Cloud Vision API, Google Cloud Speech API, or Deploying Deep Neural Networks on Microsoft Azure GPU VMs Deployment and operations examples: cloud hosting vs. device hosting, or harnessing user feedback to drive improvement Measuring success: methods and metrics examples: defining user engagement and satisfaction metrics, or assessing the naturalness of smart interactions **Introduction to robotics:** main definitions, illustration of application domains-Mechanics and kinematics of the robot-Sensors for robotics-Robot Control-Architectures for controlling behaviour in robots-Robotic Navigation-Tactile Perception in humans and robots-Vision in humans and robots-Analysis of case studies of robotic systems-Project laboratory: student work in the lab with robotic systems	**8**	**14**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical

Course Code: BCAD691B

Credit: 2

Skills to be developed:

List of Practical:

As compatible with theory syllabus.

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Stuart Russell and Peter Norvig	Artificial Intelligence: A Modern Approach		
Nils J Nilsson	Artificial Intelligence: A New Sythesis		
Reference Books:			
Negnevitsky	Artificial Intelligence		
Akerkar Rajendr	Intro. to artificial intelligence		
AnandHareendran S and Vinod Chandra S S	Artificial Intelligence and Machine Learning		

End Semester Examination Scheme.		**Maximum Marks-70.**		**Time allotted-3hrs.**			
Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1,2,3,4,5	10	10				
B	3, 4, 5			5	3	5	60
C	1,2,3,4,5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:				
Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

Name of the Course: BCA **Subject: Introduction to Data Science**	
Course Code: BCAD601C	**Semester: 6th**
Duration:48 Hrs	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**

Theory:4	**End Semester Exam:70**
Tutorial: 0	**Attendance: 5**
Practical:4	**Continuous Assessment:25**
Credit: 4 + 2	**Practical Sessional internal continuous evaluation:NA**
	Practical Sessional external examination:NA

Aim:

Sl. No.	
1.	To gain basic knowledge of data and information.
2.	To gain basic knowledge of data science.
3.	To understand the history, potential application area and future of data science.
4.	To gain basic knowledge of machine learning.

Objective:

Sl. No.	
1.	To gain knowledge of data, information and data science.
2.	To be able to identify problems related to data science.
3.	To be able to enhance logical thinking .
4.	To be able to understand basic machine learning principles and apply the knowledge in appropriate domains.

Pre-Requisite:

Sl. No.	
1.	Knowledge of basic mathematics.
2.	Analytical and Logical skills

Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed.	**4**	**5**
02	**Introduction to Statistics** Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model - Intro to R.	**4**	**5**
03	**Data Analysis**	**6**	**10**

	Exploratory Data Analysis and Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study: RealDirect (online real estate firm).		
04	**Machine Learning** Three Basic Machine Learning Algorithms - Linear Regression - k-Nearest Neighbors (k-NN) - k-means.	**4**	**10**
05	**Application of Machine Learning** One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why it works for Filtering Spam - Data Wrangling: APIs and other tools for scrapping the Web.	**6**	**10**
06	**Introduction to Feature** Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests.	**6**	**10**
07	**Recommendation Systems** Building a User-Facing Data Product - Algorithmic ingredients of a Recommendation Engine - Dimensionality Reduction - Singular Value Decomposition - Principal Component Analysis - Exercise: build your own recommendation system.	**6**	**5**
08	**Social-Network Graphs** Mining Social-Network Graphs - Social networks as graphs - Clustering of graphs - Direct discovery of communities in graphs - Partitioning of graphs - Neighborhood properties in graphs.	**4**	**5**
09	**Data Visualization** Data Visualization - Basic principles, ideas and tools for data visualization 3 - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset.	**4**	**5**
10	**Data Science and Ethical Issues**	**4**	**5**

	Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists.		
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**52**	**100**

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Books

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Jure Leskovek, AnandRajaraman and Jeffrey Ullman	Mining of Massive Datasets. v2.1		Free Online
Kevin P. Murphy	Machine Learning: A Probabilistic Perspective	ISBN 0262018020	
Foster Provost and Tom Fawcett	Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking	ISBN 1449361323. 2013	
Trevor Hastie, Robert Tibshirani and Jerome Friedman	Elements of Statistical Learning	Second Edition. ISBN 0387952845. 2009. (free online)	
Cathy O'Neil and Rachel Schutt	Doing Data Science, Straight Talk From The Frontline		O'Reilly

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 10	10	10				

B	1 to 10			5	3	5	70
C	1 to 10			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Major Project with Viva-Voce	
Course Code: BCAD681	**Semester: 6th**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: NA**
Tutorial: 0	**Attendance : NA**
Practical: 0	**Continuous Assessment: NA**
Credit: 8	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	Analyze and apply the role of client side and server side scripting languages.
2	Building team work.
3	
4	

Objective:	
Sl. No.	
1	Analyze and apply the role of client side and server side scripting languages.

2	Building team work.
3	

Bachelor of Computer Application

Semester V							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	**CC12**	**BCAC501 BCAC591**	**Internet Technology**	**4**	**0**	**4**	**6**
2	CC13	BCAC502	Theory of Computation	5	1	0	6
3	DSE-I	BCAD501	A. Information Security B. Cloud Computing C. Artificial Intelligence	5/4	1/0	0/4	6
4	DSE-2	BCAD502	A. Numerical Methods B. Combinatorial Optimization C. Soft Computing	4/5	0/1	4/0	6
Sessional							
5	SEC-4	BCAS501	Industrial Training and Internship	0	0	0	**2**
						Total Credit	26

CC: Core Course
GE: General Electives(To be selected from MOOCs Basket listed below)
AEC: Ability Enhancement Course
SEC: Skill Enhancement Course

Bachelor of Computer Application
Semester-5

Name of the Course: BCA **Subject:** Internet Technology	
Course Code: BCAC501 + BCAC591	**Semester: 5th**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To gain comprehensive knowledge of Internet and its working.
2	Ability to use services offered by internet.

3	To enhance skill to develop websites using HTML , CSS, JS.
4	
Objective:	
Sl. No.	
1	To introduce the students to the network of networks -Internet.
2	To enable the students to use various services offered by internet.
3	To gain knowledge about the protocols used in various services of internet.
4	To understand the working and applications of Intranet and Extranet.
5	
Pre-Requisite:	
Sl. No.	
1	Understanding of basic programming logic.

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction to Networking Overview of Networking, Intranet, Extranet and Internet, Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP, Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6, Classful and Classless Addressing, Subnetting. NAT, IP masquerading, IPtables, Routing -Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast, Electronic Mail	8	12
02	Web Programming Introduction to HTML, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Color name, Color value, Image Maps, area, attributes of image area, Extensible Markup Language (XML), CGI Scripts, GET and POST Methods.	8	15
03	Server Side Programming and Scripting Basic PHP Programming, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling, JavaScript basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation, Definition of cookies, Create and Store cookie.	8	15
04	Security Issues Network security techniques, Password and Authentication, VPN, IP Security, security in electronic transaction, Secure Socket Layer(SSL), Secure Shell (SSH), Introduction to Firewall, Packet filtering, Stateful,	**10**	**13**

	Application layer, Proxy.		
05	Advance Internet Technology Internet Telephony (VoIP), Multimedia Applications, Multimedia over IP: RSVP, RTP, RTCP and RTSP. Streamingmedia, Codec and Plugins, IPTV, Search Engine Optimization, Metadata.	**10**	**15**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAC591
Credit: 2
Skills to be developed:
Intellectual skills:

1. Ability to understand Web Design and Development.
2. Ability to analyze problems and provide program based solutions.

List of Practical:

1. As compatible to theory syllabus.

Assignments:
Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
N.P. Gopalan and J. Akilandeswari	Web Technology: A Developer's Perspective		PHI
Rahul Banerjee	Internetworking Technologies, An Engineering Perspective		PHI Learning

Reference Books:

List of equipment/apparatus for laboratory experiments:

Sl. No.	

1.	Computer with moderate configuration

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 5	10	10				
B	1 to 5			5	3	5	70
C	1 to 5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

Name of the Course: BCA
Subject: Theory of Computation

Course Code: BCAC502	**Semester: 5th**
Duration: 60 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	End Semester Exam: 70
Tutorial: 1	Attendance : 5
Practical: 0	Continuous Assessment: 25
Credit: 6	Practical Sessional internal continuous evaluation: NA
	Practical Sessional external examination: NA

Aim:	
Sl. No.	
1	To gain knowledge of automata theory.
2	To understand the theoretical computer science.
3	
4	

Objective:	
Sl. No.	
1	Study various types of finite automata.
2	Understand the challenge of theoretical computer science and it's application.
3	
4	
5	

Pre-Requisite:	
Sl. No.	**None**

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Languages [Alphabets, string, language, Basic Operations on language, Concatenation, KleeneStar	**11**	**10**
02	Finite Automata and Regular Languages Regular Expressions, Transition Graphs, Deterministics and non-deterministic finite automata, NFA to DFA Conversion, Regular languages and their relationship with finite automata, Pumping lemma and closure properties of regular languages.	**15**	**20**
03	Context free languages Context free grammars, parse trees, ambiguities in grammar and languages, Pushdown automata (Deterministic and Non-deterministic), Pumping Lemma, Properties of context free languages, normal forms.	**15**	**20**

04	Turing Machines and Models of Computation RAM, Turing Machine as a model of computation, Universal Turing Machine, Language acceptability, decidability, halting problem, Recursively enumerable and recursive languages, unsolvability problems.	**15**	**20**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Daniel I.A.Cohen	Introduction to computer theory	8th Edition	John Wiley Publications
Lewis & Papadimitriou	Elements of the theory of computation		PHI
Hoperoft, Aho, Ullman	Introduction to Automata theory, Language & Computation	3 rd Edition	Pearson Education

Reference Books:

P. Linz	An Introduction to Formal Language and Automata	4th edition	Publication Jones Bartlett

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A **B** **C**	**1 to 4** **1 to 4** **1 to 4**	**10**	**10**	 **5** **5**	 **3** **3**	 **5** **15**	 **70**

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject: Information Security**	
Course Code: BCAD501A	**Semester: 5th**
Duration: 60 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: 70**
Tutorial: 1	**Attendance : 5**
Practical: 0	**Continuous Assessment: 25**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA

Aim:	
Sl. No.	
1.	This introductory course is aimed at giving basic understanding about system security.
2.	This entry-level course covers a broad spectrum of security topics and is based on real-life examples to create system security interest in the students
3.	A balanced mix of technical and managerial issues makes this course appealing to attendees who need to understand the salient facets of information security basics and the basics of risk management.

Objective:	
Sl. No.	
1.	Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
2.	Gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.
3.	Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
4.	Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges

Pre-Requisite:	
Sl. No.	
1.	Not Required

Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Information and Network Security fundamentals** Overview of Networking Concepts Basics of Communication Systems, Transmission Media, Topology and Types of Networks, TCP/IP Protocol, Wireless	**15**	**20**

	Networks, The Internet Information Security Concepts Information Security Overview: Background and Current Scenario, Types of Attacks, Goals for Security, E-commerce Security Security Threats and Vulnerabilities Overview of Security threats, Weak / Strong Passwords and Password Cracking, Insecure Network connections, Malicious Code Cybercrime and Cyber terrorism Cryptography Introduction to Cryptography, Digital Signatures, Public Key infrastructure, Applications of Cryptography, Tools and techniques of Cryptography		
02	**Security Management** Security Management Practices Overview of Security Management, Security Policy, Risk Management, Ethics and Best Practices Security Laws and Standards Security Assurance, Security Laws, International Standards, Security Audit	**15**	**10**
03	**Information and Network Security** Server Management and Firewalls User Management, Overview of Firewalls, Types of Firewalls, DMZ and firewall features Security for VPN and Next Generation Technologies VPN Security, Security in Multimedia Networks, Various Computing Platforms: HPC, Cluster and Computing Grids, Virtualization and Cloud Technology and Security	**15**	**20**
04	**System and Application Security** Security Architectures and Models Designing Secure Operating Systems, Controls to enforce security services, Information Security Models System Security Desktop Security, Email security, Database Security	**11**	**20**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
B. A. Forouzan	Data Communications and Networking	3rd Ed	TMH
A. S. Tanenbaum	Computer Networks	4th Ed	Pearson Education/PHI

Reference Books:			
W. Stallings	Data and Computer Communications	5th Ed	PHI/ Pearson Education
Atul Kahate	Cryptography & Network Security		TMH

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1,2,3,4,5	10	10				
B	3, 4, 5			5	3	5	60
C	1,2,3,4,5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

Name of the Course: BCA
Subject: Cloud Computing

Course Code: BCAD501B	**Semester: 5th**
Duration: 60 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	End Semester Exam: 70
Tutorial: 1	Attendance : 5
Practical: 0	Continuous Assessment: 25
Credit: 6	Practical Sessional internal continuous evaluation:
Aim:	Practical Sessional external examination:

1	To gain knowledge of cloud computing.
2	To gain knowledge of several application areas of cloud computing.
3	To understand cloud computing platforms.
4	
Objective:	
Sl. No.	
1	Understand the principles of cloud computing.

2	Understanding SaaS, PaaS etc.
3	To gain knowledge of applications of cloud computing.
Pre-Requisite:	
Sl. No.	None

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Definition of Cloud Computing and its Basics Definition of Cloud Computing: Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model. Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing Cloud Architecture: A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients . Services and Applications by Type IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS – Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service (IDaaS) Compliance as a Service (CaaS)	**15**	**15**
02	Use of Platforms in Cloud Computing Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF) Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development Use of PaaS Application frameworks. Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google	**15**	**15**

	Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service. Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store, Amazon SimpleDB and Relational Database Service Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services		
03	Cloud Infrastructure Cloud Management :An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle) Concepts of Cloud Security Cloud security concerns, Security boundary, Security service boundary Overview of security mapping Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)	**15**	**20**
04	Concepts of Services and Applications Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs Cloud-based Storage: Cloud storage definition – Manned and Unmanned Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services	**11**	**20**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**
Assignments:			

Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Barrie Sosinsky	Cloud Computing Bible		Wiley India Pvt. Ltd
Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi	Mastering Cloud Computing		McGraw Hill Education (India) Private Limited

Reference Books:

Anthony T. Velte	Cloud computing: A practical approach,		Tata Mcgraw-Hill

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 4**	**10**	**10**				
B	**1 to 4**			**5**	**3**	**5**	**70**
C	**1 to 4**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Information and Coding Theory	
Course Code: BCAD501C	**Semester: 6th**
Duration: 60 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: 70**
Tutorial: 1	**Attendance : 5**
Practical: 0	**Continuous Assessment: 25**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**

	Practical Sessional external examination: NA		
Aim:			
Sl. No.			
1	Introduced to the basic notions of information and channel capacity.		
2	To introduce information theory, the fundamentals of error control coding techniques and their applications, and basic cryptography.		
3	To provide a complementary U/G physical layer communication		
	to convolutional and block codes, decoding techniques, and automatic repeat request (ARQ) schemes.		
Objective:			
Sl. No.			
1	Understand how error control coding techniques are applied in communication systems.		
2	Able to understand the basic concepts of cryptography.		
3	To enhance knowledge of probabilities, entropy, measures of information.		
Pre-Requisite:			
Sl. No.			
1.	Probability and Statistics		
Contents		**3 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**INFORMATION ENTROPY FUNDAMENTALS** Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.	**20**	**23**
02	**DATA AND VOICE CODING** Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC). Denial of Service Attacks, DOS-proof network architecture, Security architecture of World Wide Web, Security Architecture of Web Servers, and Web Clients, Web Application Security – Cross Site Scripting Attacks, Cross Site Request Forgery, SQL Injection Attacks, Content Security Policies (CSP) in web, Session Management and User Authentication, Session Integrity, Https, SSL/TLS, Threat Modeling, Attack Surfaces, and other comprehensive approaches to network design for	**20**	**24**

	security		
03	**ERROR CONTROL CODING** Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.	**16**	**23**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Simon Haykin	Communication Systems	4th Edition	John Wiley and Sons, 2001
Fred Halsall	Multimedia Communications, Applications Networks Protocols and Standards		Pearson Education, Asia 2002
Reference Books:			
Mark Nelson	Data Compression Book		Publication 1992
Watkinson J	Compression in Video and Audio		Focal Press, London, 1995

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1,2,3**	**10**	**10**				
B	**1,2,3**			**5**	**3**	**5**	**60**
C	**1,2,3**			**5**	**3**	**15**	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Numerical and statistical Methods			
Course Code: BCAD502A		**Semester: 5th**	
Duration: 60 Hrs.		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 5		**End Semester Exam: 70**	
Tutorial: 1		**Attendance : 5**	
Practical: 0		**Continuous Assessment: 25**	
Credit: 6		**Practical Sessional internal continuous evaluation: NA**	
		Practical Sessional external examination: NA	
Aim:			
Sl. No.			
2.			
3.			
4.			
5.			
Sl. No.			
6.			
7.			
8.			
9. Pre-Requisite:			
Sl. No.			
10.	None		
Contents		**3 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
1	Roots of Equations: Graphical Method -Bisection Method - False-Position Method - Fixed-Point Iteration - Newton-Raphson Method Secant Method - Roots of Polynomials:	**8**	**14**

	Conventional Methods - Muller's Method - Bairstow's Method. Algebraic Equations: Gauss Elimination -Gauss-Jordan - LU Decomposition - Matrix Inverse -Gauss-Seidel		
2	Numerical Differentiation - Integration: Trapezoidal Rule - Simpson's Rule - Romberg Integration - Differential equations: Taylor's method - Euler's method -Runge-Kutta 2nd and 4th order methods Predictor - corrector methods.	**12**	**14**
3	Diagrammatic and Graphical representation of Numerical Data - Formation of frequency distribution - Histogram, Cumulative Frequency - Polygon and Ogives - Measures of central tendencies - Mean, Median, Mode - Measures of dispersion - Mean deviation, Standard deviation, variance, Quartile deviation and coefficient of variation - Moments (upto 4th) - Measures of Skewness and Kurtosis for grouped and ungrouped data.	**12**	**14**
4	Sample space - Events - Definition of probability - combinatorial problems - conditional probability and independence - Random variables, distributions and Mathematical expectations - Discrete distributions - Binomial - Poisson - Continuous distributions - Normal and Exponential distributions - Moments and Moment generating functions.	**12**	**14**
5	Correlation and Regression analysis: product moment correlation -coefficient - rank correlation coefficient - simple regression - method of least squares for estimation of regression coefficient. Concept of sampling and Sampling distributions - Sampling from Normal distributions - Standard error - Tests of significance - Large sample test for population mean and proportions - Test for populations means: single - two sample and paired t - test - Chi square tests for goodness of fit and test for independence of attributes in contingency table.	**12**	**14**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Snedecor G.W. and Cochran W.G. (1989)	Statistical methods	8 ed	Affiliated East West.
Trivedi K.S. (1994)	Probability and Statistics with Reliability, Queueing and computer Science		Prentice Hall of India

	applications		
Reference Books:			
S. C. Chopra and R. P.Canale	Numerical Methods for Engineers	3rd	McGraw Hill International Edition

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
• **A** • • **B** • • **C**	**1,2,3,4,5** **1,2,3,4,5** **1,2,3,4,5**	**10**	**10**	 **5** **5**	 **3** **3**	 **5** **15**	 **60**

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Combinatorial Optimization	
Course Code: BCAD502B	**Semester: 5th**
Duration: 60 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: 70**
Tutorial: 1	**Attendance : 5**
Practical: 0	**Continuous Assessment: 25**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA
Aim:	
Sl. No.	

1.	To Understand Combinatorial Optimization problems
2.	
3.	
4.	
Sl. No.	
5.	
6.	
7.	
Pre-Requisite:	
Sl. No.	
	None

Contents		**6 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
1	Introduction to combinatorial optimization. Matrix multiplication Knapsack problem Tardos, Prof. Ranade's lecture Bipartite matching problem	**12**	**14**
2	Introduction to Linear algebra - Vectors, matrices, row view, column view, matrix multiplication, special matrices: square, symmetric, identity. Inverse of a matrix Row/Column space, rank, orthogonal vectors, null space, fundamental theorem of linear algebra	**12**	**14**
3	Introduction to Linear programming - diet problem example, the LP problem, 2-D geometric view and finding min and max Different LP problems. Feasible solution, basic feasible solution (bfs)	**12**	**14**
4	Existence of basic feasible solution Affine set, affine combination of points, Convex sets - examples, closure properties, Convex Hull of a set	**12**	**14**
5	Traversing from one bfs to another bfs Finding an initial bfs, The simplex algorithm, Proof of correctness	**8**	**14**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Vangelis Th. Paschos	Concepts of Combinatorial Optimization	2nd Edition	Wiley
Reference Books:			

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
• **A** • **B** • **C**	**1,2,3,4,5** **1,2,3,4,5** **1,2,3,4,5**	**10**	**10**	**5** **5**	**3** **3**	**5** **15**	**60**

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Soft Computing	
Course Code:BCAD502C	**Semester: 5th**
Duration: 60	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: 70**
Tutorial: 1	**Attendance : 5**

Practical:0	**Continuous Assessment:25**
Credit: 6	**Practical Sessional internal continuous evaluation:NA**
	Practical Sessional external examination:NA

Aim:

Sl. No.	
1.	Enumerate the theoretical basis of soft computing
2.	Explain the fuzzy set theory
3.	Discuss the neural networks and supervised and unsupervised learning networks
4.	Demonstrate some applications of computational intelligence
5.	Apply the most appropriate soft computing algorithm for a given situation

Objective:

Sl. No.	
1.	Enumerate the strengths and weakness of soft computing
2.	Illustrate soft computing methods with other logic driven and statistical method driven approaches
3.	Focus on the basics of neural networks, fuzzy systems, and evolutionary computing
4.	Emphasize the role of euro-fuzzy and hybrid modeling methods
5.	Trace the basis and need for evolutionary computing and relate it with other soft computing approaches

Pre-Requisite:

Sl. No.	
1	Mathematical knowledge

Contents		**6 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**

01	Introduction: Introduction to soft computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm.	**8**	**5**
02	Fuzzy sets and Fuzzy logic systems: Classical Sets and Fuzzy Sets and Fuzzy relations : Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations. Membership functions : Features of membership functions, standard forms and boundaries, different fuzzification methods. Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods. Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules, Fuzzy InferenceSystem-Mamdani Fuzzy Models – Sugeno Fuzzy Models. Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, GeneralFuzzy Logic controllers, BasicMedical Diagnostic systems and Weather forecasting	**12**	**20**
03	Neural Network Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, BiologicalNeurons and Artificial neural network; model of artificial neuron. Learning Methods : Hebbian, competitive, Boltzman etc., Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Back-propagation and multi layer networks. Competitive learning networks: Kohonenself organizing networks, Hebbian learning; Hopfield Networks. Neuo-Fuzzy modelling:	**12**	**20**

	Applications of Neural Networks: Pattern Recognition and classification		
04	Genetic Algorithms: Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA). Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Imageprocessing and pattern Recognition	**12**	**15**
05	Other Soft Computing techniques: Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO).	**12**	**10**
	Sub Total:	**56**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**60**	**100**

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Timothy J. Ross	Fuzzy logic with engineering applications		John Wiley and Sons.
S. Rajasekaran and G.A.V.Pai,	Neural Networks, Fuzzy Logic and Genetic Algorithms		PHI

Reference Books:

S N Sivanandam, S. Sumathi	Principles of Soft Computing		John Wiley & Sons
David E. Goldberg	Genetic Algorithms in search, Optimization &		Pearson/PHI

	Machine Learning		
Samir Roy &Udit Chakraborty	A beginners approach to Soft Computing		Pearson
Kumar Satish	Neural Networks: A Classroom Approach,1/e		TMH

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 5**	**10**	**10**				**60**
B	**1 to 5**			**5**	**3**	**5**	
C	**1 to 5**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**3**	**3**

Name of the Course: BCA **Subject: Industrial Training and Internship**	
Course Code: BCAS501	**Semester: 5th**
Duration: 4 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	End Semester Exam: NA
Tutorial: 0	Attendance: NA
Practical: 0	Continuous Assessment: NA
Credit: 2	Practical Sessional internal continuous evaluation:40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To develop industrial understanding.
2	To develop understanding of project management.
3	To cope up with industry oriented real time project environment.

Objective:	
Sl. No.	
1	To develop team work.
2	To develop understanding of project management.
3	To be able to implement real life software or hardware based projects.

Pre-Requisite:	
Sl. No.	
1.	None

Bachelor of Computer Application
Semester-6

Semester VI							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory							
1	CC14	BCAC601 BCAC691	Advanced Database and PL-SQL	4	0	4	6
2	DSE-3	BCAD601 BCAD691	A. Digital Image Processing B. Introduction to AI and Machine Learning C. Introduction to Data Science	4	0	4	6

Sessional							
3	SEC-3	BCAS601	Grand Viva	0	0	2	**1**
4	DSE-4	BCAD681	Major Project and Entrepreneurship	0	0	8	**4**
5	SEC-4	BCAS602	Seminar	0	0	4	**2**
			Total Credit				19

Name of the Course: BCA **Subject: Advanced DBMS with PL-SQL**	
Course Code: BCAC601 + BCAC691	**Semester: 6th**
Duration: 48 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To gain knowledge of advanced database management ideas.
2	To gain knowledge of concurrency control and recovery management procedures.
3	To gain skill to write database programs using SQL or PL-SQL.
4	

Objective:	
Sl. No.	
1	Understand the concept of Database transactions management.
2	Understand the concept of concurrency control techniques and recovery management.
3	Gain idea about distributed DBMS.
4	To gain skill to write PL-SQL.

Pre-Requisite:	
Sl. No.	
1.	None

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Query Optimization Algorithm for Executing Query Operations: External sorting, Select operation, Join operation, PROJECT and set operation, Aggregate operations, Outer join, Heuristics in Query Optimization, Semantic Query Optimization, Converting Query Tree to Query Evaluation Plan, multiquery optimization and application, Efficient and extensible algorithms for multi-query optimization, execution strategies for SQL sub queries, Query Processing for SQL Updates	**6**	**5**

02	ARQQuery Execution: Introduction to Physical-Query-Plan Operators, One-Pass Algorithms for Database, Operations, Nested-Loop Joins, Two-Pass Algorithms Based on Sorting, Two-Pass, Algorithms Based on Hashing, Index-Based Algorithms, Buffer Management, Parallel Algorithms for Relational Operations, Using Heuristics in Query Optimization, Basic Algorithms for Executing Query Operations.	**6**	**5**
03	Concurrency Control Serializability: Enforcing, Serializability by Locks, Locking Systems With Several, Lock Modes, Architecture for a Locking Scheduler Managing Hierarchies of Database Elements, Concurrency Control by Timestamps, Concurrency Control by Validation, Database recovery management	**4**	**20**
04	Transaction processing: Introduction of transaction processing, advantages and disadvantages of transaction processing system, online transaction processing system, serializability and recoverability, view serializability, resolving deadlock, distributed locking. Transaction management in multi-database system, long duration transaction, high-performance transaction system.	**8**	**20**
05	Object Oriented DBMS Overview of object: oriented paradigm, OODBMS architectural approaches, Object identity, procedures and encapsulation , Object oriented data model: relationship ,identifiers, Basic OODBMS terminology, Inheritance , Basic interface and class structure, Type hierarchies and inheritance, Type extents and persistent programming languages, OODBMS storage issues.	**4**	**10**
06	DDB: Distributed Database Introduction of DDB, DDBMS architectures, Homogeneous and Heterogeneous databases, Distributed data storage, Advantages of Data Distribution, Disadvantages of Data Distribution Distributed transactions, Commit protocols, Availability, Concurrency control & recovery in distributed databases, Directory systems, Data Replication, Data Fragmentation. Distributed database transparency features, distribution transparency.	**8**	**5**
07	Database application: Active database: starburst, oracle, DB2, chimera, Applications of active database, design principles for active rules, Temporal database, special, text and multimedia database. Video database management: storage management for video, video preprocessing for content representation and indexing, image and semantic-based query processing, real time buffer management.	**8**	**5**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**
Practical **Course Code: BCAC691**			

Credit: 2

List of Practical:

Implementation of practicals are adhered to the theoretical curriculum.

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Henry F. Korth and Silberschatz Abraham	Database System Concepts		Mc.Graw Hill.
Ramez Elmasri, Shamkant B.Navathe	Fundamentals of Database Systems		Addison Wesleyl
Stefano Ceri	Distributed Databases: Principles and Systems		

Reference Books:

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1	Computer with moderate configuration
2	DBMS Package

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 7**	**10**	**10**				
B	**1 to 7**			**5**	**3**	**5**	**70**
C	**1 to 7**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**
Examination Scheme for Practical Sessional examination:				
Practical Internal Sessional Continuous Evaluation				
Internal Examination:				
Five No of Experiments				
External Examination: Examiner-				
Signed Lab Note Book(for five experiments)		**5*2=10**		
On Spot Experiment(one for each group consisting 5 students)		**10**		
Viva voce		**5**		

Name of the Course: BCA **Subject:** Digital Image Processing	
Course Code: BCAD601 A+ BCAD691A	**Semester: 6th**
Duration: 36 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To gain knowledge of about digital image .
2	To gain knowledge of image processing techniques.
3	To enhance programming skills to implement image processing algorithms.

Objective:	
Sl. No.	
1	To introduce and discuss the fundamental concepts and applications of Digital Image Processing.
2	To discuss various basic operations in Digital Image Processing.
3	To know various transform domains.
4	
5	

Pre-Requisite:	
Sl. No.	

	Knowledge of mathematics and coordinate geometry.		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.	**8**	**10**
02	Digital Image Formation A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.	**10**	**10**
03	Image Enhancement Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.	**8**	**20**
04	Image Restoration Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation - Spatial Transformation, Gray Level Interpolation.	**9**	**15**
05	Image Segmentation Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection- Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding,; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.	**9**	**15**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical
Course Code: BCAD691A
Credit: 2
Skills to be developed:

List of Practical:

1. As compatible with theory syllabus.

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Gonzalves	Digital Image Processing		Pearson
S. Sridhar	Digital Image Processing		Oxford

Reference Books:

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	A computer with moderate configuration.
2.	Matlab/ python opencv libraries

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 5**	**10**	**10**				
B	**1 to 5**			**5**	**3**	**5**	**70**
C	**1 to 5**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			
External Examination: Examiner-			
Signed Lab Note Book(for five experiments)		**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)		**10**	
Viva voce		**5**	

Name of the Course: BCA **Subject: Introduction to AI and Machine Learning**	
Course Code: BCAD601B	**Semester: 6th**
Duration: 48 Hrs.	**Maximum Marks: 100 +100**
Teaching Scheme	**Examination Scheme**
Theory: 4	**End Semester Exam: 70**
Tutorial: 0	**Attendance : 5**
Practical: 4	**Continuous Assessment: 25**
Credit: 4+2	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	Define Artificial Intelligence (AI) and understand its relationship with data
2.	Understand Machine Learning approach and its relationship with data science
3.	Identify the application
4.	Define Machine Learning (ML) and understand its relationship with Artificial Intelligence
Objective:	
Sl. No.	
1.	Gain a historical perspective of AI and its foundations
2.	Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
3.	Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4.	Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool.
5.	Experiment with a machine learning model for simulation and analysis.
6.	Explore the current scope, potential, limitations, and implications of intelligent systems
Pre-Requisite:	
Sl. No.	

1.	**Basic Statistical and Computational knowledge**		
Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Artificial intelligence fundamentals** A.I. systems integrating approaches and methods.- Advanced search- Constraint satisfaction problems - Knowledge representation and reasoning - Non-standard logics - Uncertain and probabilistic reasoning (Bayesian networks, fuzzy sets).- Foundations of semantic web: semantic networks and description logics. - Rules systems: use and efficient implementation.- Planning systems	**9**	**14**
02	**Machine learning** Computational learning tasks for predictions, learning as function approximation, generalization concept. - Linear models and Nearest-Neighbors (learning algorithms and properties, regularization). - Neural Networks (MLP and deep models, SOM). - Probabilistic graphical models. - Principles of learning processes: elements of statistical learning theory, model validation. - Support Vector Machines and kernel-based models. - Introduction to applications and advanced models. Applicative project: implementation and use of ML/NN models with emphasis to the rigorous application of validation techniques	**9**	**14**
03	**Human language technologies** Formal and statistical approaches to NLP. Statistical methods: Language Model, Hidden Markov Model, Viterbi Algorithm, Generative vs Discriminative Models Linguistic essentials (tokenization, morphology, PoS, collocations, etc.). Parsing (constituency and dependency parsing).Processing Pipelines. Lexical semantics: corpora, thesauri, gazetteers. Distributional Semantics: Word embeddings, Character embeddings. Deep Learning for natural language. **Applications:** Entity recognition, Entity linking, classification, summarization. Opinion mining, Sentiment Analysis. Question answering, Language inference, Dialogic interfaces. Statistical Machine Translation. NLP libraries: NLTK, Theano, Tensorflow	**9**	**14**
04	**Intelligent Systems for Pattern Recognition** Particular focus will be given to pattern recognition problems and models dealing with sequential and time-series data-Signal processing and time-series analysis-Image processing, filters and visual feature detectors-Bayesian learning and deep learning for machine vision and signal processing-Neural network models for pattern recognition on non-vectorial data (physiological data, sensor streams, etc)-Kernel and adaptive methods for relational data-Pattern recognition applications: machine vision, bio	**9**	**14**

	informatics, robotics, medical imaging, etc.-ML and deep learning libraries overview: e.g. scikit-learn, Keras, Theano		
05	**Smart applications and Robotics** Common designs for smart applications examples: fuzzy logic in control systems or cloud analysis of field sensors data streams Make or buy: selecting appropriate procurement strategies example: writing your own RRN architecture vs. using cloud services Development platforms for smart objects examples: Brillo (IoT devices) or Android TV (Smart TVs) Development platforms for smart architectures examples: TensorFlow (server-side RNNs), or the Face Recognition API (mobile) Cloud services for smart applications examples: Google Cloud Machine Learning API, Google Cloud Vision API, Google Cloud Speech API, or Deploying Deep Neural Networks on Microsoft Azure GPU VMs Deployment and operations examples: cloud hosting vs. device hosting, or harnessing user feedback to drive improvement Measuring success: methods and metrics examples: defining user engagement and satisfaction metrics, or assessing the naturalness of smart interactions **Introduction to robotics:** main definitions, illustration of application domains-Mechanics and kinematics of the robot-Sensors for robotics-Robot Control-Architectures for controlling behaviour in robots-Robotic Navigation-Tactile Perception in humans and robots-Vision in humans and robots-Analysis of case studies of robotic systems-Project laboratory: student work in the lab with robotic systems	**8**	**14**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical

Course Code: BCAD691B

Credit: 2

Skills to be developed:

List of Practical:

As compatible with theory syllabus.

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Stuart Russell and Peter Norvig	Artificial Intelligence: A Modern Approach		
Nils J Nilsson	Artificial Intelligence: A New Sythesis		
Reference Books:			
Negnevitsky	Artificial Intelligence		
Akerkar Rajendr	Intro. to artificial intelligence		
AnandHareendran S and Vinod Chandra S S	Artificial Intelligence and Machine Learning		

End Semester Examination Scheme.		**Maximum Marks-70.**		**Time allotted-3hrs.**			
Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1,2,3,4,5	10	10				
B	3, 4, 5			5	3	5	60
C	1,2,3,4,5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:				
Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

Name of the Course: BCA **Subject: Introduction to Data Science**	
Course Code: BCAD601C	**Semester: 6th**
Duration:48 Hrs	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**

Theory:4	**End Semester Exam:70**
Tutorial: 0	**Attendance: 5**
Practical:4	**Continuous Assessment:25**
Credit: 4 + 2	**Practical Sessional internal continuous evaluation:NA**
	Practical Sessional external examination:NA

Aim:

Sl. No.	
1.	To gain basic knowledge of data and information.
2.	To gain basic knowledge of data science.
3.	To understand the history, potential application area and future of data science.
4.	To gain basic knowledge of machine learning.

Objective:

Sl. No.	
1.	To gain knowledge of data, information and data science.
2.	To be able to identify problems related to data science.
3.	To be able to enhance logical thinking .
4.	To be able to understand basic machine learning principles and apply the knowledge in appropriate domains.

Pre-Requisite:

Sl. No.	
1.	Knowledge of basic mathematics.
2.	Analytical and Logical skills

Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed.	**4**	**5**
02	**Introduction to Statistics** Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model - Intro to R.	**4**	**5**
03	**Data Analysis**	**6**	**10**

	Exploratory Data Analysis and Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study: RealDirect (online real estate firm).		
04	**Machine Learning** Three Basic Machine Learning Algorithms - Linear Regression - k-Nearest Neighbors (k-NN) - k-means.	**4**	**10**
05	**Application of Machine Learning** One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why it works for Filtering Spam - Data Wrangling: APIs and other tools for scrapping the Web.	**6**	**10**
06	**Introduction to Feature** Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests.	**6**	**10**
07	**Recommendation Systems** Building a User-Facing Data Product - Algorithmic ingredients of a Recommendation Engine - Dimensionality Reduction - Singular Value Decomposition - Principal Component Analysis - Exercise: build your own recommendation system.	**6**	**5**
08	**Social-Network Graphs** Mining Social-Network Graphs - Social networks as graphs - Clustering of graphs - Direct discovery of communities in graphs - Partitioning of graphs - Neighborhood properties in graphs.	**4**	**5**
09	**Data Visualization** Data Visualization - Basic principles, ideas and tools for data visualization 3 - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset.	**4**	**5**
10	**Data Science and Ethical Issues**	**4**	**5**

	Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists.		
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**52**	**100**

Assignments:

Based on the curriculum as covered by the subject teacher.

List of Books

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Jure Leskovek, AnandRajaraman and Jeffrey Ullman	Mining of Massive Datasets. v2.1		Free Online
Kevin P. Murphy	Machine Learning: A Probabilistic Perspective	ISBN 0262018020	
Foster Provost and Tom Fawcett	Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking	ISBN 1449361323. 2013	
Trevor Hastie, Robert Tibshirani and Jerome Friedman	Elements of Statistical Learning	Second Edition. ISBN 0387952845. 2009. (free online)	
Cathy O'Neil and Rachel Schutt	Doing Data Science, Straight Talk From The Frontline		O'Reilly

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 10	10	10				

B	1 to 10			5	3	5	70
C	1 to 10			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: BCA **Subject:** Major Project with Viva-Voce	
Course Code: BCAD681	**Semester: 6th**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: NA**
Tutorial: 0	**Attendance : NA**
Practical: 0	**Continuous Assessment: NA**
Credit: 8	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	Analyze and apply the role of client side and server side scripting languages.
2	Building team work.
3	
4	

Objective:	
Sl. No.	
1	Analyze and apply the role of client side and server side scripting languages.

2	Building team work.
3	

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL
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Ref.No. COE/Notice/CBCS Syllabus/70/2020-21 Date: 13TH January,2021

Updated GE Baskets for Odd Semester 2020-21 for CBCS structure programs

Basket No	GE Basket	Course Code	Course Name
Basket 1	HUMANITIES & HUMAN SKILLS	GE1B-01	Mind and Measurement
		GE1B-02	Introduction to Hospitality Industry and major Departments
		GE1B-03	Health Education & Communication
		GE1B-04	Sustainability & Fashion
		GE1B-05	The Yoga Professional
		GE1B-06	Indian History & Culture
Basket 2	CREATIVE & PERFORMING ARTS	GE2B-01	Cinema and Other Arts
		GE2B-02	Surface & Soft Furnishings Design Development Techniques
Basket 3	GENERAL SCIENCE & **MATHEMATICS**	GE3B-01	Study of Textiles
		GE3B-02	IT Literacy
		GE3B-03	Basic Mathematics & Statistics
		GE3B-04	Mathematics for Computer Science Part- 1
Basket 4	EMERGING TECH, INNOVATION & ENTREPRENEURSHIP	GE4B-01	Operating Systems with Linux
Basket 5	OTHER COURSES	GE5B-01	Principles of Management

(S Datta)
Controller of Examinations

Detail Syllabus of GE Courses available in Offline/Blended mode:

Course Name: Mind and Measurement
Course Code: GE1B-01

Mode- Offline/ Blended **Credits: 6**

Course Objectives: The course has been designed to explore the emotional and motivational states of mind along with knowledge and application of higher cognitive functions. The learner will be able to apply the knowledge of cognition, conation and effect on the human psyche in the context of personal and professional domains and make a relation between brain and body through the understanding of Human Physiology, various psychological processes and changes throughout the lifespan of humans.

Sl	Course Outcome	Mapped modules
CO1	Explaining the concept and the physiological correlates of emotion.	(M1) BL2
CO2	Understanding the different theoretical aspects of emotion.	(M2) BL2
CO3	Explaining the concept and the physiological correlates of motivation.	(M3) BL2
CO4	Understanding the different theoretical aspects of motivation.	(M4) BL2
CO5	Labelling different span of attention.	(M5) BL2
CO6	Assessment of memorization capacity	(M6) BL1, BL2

Module	Content	Total Hours	%ageof questions	Blooms Level (if applicable)	Remarks (If any)
Module 1	Define Emotion and Physiological correlates of emotion: Electrical, Circulatory changes, Respiration and Peripheral measures. The role of Cortex in Emotions. Concept of Homeostasis.	5	15	2	
Module 2	Theories of Emotion : James-Lange; Cannon-Bard, Lindsay, Schachter-Singer, and Lazarus	8	20	2	
Module 3	Understanding the concept of Motivation in connection to its role in education and physiological basis of hunger, thirst.	8	20	2	
Module 4	Theories of Motivation – Maslow, McClelland, Murray. Application, Nature of thinking; Inductive and Deductive reasoning; Problem solving approaches	10	15	2	
Module 5	Assessment of the different span of attention- sustained attention (digit vigilance test) test of divided attention (triad)	12	15	2	

	test of focused attention (trail making)				
Module 6	Interpretation and practical application of memory, learning and forgetting using - whole vs part learning, spaced vs un-spaced learning, retroactive inhibition, pro-active inhibition. Learning curve,	15	15	1,2	
		58	100		

Detailed Syllabus

Module 1- Define Emotion, Nature, Impact & Expression. Physiological correlates of emotion: Electrical, Circulatory changes, Respiration and Peripheral measures.
The role of Cortex, Hypothalamus & Limbic System in Emotions. Concept of Homeostasis. Kluver-Bucy Syndrome.

Total Hours: 5

Module 2- Theories of Emotion: James-Lange Theory of Emotion; Cannon-Bard Thalamic Theory of Emotion, Activation Theory of Emotion by Lindsley, Two Factor Theory by Schachter-Singer, and Cognitive Appraisal Theory of Lazarus: Concept, Research Evidence, Implication, Critical Appraisal for each theory

Total Hours: 8

Module 3- Understanding the concept of Motivation, Drive, Need, Impulse in connection to its role in education, physiological basis of hunger, thirst: mechanisms within the system with neurobiological underpinning & special emphasis on research evidence.

Total Hours: 8

Module 4- Theories of Motivation – Need Hierarchical Theory by Maslow, Achievement Motivation Theory by McClelland, Theory of Psychogenic Needs by Murray: Concept, Research Evidence, Implication, Critical Appraisal for each theory, Application,
Nature of thinking; Inductive and Deductive reasoning; Problem solving approaches

Total Hours: 10

Module 5- Practicum
Assessment of the different span of attention- sustained attention (digit vigilance test)
Test of divided attention (triad)
Test of focused attention (trail making)

Total Hours: 12

Module 6-Practicum
Interpretation and practical application of memory, learning and forgetting using - whole vs part learning, spaced vs un-spaced learning, retroactive inhibition, pro-active inhibition. Learning curve

Total Hours: 15

Suggested Readings

- Morgan, C. T., King, R. A., Weisz, J. R., &Schopler, J. (2006). Introduction to Psychology, 7th eds.
- Fredrickson, B., Loftus, G. R., Lutz, C., & Nolen-Hoeksema, S. (2014). *Atkinson and Hilgard's introduction to psychology*. Cengage Learning EMEA.
- Schultz, D. P., & Schultz, S. E. (2020). *Psychology and work today*. Routledge.
- Woodsworth, R. S., & Schlosberg, H. (1954). Experimental psychology (Rev. ed.). *New York: Holt*

Course Name: Introduction to Hospitality Industry and Major departments
Course Code: GE1B-02
Mode- Blended

Course Objective: The course is designed to provide overall concept of a hotel operation, the major operating departments, hierarchy, job profiling, functions and relation amongst the departments

Sl	Course Outcome	Mapped modules
1	Understand hospitality industry and relationship with tourism.	M1, M2
2	Understand basic front office operation.	M2, M1
3	Understand basic Housekeeping operation	M2, M3
4	Understand the importance of safety and hygiene.	M2.M3.M4
5	Understand the basic F &B service operation.	M1 ,M5
6	Understand & demonstrate menu and types of service	M5 ,M6

Module Number	Content	Total Hours	%age of questions	Blooms Level (if applicable)	Remarks (If any)
M 1	Introduction to hospitality	6	10	1,2	
M 2	Basic Front office operation	12	15	2,3	
M 3	Basic Housekeeping operation	12	15	2,3	
M 4	Safety and hygiene	06	20	2,3	
M 5	Basic F&B service operations	12	20	3,4	
M 6	Menu and types of service	12	20	3,4	
		60	100		

Detailed Syllabus:

Module 1 – Introduction to Hospitality Industry: Characteristics of Hospitality Industry and relation with Tourism, Types and Classification of Hotels, Departments in Hotels like Front Office, House Keeping, F&B Service and non-revenue earning departments and their co-ordination. (06 hours)

Module 2 – Basic Front Office Operations: Organizational chart of Front Office department with duties and responsibilities of staff, Types of guest room, basis of charging tariff, meal plans, type of guests, responsibility of Front Office department, Procedures in Front Office, Pre-registration, registration procedures, Bell-desk, Concierge, Cahier, Night Audit. Registration procedure, Role-play for check-in checkout procedures. Sanitization procedures. (12 Hours)

Module 3 –Basic Housekeeping Operations: Organizational chart of House Keeping department with duties and responsibilities of staff, responsibility of House Keeping department, Layout of Guest room, Guest supplies and amenities, Floor and Pantry, Room cleaning procedures, key control, lost and found procedures, forms formats and registers in Housekeeping, functions of House Keeping control desk. Role-play for complain handling and various services. (12 Hours)

Module 4 – Safety and Hygiene: Importance of Safety and Hygiene, Sanitization techniques for guest, hotel personnel, offices, Guest rooms and Public areas, Liaison with

Public health department, Accidents, Fire, and security. Concept of First aid and artificial respiration (06 Hours)

Module 5 – Basic F&B Service Operations: Organizational chart of F&B Service department with duties and responsibilities of staff, responsibility of F&B Service department, Attributes of personnel, Equipment and Service ware uses care and maintenance, Types and Layout of F&B Service areas, basic menu knowledge and types of service. (12 Hours)

Module 6 –Menu and types of Service: Basic concept of Menu, restaurant and Coffee Shop Layout, the concept of stations, numbering the tables and covers at a table, reservation systems in restaurants, records & registers maintained by a Restaurant, rules to be observed while laying and waiting at the table, Dos & don'ts of waiting staff in F&B service operations, organizing the staff for service. (12 Hours)

Suggested Readings:

- Hotel Housekeeping, Sudhir Andrews, Tata McGraw Hill
- The Professional Housekeeper, Tucker Schneider, VNR
- Professional Management of Housekeeping Operations, Martin Jones, Wiley
- House Keeping Management for Hotels, Rosemary Hurst, Heinemann
- Front office operations by Colin Dix &Chirs Baird
- Hotel Front office management by James Bardi
- Managing front office operations by Kasavana& Brooks
- Food & Beverage Service -Lillicrap& Cousins
- Modern Restaurant Service -John Fuller
- Food & Beverage Service Management-Brian Varghese
- Introduction F& B Service-Brown, Heppner & Deegan
- Professional Food & Beverage Service Management -Brian Varghese

Course: Health Education and Communication

Course Code: GE1B-03

Mode- Offline/ Blended

Course Objective The course is designed to provide basic knowledge about the health and health communication. The students will be able to use information, communication and education across media for the public towards ensuring equitable access to health for both prevention and cure.

Sl	Course Outcome	Mapped modules
1	Explain the concept of health and the knowledge of health education in society.	M1
2	Apply the modern technology in health care sectors.	M2
3	Describe the different model of communication.	M3
4	Develop the communications to the different field of society.	M4
5	Able to use the computer as a tool in health care.	M5
6	Understand how to aware the people about the health.	M6

Module Number	Content	Total Hours	%age of questions	Blooms Level(if applicable)	Remarks (If any)
M 1	Concept Of Health And Health Education	16	20	L1, L2	
M 2	Health Education & Artificial Intelligence	8	10	L1, L2	
M 3	Heath Communication	10	10	L1, L2	
M 4	Mass communication and role of media	8	10	L1, L2	
M 5	Tools used for communication	8	30	L1, L2	LAB
M 6	Presentation on concept of health and health education	10	20	L1, L2	LAB
		60	100		

Detailed Syllabus:

Module 1- Concept of Health and Health Education: 16h

Definition of physical health, mental health, social health, spiritual health determinants of health, indicatory of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.

Health Education: Principles & Objectives, Levels of Health Education, Educational Methods, Evaluation & practice of Health Education in India.

Family planning: Demography and family planning: Demography cycle, fertility, family planning, contraceptive methods, behavioral methods, natural family planning methods, chemical methods, mechanical methods, hormonal contraceptives, population problem of India.

Module 2-Health Education & Artificial Intelligence: 8h

Changes in the workforce, Robots, assisting the human experts or completely robotic diagnosis, Medical training: to train paramedical students, AI can play a big role, Virtual health assistants, advanced health research, Clinical and administrative task handling.

Module 3-Heath Communication: 10h

Basic Concept & Principles of Communication, Definition, Purpose, Types of Communication, Communication Process, Directions of Communication: Upward, Downward, Lateral, Factors influencing Communication, Barriers of Effective communication, How to overcome the Barriers Models of communication: Aristotle Model, Shannon and Weaver model, Schramm Model, Laegans Model, Fano Model, Literer's Model, Westly Maclean's Model.

Module 4- Mass Communication and Role of Media: 8h

Mass communication & Role of Media in health education, Information Communication Technologies (ICT) in health care and awareness. (Telemedicine & e-health, community radio) Future trends in information and communications systems:

Module 5: Tools Used for Communication 8h

Introduction to PC Operating System and MS office package - Windows 10/Ubuntu, MS Office 2016 / Office360 (MS Word, MS Excel, MS PowerPoint, MS Outlook, Internet and Email)

Module 6: Presentation on Concept of Health and Health Education 10h

Reference Books:

1.Health Education – A new approach – L. Ramachandran & T. Dharmalingan

2.Health Communication in the 21st Century, By Kevin B. Wright, Lisa Sparks, H. Dan O'Hair, Blackwell publishing limited, 2013,

3.Health Communication: From Theory to Practice, By Renata Schiavo, Published by Jossey Bash.

4.Health Communication, R.D. Karma Published by Mohit Publications 2008.

5.Counseling Skills for Health Care Professionals, 1st Edition, Rajinikanth AM, Jaypee Brothers, 20

Course Name-Sustainability & Fashion

Course Code-GE1B-04

Mode- Offline/ Blended

Course Objectives:

The course is designed to provide working knowledge of Environmental, Sustainable, and Ethical issues prevailing in the world. Students will be able to understand the relation between sustainable development goals and fashion industry.

Course Outcomes (CO):

Sl	Course Outcome	Mapped modules
1	Remember & Understand Environmental, Sustainable & Ethical issues being faced today and their causes	M1
2	Remember & Understand the Role of sustainable, ethical and environmental organizations	M2
3	Remember & Understand the innovation in sustainable thinking for the future	M3
4	Remember & Understand the roles and impact designers have on the natural resources and the environment	M4
5	Remember & Understand the renewable & non-renewable energy	M5
6	Remember & Understand the possibilities in sustainable and ethical fashion	M6

Module Number	Content	Total Hours	%age of questions	Blooms Level (if applicable)	Remarks (If any)
M1	Environmental & Sustainability Issues	10	20	1,2	
M2	Sustainable & Ethical focused Organizations	8	14	1,2	
M3	Innovations in sustainable thinking for the future	8	14	1,2	
M4	Resource consumption and depletion	8	16	1,2	
M5	Renewable Energy Vs. Non-Renewable Energy	10	16	1,2	
M6	Fashion Design & Sustainability	10	20	1,2	
		60	**100**		

Detailed Syllabus:

ModuleI (10 Hours)

Environmental & Sustainability Issues: Climate Change & Global Warming, Pollution, Resource depletion, Consumerism and the throw-away society,

ModuleII (8 Hours)

Sustainable & Ethical focused Organizations, bodies and Agencies: Greenpeace, Earth day Network, Ethical Fashion Forum, United Nations, Fair Trade, World Wildlife Fund (WWF)

ModuleIII (8 Hours)
Innovations in sustainable thinking for the future: UN Sustainable Development Goals, The Paris Climate Agreement, Ocean Clean-Up

Module IV (8 Hours)
Resource consumption and depletion: Deforestation, Fossil Fuels, Sand, Minerals, Precious Stones & Metals

ModuleV (10 Hours)
Renewable Energy Vs. Non-Renewable Energy: Impact of non-renewable i.e. traditional fossil fuel based energies, Renewable energy systems and technology innovations, Sustainable energy schemes and initiatives in India

ModuleVI (10 Hours)
Fashion Design & Sustainability: Sustainable Fashion design concepts, Sustainable materials for fashion and an understanding of the impacts of our materials choices, Future trends within sustainable fashion, an overview of the key issues the fashion and textiles industry faces, Discussion on the impact of new emerging technologies

Suggested readings:
1. Introduction to Sustainability Paperback – 2016 by Robert Brinkmann
2. Sustainability in Interior Design Book by Sian Moxon
3. References:
1. Centre for Sustainable Fashion- www.sustainable-2. MISTRA Future Fashion- www.mistrafuturefashiofans.choiomn .com
3. Sustainable Clothing Action Plan: Clothing Knowledge Hub- www.wrap.org.uk/node/19930
4. Textiles Environment Design- www.tedresearch.net
5. Textile Futures Research Centre -www.tfrc.org.uk
6. Sandy Black | The Sustainable Fashion Handbook 2012
Tamsin Blanchard | Green is the New Black: How to Change The World with Style 2008
7. Michael Braungart and William McDonough | Cradle to Cradle: Remaking the Way We Make Things 2009
8. Sass Brown | ReFashioned: Cutting Edge clothing from Recycled Materials 2013
9. Elisabeth Cline | Overdressed: The Shockingly High Cost of Cheap Fashion 2012
10. Kate Fletcher and Lynda Grose | Fashion and Sustainability: Design for Change 2012

COURSE: THE YOGA PROFESSIONAL

COURSE CODE:GE1B-05

MODE: OFFLINE/ BLENDED

COURSE OBJECTIVE:

The course is designed to provide understanding about the textual and grammatical aspects of sanskrit language to enable the students to better imbibe the essence of the yogic concepts. The students will be able to interpret the new dimensions of yoga and education and be able to apply principles of yoga for personality development through objectivity.

Sl	Course Outcome	Mapped modules
1	Read and understand the colloquial words of Sanskrit.	M1, M2
2	Write in Sanskrit and have some idea about grammar.	M1, M2
3	Communicate and comprehend Sanskrit to the best of their ability.	M1, M2, M3
4	Understand the Interface between Culture & Psychology.	M4
5	Apply the principles of Culture & Basic Psychological Processes	M5
6	Assess the importance of Culture & Gender interrelation	M6

Module Number	Content	Total Hours	%age of questions	Covered CO	Blooms Level	Remarks (If any)
Module 1	Introduction to reading, writing & speaking of Sanskrit language	10	15	1,2,3	2,3	
Module 2	Grammatical aspects of Sanskrit language	10	15	1,2,3	2,3	
Module 3	Transliteration according to authentic dictionary method	10	10	3	2,3	
Module 4	Interface between Culture & Psychology	10	10	4	2,3	
Module 5	Culture & Basic Psychological Processes	10	30	5	2,3,4,5	
Module 6	Culture & Gender	10	20	6	2,3,5	
		60	100			

Detailed Syllabus:

MODULE 01 **8L + 2T**

Vowels and Consonants, pronunciation, articulation of each letter and the technical names of the letters according to their articulation, similar and dissimilar letters and how to write them.
Consonants combined with vowels, pronunciation and writing, special letters which do not follow the general method.

MODULE 02 **8L + 2T**

Conjunct letters, rules to combine consonants, special consonants, how Sanskrit articulation can be applied to languages like English, special attention to Anusvara, when it can be written in the form of a nasal, two consonant combinations and three consonant combinations, their writing practice, special conjunct letters and their writing.

MODULE 03 **8L + 2T**

Transliteration according to authentic dictionary method.

MODULE 04 **8L + 2T**

Interface between Culture & Psychology Methods of Understanding Culture, Scope of Cultural Psychology, Mechanisms of Cultural Transmission

MODULE 05 **8L + 2T**

Culture & Basic Psychological Processes Interrelation between Culture, Perception, Cognition Emotional expressions and Culture

MODULE 06 **8L + 2T**

Culture & Gender, Culture and Gender stereotype

REFERENCE BOOKS:

1. Dr. Sarasvati Mohan, Sanskrit Level-1 Sharadh Enterprises, Bangalore, 2007.
2. Dr. Sarasvati Mohan, DVD and CD.(Publication of Akshram and Hindu SevaPrathisthana)

Paper Code: BBA (TTM)-103/GE1B-06

Paper Name- Indian History & Culture

Total Credit: 6
Total hours of lectures: 60 hours

Sl.	Topic/Module	Hour
1.	**Unit-I** The pre-historic period, Indus Valley Civilization - Source of Information, Characteristics of Indian culture & society in the pre-historic ages and Indus valley civilization. Vedic Period – Early and Later Vedic period. . Jainism, Teaching & Principles of Jainism, Contribution of Jainism to Indian Culture. Buddhism- Rise and Growth, Doctrines of Buddhism.	10
2.	**Unit-II** Mauryan Period – origin, growth and contribution, Sunga Dynasty, Kusana Dynasty, Gupta Period – political, religious, socio-cultural and economic development during Maurya to Gupta period. Art & Architecture during Mauryan and Gupta period Political condition of North India, South India and Eastern India after Guptas.	10
3.	**Unit-III** History of Medieval India 1206 - 1526 A.D. Rise of Turks, causes of Success of Arab invasion and its impact, Slave Dynasty, Khaliji Dynasty, Tughlaq Dynasty, Sayyid Dynasty, Lodhi Dynasty. Moghul dynasty. Indo Islamic & Mughal Architecture.	10
4.	**Unit- IV** Political Condition of India after Moghul- Decline of Mughal emperor and its impact. Shivaji & the rise of the Marathas. Advent of Europeans in India – Establishment of East India company and other European companies. Establishment of British Rule in India.	10
5.	**Unit-V** Social and religious reforms movement in India, Brahma Samaj, Arya Samaj, Rama Krishna Mission, Social Traditions, Economic, political, religious and social development post-Independence.	10
6.	**Unit-VI** Concept of Cultural Tourism. Performing Arts- Classical Music, Classical Dance- various formation, Theatre, Visual Arts- Paintings, Sculpture, Different fairs & festivals in India. Various handicrafts items in India, folk culture in India,	10

Suggested reading

1) Themes of Indian History – Part 1, 2, 3 – NCERT (2013)
2) Mitter. Partha (2001), Indian Art, Oxford Publications, London
3) R. S. Sharma – India's ancient Past, Oxford University Press
4) 2. Romila Thapar- Penguin History of India
5) R.C.Mazumdar, H.C.Roychowdhury & K. K. Dutta Advance History of India
6) Singhania. Nitin (2015), Indian Art and Culture, Tata McGraw Hill Education,

Course Name: Cinema and Other Arts

Course Code: GE2B-01

Mode: Offline/ Blended

Course Objective: The course is designed to provide a general understanding and appreciation of the history of world cinema, acclaimed international films, artists, and movements. The students will be able to gain a multiple cultural perspective based on the underlying theories and principles of cinema and media.

Sl	Course Outcome	Mapped modules
1	Understand the fundamental components of a Cinema and other arts	M1, M2, M3, M4, M5, M6
2	Remember the readings and understand the perspective	M1, M2
3	Understand the nuances of modern painting	M2, M3
4	Understand the nuances of Indian painting	M2, M3, M4
5	Understand and examine the Indian and Western music	M1, M2, M5
6	Analyze the music of parallel and commercial Indian cinema	M1, M2, M5, M6

Module Number	Content	Total Hours	%age of questions	Blooms Level (if applicable)	Remarks (If any)
Module 1	Pre-Renaissance	10	15	L1, L2	
Module 2	Renaissance and Perspective	10	15	LI, L2	
Module 3	Modern Painting	08	15	L1, L2	Workshop
Module 4	Indian Painting	08	15	L1, L2	Workshop
Module 5	Fundamentals of music	12	15	L2, L3	Workshop
Module 6	Music and cinema	12	25	L2, L3	Workshop
		60	100		

Detailed Syllabus:

M1	**Pre-Renaissance**: Visual representations in cave paintings, in folk cultures and early civilizations like Egypt Visual representations in Greece: A breakaway from earlier practices Visual representations in ancient and medieval India: Ajanta cave paintings,Mughal miniature, Kangra, Ragmalaetc
M2	**Renaissance and Perspective** The Renaissance at a Glancefrom The Enquiring Eye – European Renaissance Art, Development of the idea of perspective; Use of camera obscura and camera lucida Selected Readings from John Berger's Ways of Seeing, Dutch painting; Baroque, Rococo and Mannerism.
M3	**Modern Painting:** Impressionism, Expressionism, Surrealism, Cubism

M4	**Indian Painting** Raja Ravi Verma, Bengal School Contemporary Masters
M5	**Fundamentals of music:** Tone, note, key, octave, musical scales – diatonic and tempered scales, chords, melody, harmony, swar and shruti Folk music, forms and structures of Indian classical music, forms and structures of western classical music; Evolution of musical forms; Music industry and popular music; Urban folk music, Blues, Jazz, Rock
M6	**Music and cinema;** Music for Cinema Comparison of the two art forms – music and cinema; Ray and Ghatak's ideas on structural similarities of music and cinema Analysis of structures of films to compare with musical forms Musical accompaniment of films – from live musical accompaniment of silent era to present day. Diagetic and extra-diagetic music Analysis of music tracks of selected films Electronic Vs acoustic musical accompaniment (Has to be done as a workshop by a music composer) Item numbers of Bollywood films

Suggested Readings:

1. Andrei Tarkovsky, Sculpting in Time

2. Satyajit Ray, Our Films Their Films

3. RitwikGhatak, Rows and Rows of Fences

4. Penguin Dictionary of Music

5. S.C Deva, Music of India

6. E.H Gombirch, The Story of Art, Phaidon Publications

7. Hendrik Willen Van Loon, The Arts of Mankind

8. Hugh Honour and John F. Fleming, The Visual Arts: A History. Prentice Hall, 2005. Sylvan Barnet, A Short Guide to Writing About Art. Prentice Hall, 2007.

9. The Enquiring Eye – European Renaissance Art (National Gallery of Art, Washington)

10. Herbert Read The Meaning of Art 11. Walter Pater The Renaissance

12. John Berger, Ways of Seeing

13. Art Through the Ages by Helen Gardner

14. Nothing If Not Critical: Selected Essays on Art and Artists

15. The Story of Painting by Wendy Beckett

16. Minor: Art Historys History _p2 by Vernon Hyde Minor

17. Isms: Understanding Art by Stephen Little

18. The Visual Arts: A History by Hugh Honour

19. What Are You Looking At: 150 Years of Modern Art in a Nutshell by Will Gompertz

20. Art and Illusion: A Study in the Psychology of Pictorial Representation by E.H. Gombrich

Course Name: Surface & Soft Furnishings Design Development Techniques

Course Code-GE2B-02

Mode-Offline/ Blended

Course Objective:**The course is designed to provide a conceptual understanding of interior design of spaces with surface and soft furnishings. The students will be able to visually express with colour, texture, pattern and material effects for surface design appropriate to project specifications.**

Sl	Course Outcome	Mapped modules
1	Understand the fundamental interior design aspects of surface and soft furnishings	M1, M2, M6
2	Understand the fundamentals of textiles and types	M1, M2
3	Understand and demonstrate printing techniques	M2, M3
4	Understand the apply embroideries	M2, M3, M4
5	Understand and examine materials, techniques, and technology	M1, M2, M5
6	Apply the surface designs	M5, M6

Module Number	Content	Total Hours	%age of questions	Blooms Level (if applicable)	Remarks (If any)
Module 1	Textiles and Its Types	08	15	L1, L2	
Module 2	Research soft furnishings and textiles/fabrics used in the design	08	15	L1, L2	
Module 3	Printing and its techniques	10	15	L1, L2	
Module 4	Embroideries and its types	10	15	L1, L2	
Module 5	Exploration of materials, techniques and technologies for the development of surface design	12	15	L2, L3	
Module 6	Final surface designs and presentation	12	25	L3	
		60	100		

Detailed Syllabus:

Module -1: Textiles and Its Types

- Introduction to textiles – Indian (kalamkari, matanipachedi, ikkat) and international textiles.
- Special embellishment techniques: Batik, Tie and dye - lehariya, bandhini ,shibori, sunray and marbling.

Module – 2: Research soft furnishings and textiles/fabrics used in the design

- Table Linens
- Rugs & Carpets
- Window dressings (Curtains & Blinds)
- Towels
- Bedding & Bedspreads
- Cushions & Throws

- Lampshades
- Wallpaper
- Tiles
- Flooring

Module -3: Printing and its techniques

- Print application through block printing, Lino printing, Wood cut printing, Lithograph printing
- Print application through screen & block printing (vegetable block and wooden blocks, Appliqué, quilting, Smocking, honey comb, Fabric painting, Stencil- dabbing and spraying).
- Natural dyeing techniques and explorations.

Module -4: Embroideries and its types

•Basic Hand Embroidery, their technique, variations and applications. Basic running stitch, backstitch, stem stitch, chain stitch, lazy daisy stitch, buttonhole stitch, featherstitch, herringbone stitch, knot stitch, satin stitch and cross-stitch.

•Traditional Embroidery- Origin, application &colours. Kantha, Chikan, Kasuti, Zardosi, Kutch and Mirror work.

Module -5: Exploration of materials, techniques and technologies for the development of surface design

- Print – Screen, Block, Mono etc.
- Stenciling
- Fabric Dye (Natural and Azo free)
- Fabric paints
- Fabric and textiles Embellishment

Module -6: Final surface designs and presentation

- Develop surface designs for a range of applications.

Reference Books:

- The Complete Technology Book on Dyes & Dye Intermediates Paperback – 1 Jan 2003 by NIIR Board of Consultants & Engineers (Author)
- Biodegradation of Azo Dyes by HaticeAtacagErkurt (Editor) – Publisher: Springer (9 August 2010), ISBN-10: 3642118917
- Second Skin: Choosing and Caring for Textiles and Clothing by India Flint Murdoch Books, 2011 ISBN 978-1-74196-720
- Indigo:The Color that Changed the World by Catherine Legrand Thames & Hudson, 2013 ISBN 978-0500516607
- Warp and Weft:
Woven Textiles in Fashion, Art and Interiors by Jessica HemmingsBloomsbury, 2012 – ISBN 978-1-4081-3444-3
- Quilt National 2013:The Best of Contemporary Quilts by The Dairy Barn Cultural Arts Center
- DragonThreads Extraordinary Textile Arts Books, 2013 - ISBN 978-0-9818860-4-6
- Surface Design for Fabric: Studio Access Card Printed Access Code – February 15, 2015 by Kimberly Irwin Publisher: Fairchild Books (February 15, 2015) ISBN-10: 1501395033

Websites

- https://www.houseology.com/masterclass/design-school/chapter-eight-soft-furnishings
https://www.twosistersecotextiles.com/pages/azo-dyes

Course Name- Study of Textiles
Course Code- GE3B-01
Mode-Offline/ Blended

Course Objectives:

The course is designed to provide working knowledge of textile, the best utilization of available fabric resources, the awareness of its property, suitability for a particular use. The students will be able to understand and apply the acquired knowledge in their designs., and enhance aesthetic and functional value of textile material for fashion industry.

Course Outcomes (CO):

Sl	Course Outcome	Mapped modules
1	Remember & Understand different types of Textile materials available in the market and their uses.	M1, M2
2	Understand various kinds of fabrics, their structure, properties and the utility.	M2,
3	Understand Textile dyeing, printing and finishing techniques and	M3, M4.
4	Apply dyeing & Printing techniques on fabric samples to add aesthetic value to it	M4, M6
5	Remember & Understand various traditional hand embroidery techniques of India, and Apply this techniques for surface ornamentation of fabric samples	M5
6	Apply different embellishment techniques on different samples for value addition to it	M6

Module	Content	Total Hours	%age of questions	Covered CO	Blooms Level	Remarks (If any)
Module 1	Fiber Classification	4	12	1	1,2	
Module 2	Yarn & Fabric Formation	10	20	1	1,2	
Module 3	Fabric Finishing	6	20	2,3	1,2	
Module 4	Dyeing & Printing	8	20	3,4	2,3	
Module 5	Embroidery (Practical)	16	16	5	2,3	
Module 6	Surface Embellishment (Practical)	16	12	4, 6	2,3	
		60	100			

Detailed Syllabus:

ModuleI (4 Hours)
Introduction to Textiles and classification off ibres
According to source– Natural and Manmade.
Identification and proper ties of Textile fibres- Cotton, Silk, Wool ,Linen, Rayon(regenerated),Acetate ,Polyester, Nylonand Acrylic.

ModuleII (10 Hours)
Process of yarn for mation– handspinning, mechanical–ring spinning and modern-open end spinning. Yarn classification–simple and novel tyyarns, characteristics, properties and uses of different yarn.
Method of fabric construction: Weaving-. Basic weaves-plain, satin, twill and their variations. Fancy weaves-pile, dobby, jacquard, extrawarp and weftfigure, leno, crepe and double cloth.
Other method of fabric construction- knitting, braiding, lace and felt. Non-woven fabrics and their applications.

ModuleIII (6Hours)

Finishes given to fabrics- definition, importance to the consumer, classification according to durability and function. singeing, scouring, bleaching, mercerization calendaring, sizing, de-sizing, brushing, carbonizing, crabbing, fulling, heat setting, shearing, weighting, stentering, napping.
Special Finishes and Treatments- water repellent and waterproof finishes, antistatic finish, anti-slip finish, flame retardant finishes, crease resistant finishes, durable press and shrink resistant finishes.

Module IV (8 Hours)

Dyeing-Stages of dyeing- fibrestage, yarn dyeing, fabric, cross, union dyeing and product stage. Method of dyeing- batch dyeing, reeldyeing, jig dyeing and package dyeing.
Printing- Direct roller printing, block printing, duplex printing, discharge printing, screenprinting-flat androtary, resist, batikandtie-dye.

ModuleV (Practical) (16 Hours)

Embroidery

Embroidery tools and techniques, embroidery threads and their classification, selection of threads, needle and cloth, tracing techniques, ironing and finishing of embroidered articles.

Basic Hand Embroidery. Basic and two variations of running stitch, backstitch, stemstitch, chainstitch, lazy daisy stitch, button hole stitch, feather stitch, herring bone stitch, knot stitch, satin stitch and cross stitch.

Traditional Embroidery- Origin, application & colours. Kantha, Chikan, Kasuti, Zardosi(Fourvariations), Kutchand Mirrorwork (Twovariations).

ModuleVI (Practical) (16Hours)

Surface Embellishment

Printing & Painting techniques:–originand applications –Block printing, Kalamkari and Patachitra.
Dyeingand weaving techniques:- Ikats, Patola, Bhandini, Laharia, Shibori, Brocade weave and Carpet weaving.
Special embellishment techniques: Batik-splash, t-janting, crackled, Tie and dye-lehariya, bandini, shibori, sunray and marbling, Block printing- vegetable block and wooden blocks, Applique(2methods), quilting(2 methods), Smocking-Chinese smocking(2 methods), honey comb, gathered with embroidery, Fabric painting(4methods), hand, Stencil- dabbing and spraying.

Suggested readings:

1. Fibertofabric.,B.T.Corbman,Mc.GrawHill
2.Fromfiberto fabrics,E.gale,Allman&SonsLtd.
3.FiberScienceandtheirselection.,Wingate,Prenticehall
4.Encyclopediaoftextiles.,EditorsofAmericanfabricmagazine.
5.Textiles.,Hollen.N.,Macmillanpublishingcompany.
6.Murphy.W.S.,TextileFinishing,AbhishekPublications,Chandigarh.
7.IndianTie-DyedFabrics,VolumeIVofHistoricTextilesofIndia.Merchant: CelunionShop
8.Traditional IndianTextiles., JohnGillow/NocholasBarnard, Thames& Hudson.
9.Surfacedesignforfabric,RichardMProctor/JenniferFLew,Universityof Washington Press.
10.Artof Embroidery: Historyofstyleandtechnique, LantoSynge,Woodridge
11.TheTimelessEmbroidery,HelenM,David&Charles.
12.Readers Digest, CompleteguidetoSewing,1993, Pleasantville-Nu GailL,SearchPressLtd.
13.Barbara. S,CreativeArt ofEmbroidery,Lundon,NumblyPub.groupLtd.
14.ShailajaN,TraditionalEmbroideriesof India.,MumbaiAPHPublishing.

Course Name: IT Literacy

Course Code: GE3B-02

Mode-Blended

Course Objective: This course is designed impart a foundational level appreciation for the implementation of IT in business and management. Students will be utilizing digital tools for communication, researching and interpreting digital information, developing advanced spreadsheets, understanding operating systems and word processing functions, supporting the evaluation, selection and application of office productivity software appropriate to a sports management context.

Sl	Course Outcome	Mapped modules
1	Identify the principal components of a relevant computer system and describe computer technology for communication in management.	M1, M3
2	Interpret fundamental hardware components that make up a computer's hardware and the role of each of these components relevant to Management.	M1,M2
3	Relate the usage of Digital innovations in Sports Threats and Opportunities of Digital Application in Sports, SWOT analysis.	M2, M4
4	Explain the role of information technology in presentation supporting the functions of large sport events and their stakeholders, as well as the needs of sports federations.	M1, M2, M3
5	To understand the emerging technological trends, as well as solutions and applications that will impact broadcasting and media industries and spectators' experience.	M1, M4, M5, M6
6	Demonstrate developing technology solutions and understanding the limits of data capture (what, how, and why) in sport.	M4, M6

Module	Content	Total Hours	%age of questions	Blooms Level	Remarks (If any)
M 1	Data and Information Storage	12	20	1,2	
M2	Digital Transformation and innovation in Sports Management	10	15	1, 2	
M3	Presentation Software	08	15	1, 2	
M4	Management Information System	06	15	1, 2	
M5	DOS System commands and editors	10	15	2,3	
M6	Programs involving the use of arrays with subscripts and pointers	12	20	2, 3	
		58	100		

Detailed Syllabus:

Module 1 – Data and Information Storage – Data and Information, definition and meaning, Data Storage device: Primary storage – RAM, ROM, EEROM, PROM, EPROM; Secondary storage – direct access devices, serial access devices: hard disks, CD-ROM, DVD Central Processing Unit – Control Unit. Computer languages, machine language, assembly language and high level language, role of assembler and compiler. Storage devices, floppy disc, hard disc, CD ROM and DVD. Importance of Computer as data storage for Businessand Management. **Fundamental Hardware Applications in Sports Management** – RFID Chips, Sensors, Timing System, andtheir applications in Sports Management. **Operating System and Application**

Software– Meaning of software; broad classification of software; system. Software and application software; utilities. Systems software – Operating systems: Brief introduction to different types of operating systems like DOS, Windows, Unix, Linux etc.,Importance and application of Cloud, Mobile, Artificial Intelligence in Sports Management. Use.

[Total Hours – 12]

Module 2 - **Digital Transformations and Innovations**– Digital Transformation and future changes, challenges in Management, factors of success, Impact of Digital media on business, new digitized innovations in modern Management. Impact of Digital media, SWOT analysis.**Role of Data Bases -** Roles, Types, Functions, Current Practice and Future Potentials, Importance of digital technology in Management.

[Total Hours – 10]

Module 3 - **Presentation Software -** Power Point – Creating new presentations – Auto content wizard – Using template – Blank presentation – Opening existing presentations – Adding, editing, deleting, copying , hiding slides – Presentations – Applying new design – Adding graphics – Using headers and footers – Animations text – Special effects to create transition slides – Controlling the transition speed – Adding sounds to slides – Using action buttons. **Word processing software:** WORD – Creating a new document with templates & Wizard – Creating own document – Opening/modifying a saved document – converting files to and from other document formats – Using keyboard short-cuts & mouse – Adding symbols & pictures to documents – header and footers – Finding and replacing text – spell check and Grammar check – Formatting text - paragraph formats - adjusting margins, line space – character space – Changing font type, size – Bullets and numbering – Tables – Adding, editing, deleting tables – Working within tables – Adding, deleting, modifying rows and columns – merging & splitting cells. **Spreadsheet software -** EXCEL – Working with worksheets – cells – Entering, editing, moving, copying, cutting, pasting, transforming data – Inserting and deleting of cells, rows & columns – Working with multiple worksheets – switching between worksheets – moving, copying, inserting & deleting worksheets – Using formulas for quick Calculations – Working & entering a Formula – Formatting a worksheet – Creating and editing charts – elements of an Excel Chart – Selecting data to a chart – Types of chart – chart wizard – Formatting chart elements – Editing a chart – Printing charts.

[Total Hours - 08]

Module 4 - **Management Information Management (MIS)** - database management, data communications, transaction processing information systems, decision support systems, information reporting systems, office automation, networks, expert systems, and systems analyses and design. **ERP**: Introduction – Need for ERP – Advantages – Major ERP Packages – Applications.

[Total Hours - 06]

Module 5 - **DOS System commands and Editors** (Preliminaries) used in Sports Management. **UNIX system** commands and vi (Preliminaries) – Applications in Management. **Programs to demonstrate control structure:** text processing, use of break and continue, etc. **Programs involving functions and recursion,** Use and application in Business and Management.

[Total Hours - 10]

Module 6 - Programs involving the use of arrays with subscripts and pointers, Programs using structures and files. Applications of C Language. **Microsoft office -** Word, Excel, PowerPoint, Mail merge, Internet – Use and Applications.

[Total Hours – 12]

Suggested Readings:

1.Mano – Computer System Architecture; Pearson Education

2.Tanenbaum – Structured Computer Organization,Pearson Education

3.Martin & Powell – Information Systems: A Management Perspective; mcgraw-Hill

4.Laudon & Laudon – Management Information Systems: Pearson Education

5.Comer: Computer Networks and the Internet: Pearson Education Graham Curtis – Business Information Systems: Addison Wesley

6Introduction to Computers with MS-Office, Leon, TMH

7.An Introduction to Database Systems - C.J. Date, Pearson Education

8Windows 98 6 in one by Jane Calabria and Dorothy Burke – PHI

9.Using Microsoft Office 2000 by Ed, Bott – PHI

10.Enterprise Resource planning (ERP): Text and case studies by Murthy, C S V, HPH

11.Teach yourself SAP in 24 hours by George Anderson; Danielle Larocca - Pearson Education

12.Teach yourself SAP in 24 hours by George Anderson; Danielle Larocca - Pearson Education

13.Running MS – DOS by Van Wolverton, 20th Anniversary Edition

14.C Programming Language (Prentece Hall Software) by Brian W. Kernighan

15.Let Us C by Yashavant Kanetkar.

16.Data Structure Through C by Yashavant Kanetkar

17.C in depth by Deepali Srivastava and S.K.Srivastava

Paper Code: BBA (BA)- 103/ GE3B-03

Basic Mathematics and Statistics
Total Credit: 6
Total hours of lectures: 60 hours

Course Objective: The course is designed to provide a basic applied knowledge of mathematics. The students will be to apply the number system & basic algebra, set theory, determinants and matrices, limits, continuity, differentiation & Integration, data frequency & distribution and measures of central tendency and measures of dispersion for solving business problems.

statistical problems

Sl	Course Outcome	Mapped modules
1	Remembering	M1,M2,M3,M4,M5,M6
2	Understanding the course	M1,M2,M3,M4,M5,M6
3	Applying the general problem	M1,M2,M3,M4,M5,M6
4	Analyse the problems	
5	Evaluate the problems after analysing	
6	Create using the evaluation process	

Module Number	Content	Total Hours	%age of questions	Blooms Level (if applicable)	Remarks (If any)
M 1	The Number System and Basic Algebra	8	10	1,2	
M 2	Set Theory and Permutation and Combination	10	15	1,2	
M 3	Determinants and Matrices	10	15	1,2	
M 4	Limits, Continuity, Differentiation and Integration	16	35	1,2,3	
M 5	Data, Frequency Distribution	6	10	1,2,3	
M 6	Measures of Central Tendency and Measures of Dispersion	10	15	1,2,3	
		60	**100**		

Sl.	Topic/Module	Hour
1.	**Module 1 : *The Number System*** – Positive and Negative Integers, Fractions, Rational and Irrational Numbers, Real Numbers, Problems Involving the Concept of Real Numbers. ***Basic Algebra*** – Algebraic Identities, Simple Factorizations; Equations: Linear and Quadratic (in Single Variable and Simultaneous Equations). Surds and Indices; Logarithms and Their Properties (Including Change of Base); Problems Based on Logarithms.	8
2.	**Module 2** : ***Set Theory***-Introduction; Representation of sets; Subsets and supersets; Universal and Null sets; Basic operations on sets; Laws of set algebra; Cardinal number of a set; Venn Diagrams; Application of set theory to the solution of problems	7

	Permutations and Combinations – Fundamental principle of counting; Factorial notation. Permutation: Permutation of n different things; of things not all different; restricted permutations; circular permutations. Combination: different formulas on combination; complementary combination; restricted combination; Division into groups. Mixed problems on permutation and combination	
3.	**Module 3**: ***Determinants***- Determinants of order 2 and 3; minors and cofactors; expansion of determinants; properties of determinants; Cramer's rule for solving simultaneous equations in two or three variables ***Matrices-*** Different types of matrices; Matrix Algebra – addition, subtraction and multiplication of matrices; Singular and non-singular matrices; adjoint and inverse of a matrix; elementary row / column operations; Solution of a system of linear equations using matrix algebra. Concept of Eigen Value, Eigenvector.	7
4	**Module 4:** Differentiation: Meaning & geometrical interpretation of differentiation; standard derivatives (excluding trigonometric functions); rules for calculating derivatives; logarithmic differentiation. Integration: Meaning, Standard formulas, Substitution, Integration by parts (Excluding Trigonometric functions)	4
5.	**Module 5**: ***Data-***Collection, Editing and Presentation of Data: Primary data and secondary data; Methods of collection; Scrutiny of data. Presentation of data: textual and tabular presentations; Construction of a table and the different components of a table. Diagrammatic representation of data: Line diagrams, Bar diagrams, Pie charts and divided-bar diagrams.	7
5.	**Module 5** : ***Frequency Distributions-*** Attribute and variable; Frequency distribution of an attribute; Discrete and continuous variables; Frequency distributions of discrete and continuous variables; Bivariate and Multivariate Frequency Distributions. Diagrammatic representation of a frequency distribution: case of an attribute; case of a discrete variable: column diagram, frequency polygon and step diagram; case of a continuous variable: histogram and ogive.	7
6.	**Module 6** : ***Measures of Central Tendency-*** Definition and utility; Characteristics of a good average; Different measures of average; Arithmetic Mean; Median; Other positional measures – quartiles, deciles, percentiles; Mode; Relation between Mean, Median and Mode; Geometric and Harmonic Mean. Choice of a suitable measure of central tendency.	10
7	**Module 7: *Measures of Dispersion-*** Meaning and objective of dispersion; Characteristics of a good measure of dispersion; Different measures of dispersion – Range, Quartile deviation, Mean deviation, Mean Absolute deviation, Standard deviation; Comparison of the different measures of dispersion. Measures of relative dispersion – Coefficient of Variation. Combined mean and standard deviation, Combined mean and standard deviation. Introduction to Skewness, Kurtosis, Moments.	10

Suggested Readings

1. H. S. Hall & S. R. Knight – Higher Algebra; Radha Publishing House.

2. Reena Garg, Engineering Mathematics, Khanna Publishing House.

3. Sancheti& Kapoor – Business Mathematics; Sultan Chand & Company.

4. R. S. Soni – Business Mathematics – Pitambar Publishing House.

5. N G Das, Statistical Methods (Combined edition volume 1 & 2), McGraw Hill Education.

6. J K Sharma: Business Statistics, fifth edition, Vikas Publishing house.

Paper Name: MATHEMATICS FOR COMPUTER SCIENCE PART 1
Code : BSCIT103/GE3B-04
Contact: 5L+1T
Credits: 6
Allotted Hrs: 60

Course Objectives:

CO1. To understand different kind of sets, relation, various algebraic structure and their properties. CO2. To understand the base and dimension of vector space, characteristics of vector space in different dimension, linear transformation, eigenvalue and eigen vectors..
CO3. To learn the imaginary number and imaginary roots of a equation, number in terms of i, operations of complex number i.e. addition, subtraction, conjugate, multiplication, division.
CO4. . To understand basic property of matrices and determinant, relation between matrices and vector space.
CO5. To understand the formation of series from sequence, different type of series, concept of convergence and divergence.
CO6. To understand different type of data and their distribution , presentation, operation for calculating dispersion of central tendency and dispersion.

Course Outcomes:

Sl. No.	Course Outcome	Mapped Module
1	Ability to understand the properties of various algebraic structure and relationship between them. Ability to define binary operation, group, subgroup, ring, field and their properties.	Module 1
2	Ability to understand dimension of vector space, calculation of rank and nullity, linear transformation and mapping.	Module 2
3	Ability to solve quadratic equations with complex roots, properties of i, Operation of complex number.	Module 3
4	Ability to understand several kind of matrices, properties of determinant, calculation of rank of a matix, interpretation of existance and uniqueness of solution geometrically.	Module 4
5	Ability to check convergent and divergent of different series, type of infinite series.	Module 5
6	Ability to calculate measure of central for different type of series and dispersion.	Module 6

Module I Modern Algebra :

Group, Ring, Field 8

Module II Vector Spaces:

Vector Space, linear dependence of vectors, Basis, Dimension; Linear transformations (maps), Range and Kernel of a linear map, Rank and Nullity, Inverse of a linear transformation, Rank-Nullity theorem, composition of linear maps, Matrix associated with a linear map. 8

Module III Complex Numbers:

Complex Numbers; Conjugate of a complex number; modulus of a complex Number; geometrical representation of complex number; De Moivere's theorem; n-th roots of a complex number.6

Module IV Matrices and Determinants :

Determinants and its properties; Cramer's Rule, Definition of a matrix; Operations on matrices, inverse of a matrix; solution of equations using matrices, rank of a matrix, Basics of Vector analysis 8

Module V Infinite Series:

Convergence and divergence; series of positive terms; binomial series; exponential series; logarithmic series, Taylor's series.6

Module VI Basics Statistics:

Measures of central Tendency – Mean, Median, Mode for frequency and non-frequency distributions, Measures of dispersion – Range, Mean deviation about Mean and Median, Quartile deviation, individual and combined standard deviation; variance, coefficient of variation.4

Module No.	**Content**	**Total Hours**	**%age of questions**	**Covered CO**	**Covered PO**	**Blooms Level (If applicable)**	**Remarks (If any)**
Module 1	Modern Algebra	10	20	1	11		
Module 2	Vector Space	12	25	2	11		
Module 3	Complex numbers	8	10	3	11		
Module 4	Matrices and Determinants	10	20	4	11		
Module 5	Infinite Series	8	10	5	11		
Module 6	Basics Statistics	12	15	6	11		

Course Name: Operating Systems with LINUX
Course Code: GE4B-01
Mode-Offline/ Blended

Course Objective: The course is designed to understand the fundamental utilities which are required on daily basis to work on a modern operating system. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems. On successful completion of this course students will be able to make effective use of Linux utilities to solve problems

Sl	Course Outcome	Mapped modules
1	Remember fundamental components of a computer operating system	M1
2	Remember and Understand policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems	M2, M3
3	Understand the basic commands of Linux operating system	M4
4	Understand & Apply the knowledge to create file system and directories	M1, M4, M5
5	Apply the knowledge to create processes, perform pattern matching	M1, M4, M6
6	Application of the gathered knowledge to develop simple programs	M1, M4, M5, M6

Module	Content	Total Hours	%age of questions	Blooms Level	Remarks (If any)
M 1	Introduction	4	5	1	
M 2	Process	10	20	1,2	
M 3	Resource Manager	6	15	2	
M 4	Introduction to Unix OS	12	20	2,3	
M 5	Files	12	20	3	
M 6	Shells & Process	12	20	4	
		56	100		

Detailed Syllabus:

Paper: Operating system with LINUX

Module 1: Introduction

Importance of OS, Basic concepts and terminology, Types of OS, Different views, Journey of a command execution, Design and implementation of OS. **(Total hours -4)**

Module 2: Process (10L)

Concept and views, OS view of processes, OS services for process management, Scheduling algorithms, Performance evaluation; Inter-process communication and synchronization, Mutual exclusion, Semaphores, Hardware support for mutual exclusion, Queuing implementation of semaphores, Classical problem of concurrent programming, Critical region and conditional critical region, Monitors, Messages, Deadlocks. **(Total hours -10)**

Module 3: Resource Manager

Memory management, File management, Processor management, Device management. **(Total hours -6)**

Module 4: Introduction to UNIX Operating System

Introduction to UNIX UNIX operating system, UNIX architecture: Kernel and Shell, Files and Processes, System calls, Features of UNIX, POSIX and single user specification, Internal and external commands.

Utilities of UNIX Calendar (cal), Display system date (date), Message display (echo), Calculator (bc), Password changing (password), Knowing who are logged in (who), System information using uname, File name of terminal connected to the standard input (tty)
UNIX file system File system, Types of file, File naming convention, Parent – Child relationship, HOME variable, inode number, Absolute pathname, Relative pathname, Significance of dot (.) and dotdot (..), Displaying pathname of the current directory (pwd), Changing the current directory (cd), Make directory (mkdir), Remove directories (rmdir), Listing contents of directory (ls), Very brief idea about important file systems of UNIX: /bin, /usr/bin, /sbin, /usr/sbin, /etc, /dev, /lib, /usr/lib, /usr/include, /usr/share/man, /temp, /var, /home
(Total hours – 6)

Assignment –
LINUX Utilities - Calendar, Display system date, Message display, Calculator, Password changing, Knowing who are logged in, Knowing System information
Directory creation, removal, listing, navigation –
Displaying pathname of the current directory (pwd), Changing the current directory (cd), Make directory (mkdir), Remove directories (rmdir), Listing contents of directory (ls and its options), Absolute pathname, Relative pathname, Using dot (.) and dotdot (..) **(Total Hours – 6)**

Module 5: Files
Ordinary file handling Displaying and creating files (cat), Copying a file (cp), Deleting a file (rm), Renaming/ moving a file (mv), Paging output (more), Printing a file (lp), Knowing file type (file), Line, word and character counting (wc), Comparing files (cmp), Finding common between two files (comm), Displaying file differences (diff), Creating archive file (tar), Compress file (gzip), Uncompress file (gunzip), Archive file (zip), Extract compress file (unzip), Brief idea about effect of cp, rm and mv command on directory.
File attributes File and directory attributes listing and very brief idea about the attributes, File ownership, File permissions, Changing file permissions – relative permission & absolute permission, Changing file ownership, Changing group ownership, File system and inodes, Hard link, Soft link, Significance of file attribute for directory, Default permissions of file and directory and using umask, Listing of modification and access time, Time stamp changing (touch), File locating (find). **(Total Hours – 6)**

Assignment –
Ordinary File Handling - Displaying and creating files, Copying a file, Deleting a file, Renaming/ moving a file, Paging output, Knowing file type, Line, word and character counting (wc), Comparing files, Finding common between two files, Displaying file differences
File attributes – File and directory attributes listing, File ownership, File permissions, Changing file permissions – relative permission & absolute permission, Changing file ownership, Changing group ownership, File system and inodes, Hard link, Soft link, Default permissions of file and directory and using umask, Listing of modification and access time, Time stamp changing, File locating **(Total Hours – 6)**

Module 6: Shell and Process
Shell Interpretive cycle of shell, Types of shell, Pattern matching, Escaping, Quoting, Redirection, Standard input, Standard output, Standard error, /dev/null and /dev/tty, Pipe, tee, Command substitution, Shell variables
Process Basic idea about UNIX process, Display process attributes (ps), Display System processes, Process creation cycle, Shell creation steps (init ->getty -> login -> shell), Process

state, Zombie state, Background jobs (& operator, nohup command), Reduce priority (nice), Using signals to kill process, Sending job to background (bg) and foreground (fg), Listing jobs (jobs), Suspend job, Kill a job, Execute at specified time (at and batch) **(Total Hours – 6)**

Assignment –

Shell - Types of shell, Pattern matching, Escaping, Quoting, Redirection, Pipe, tee, Command substitution, Shell variables

Process - Display process attributes, Display System processes, Background jobs, Reduce priority, Sending job to background and foreground, Listing jobs **(Total Hours – 6)**

Readings

1.Operating Systems, Galvin, John Wiley

2.Operating Systems ,Milankovic, TMH

3.UNIX-Concepts & Applications, Sumitava Das, TMH

4.Learning UNIX Operating System, Peek, SPD/O'REILLY

5.Understanding UNIX, Srirengan, PHI 4. Essentials Systems Administration, Frisch, SPD/O'REILLY

Paper Code: BBA (HM) – 103 / GE5B-01
Principles of Management
Total Credit: 6
Total hours of lectures: 60 hours

Sl.	Topic/Module	Hour
1.	**Module 1 :** Introduction to Management- Nature, meaning and significance of management, Management as a Science or an Art, Difference between management & administration; management as a process, management as a functions, managerial skills, and managerial roles in organisation; quality of a good manager; relevance of management in Hospital and Health Sector	10
2.	**Module 2** : Approaches to Management – Classical, Neo-classical and Modern Contributors to Management Thought ; Taylor and Scientific Theory, Fayol's and Organization Theory, Elton Meyo & Behavioural school & human relations school ; Peter Drucker and Management Thought.; Various Approaches to Management i.e. system approach , contingency approach etc., Indian Management Thought.	10
3.	**Module 3** : Planning And Decision Making- Planning: Nature, importance, forms, types, making planning effective, Significance & Limitations of Planning; Planning Premises – Meaning & Types, Strategic Planning – Meaning & level, BCG model etc., MBO – Meaning, Process , importance ; Decision Making – Meaning, Types, Process, schools of decision making	10
4.	**Module 4** : Organization Design And Structure - Organization – Meaning, Process, Principles, Or Organization Structure – Determinants and Forms: Line, Functional, Line & Staff, Project, Matrix and Committees; Formal and Informal Organization; Departmentation – Meaning and Bases; Span of Control – Meaning and Factors Influencing; Authority, Responsibility and Accountability; Delegation – Meaning, Process; Principles; Centralization and Decentralization – Meaning; Degree of Decentralization; Difference between Delegation and Decentralization. Organization structure common in tourism industry	10
5.	**Module 5** : Directing – motivation & leadership- Motivation – Meaning , Definition, Significance & Limitations; contemporary theories of motivation; Financial and non-financial incentives of Motivation; Leadership - Definition, Significance of Leadership, Leadership styles ; Process and Barriers of Communication.	10
6.	**Module 6** : Controlling & Change- Control – meaning & importance of control, steps of controlling process, designing control systems, financial control ; Organizational change – meaning, drivers of change, process of change, resistance to change, overcoming resistance to change; Management trends in Health Sector - managing quality, innovation, concern for environment &sustainability of the organization & industry	10

Suggested Readings:

1. Management: Stoner James .A. , Freeman Edward, Gilbert Daniel , Pearson
2. Weihrich and Koontz, et al: Essentials of Management; Tata McGraw Hill
3. . V.S.P Rao & Hari Krishna: Management-Text & Cases, Excel Books
4.. Ramaswami T: Principles of Mgmt., Himalaya Publishing
5. Dipak Kumar Bhattacharyya: Principles of Management - Text and Cases, Pearson.
6. Robbins, S. P: Management, Prentice Hall.