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Choice Based Credit System

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 Programming for Problem Solving Lab	4	0	4	6
2	CC2	BCAC102 BCAC192	Digital Electronics Digital Electronics Lab	4	0	4	6
3	AECC-1	BCAA101	Soft Skills	2	0	0	2
4	GE-1		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 Structure	5	1	0	**6**
2	CC4	BCAC202 BCAC292	Computer Architecture Computer Architecture Lab	4	0	4	6
3	AECC-2	BCAA201	Environmental Science	2	0	0	2
4	GE-2		Any one from GE basket.	4 / 5	0 / 1	4 / 0	**6**
						Total Credit	20

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Semester III							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC5	BCAC301 BCAC391	Object Oriented Programming Object Oriented Programming Lab	4	0	4	6
2	CC6	BCAC302 BCAC392	Operating System Operating System Lab	4	0	4	6
3	CC7	BCAC303 BCAC393	Data Structure and Algorithm Data Structure Lab	4		4	6
4	SEC-1	BCAS301	Value and Ethics of Profession	2	0	0	2
5	GE-3		Any one from GE basket.	4 / 5	0 / 1	4 / 0	**6**
				Total Credit			26

Semester IV							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC8	BCAC401 BCAC491	Database Management System Database Management System Lab	4	0	4	6
2	CC9	BCAC402 BCAC492	Software Engineering Software Engineering Lab	4	0	4	6
3	CC10	BCAC403 BCAC493	Python Programming Python Programming Lab	4	0	4	6
4	SEC-2	BCAS401	Entrepreneurship	2	0	0	2
5	GE-4		Any one from GE basket.	4 / 5	0 / 1	4 / 0	**6**
				Total Credit			26

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Semester V							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC11	BCAC501 BCAC591	Internet Technology Internet Technology Lab	4	0	4	6
2	CC12	BCAC502 BCAC592	Computer Networking Computer Networking Lab	4	0	4	6
3	DSE-1	BCAD501	A. Cloud Computing B. Design & Analysis of Algorithm C. Information & Coding Theory D. Numerical and statistical Methods E. GUI Programming with .NET F. Theory of Computation G. Combinatorial Optimization H. Information Security	4 / 5	0 / 1	4 / 0	6
4	DSE-2	BCAD581	Industrial Training & Minor Project	4	0	4	**6**
						Total Credit	24

Semester VI							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC13	BCAC601 BCAC691	Unix and Shell programming Unix and Shell programming Lab	4	0	4	6
2	CC14	BCAC602	Cyber Security	5	1	0	6
3	DSE-3	BCAD601	A. Introduction to Data Science B. Introduction to AI and Machine Learning C. Digital Image Processing D. Digital Marketing. E. E-Commerce F. Advanced Database and PL/SQL G. Soft Computing	4 / 5	0 / 1	4 / 0	6
4	DSE-4	BCAD681	Major Project & Grand Viva	4	0	4	**6**
						Total Credit	24

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Semester	Credit
I	20
II	20
III	26
IV	26
V	24
VI	24
Total	140

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Semester-I

Detailed Syllabus

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
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

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Pre-Requisite:			
Sl. No.			
1	Understanding of basic mathematical logic.		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
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	**6**	**20**

	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.		
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical

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 C	4th Edition	ACM
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	1 to 5	10	10				
B	1 to 5			5	3	5	70
C	1 to 5			5	3	15	

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- 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 eachquestion	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**	

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Name of the Course: BCA **Subject: Digital Electronics**	
Course Code: BCAC102 + BCAC192	**Semester: 1st**
Duration: 48 Hours	**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: 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**

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Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Number Systems & Codes** 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.	**5**	**10**
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**
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:
BCAC192Credit: 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 usingmultiplexer.
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
Salivahan	Digital Circuit & Design		VIKAS
M. Morris. Mano & Michael D. Ciletti	Digital Design		PEARSON
Anand Kumar	Fundamentals of Digital Circuits		PHI

Reference Books:

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

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Name of the Course: **BCASubject: 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.

Aim:

Pre-Requisite:

Sl. No.	
1.	Basic knowledge of English Language.

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Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
1.	**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**
2.	**Essay Writing** Descriptive – Comparative – Argumentative – Thesis statement- Structure of opening / concluding paragraphs – Body of the essay.	**5**	**10**
3.	**Reading Comprehension** Global – Contextual – Inferential – Select passages from recommended text .	**5**	**10**
4.	**Business Correspondence** Letter Writing – Formal.Drafting.Biodata- Resume′- Curriculum Vitae.	**5**	**10**
5.	**Report Writing** Structure , Types of report – Practice Writing.	**5**	**10**
6.	**Communication skills** Public Speaking skills , Features of effective speech, verbal-nonverbal.	**5**	**10**
7.	**Group discussion** Group discussion – principle – practice .	**5**	**10**
	Sub Total:	**36**	**70**
	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.

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 eachquestion**	**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**	

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Semester-II

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.
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:

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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, 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.)	**12**	**14**
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**
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**

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

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Choice Based Credit System

Name of the Course: BCA **Subject:** Computer Architecture			
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 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**
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**
09	**Memory organization:** Memory hierarchy, Main memory definition,	**6**	**20**

	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		
	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 Performance		PEARSON
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:

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			

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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
	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

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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**
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, 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.

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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**		

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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 + Practical							
1	CC5	BCAC301 BCAC391	Object Oriented Programming Object Oriented Programming Lab	4	0	4	6
2	CC6	BCAC302 BCAC392	Operating System Operating System Lab	4	0	4	6
3	CC7	BCAC303 BCAC393	Data Structure and Algorithm Data Structure Lab	4	0	4	6
4	SEC-1	BCAS301	Value and Ethics of Profession	2	0	0	2
5	GE-3		Any one from GE basket.	4 / 5	0 / 1	4 / 0	**6**
				Total Credit			26

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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.

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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**	**6**	**10**

	Super class & subclasses including multilevel hierarchy, process of constructor 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

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		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**	

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Choice Based Credit System

Name of the Course: BCA **Subject:** Operating Systems	
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	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.
4	To describe the 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	**8**	**5**

	control,Formal models of protection ,Worms and viruses		
05	**Multiprocessor System** Multiprocessor system,Classification and types,OS functions and Requirements, Introduction to parallel computing,Multiprocessor interconnection synchronization	**6**	**10**
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

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**	

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- 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: Data Structure and Algorithm**	
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 algorithms.
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, Limitations of Array representation of stack.	**6**	**10**
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	**6**	**5**

	Function.		
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical: (Data Structure Lab)

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
Tannenbaum	Data Structure using C & C++	New Edition	PHI

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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/ C/C++ 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 to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 9**	**10**	**10**				
				5	**3**	**5**	**60**
B	**1 to 9**						
				5	**3**	**15**	
C	**1 to 9**						

- 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**

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Name of the Course: BCA **Subject: Values and Ethics of Profession**	
Course Code: BCAS301	**Semester: 3**
Duration: 48 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.	This course is aimed at giving basic understanding about the values of Ethics and Morality.
2.	This course is aimed at familiarizing the different theories related to Ethics.
3.	This course is aimed at providing knowledge about the ethical protocols defined for Professional world.

Objective:	
Sl. No.	
1.	Develop an understanding of Ethics and Morality.
2.	Develop a basic understanding of ethical protocols defined for professional world.
3.	Develop a balanced approach towards the assigned responsibilities in ethical and moral way.

Pre-Requisite:	
Sl. No.	
1.	None

Contents

Chapter	Name of the Topic	Hours	Marks
01	**Introduction to Ethical Theories** Consequentialist and Non-consequentialist theories, Hedonism, Utilitarianism, Virtue Ethics, Ethical Relativism, Ethical Naturalism	**4**	**5**
02	**Ethics and Morality** Ethics and Morals, Ethics in Indian Tradition, Building character in workplace, Moral and Ethical Judgement: Cannons of ethics, Ethics of duty, Ethics of responsibility	**6**	**10**
03	**Ethics and Environment** Rapid technological growth and depletion of resources, Sources of energy, Energy crisis, Reports of Club of Rome, Environmental degradation, Environmental Regulations, Environmental Ethics, Eco- friendly technologies, Sustainable Development, Important and recent national and international conventions on environment, Appropriate Technology Movement of Schumacher: Later developments	**10**	**15**
04	**Technology and Developing Nations- Technology transfer** Problems of technology transfer, Stages of technology transfer, Problems of technology transfer, Technology Impact Assessment, Problems of man machine interaction, Impact of Assembly line, Automation, Corporate Social Responsibility	**10**	**15**
05	**Ethics of Profession** Attributes of a profession, Science, Technology and Engineering as Knowledge and as Social and Professional Activities, Engineering profession: Ethical issues in engineering practice, Conflicts between business demands and professional ideals, Social and ethical responsibilities of Technologists, Codes of professional ethics, Whistle blowing and beyond. Case studies	**6**	**15**
06	**Profession and Human Values** Value Crisis in contemporary society, Nature of values: Value Spectrum of a 'good' life, Psychological values: Integrated personality; mental health, Societal values: The modern search for a 'good' society, justice, democracy, secularism, rule of law; values in Indian Constitution, Aesthetic values: Perception and enjoyment of	**8**	**10**

	beauty, simplicity, clarity		
	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 Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Biswanath Ghosh	Ethics in Management and Indian Ethos		Vikas Publishing
Sumita Manna	Values and Ethics in Business and Profession		PHI Publishing
R.S Naagarazan	Professional Ethics and Human Values		New Age International Private Limited

Reference Books:

Balachandran, Raja & Nair	Ethics, Indian Ethos and Management		Shroff Publishers and Distributors Pvt. Ltd
A. N. Tripathi	Human Values		New Age International
Prof. G.Pherwani	Business Ethics		Everest Publishing House

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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Semester IV							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC8	BCAC401 BCAC491	Database Management System Database Management System Lab	4	0	4	6
2	CC9	BCAC402 BCAC492	Software Engineering Software Engineering Lab	4	0	4	6
3	CC10	BCAC403 BCAC493	Python Programming Python Programming Lab	4	0	4	6
4	SEC-2	BCAS401	Entrepreneurship	2	0	0	2
5	GE-4		Any one from GE basket.	4 / 5	0 / 1	4 / 0	**6**
				Total Credit			26

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Name of the Course: BCA **Subject:** Database Management System	
Course Code: BCAC401 + BCAC491	**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

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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			

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Course Code: BCAC491
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:

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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**		

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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:

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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**		

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Name of the Course: BCA **Subject: Python Programming**	
Course Code: BCAC403 and BCAC493	**Semester: 4**
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 the fundamentals of Python programming environment.
2.	You should have some idea of how to work with different data types, operators and conditional operators in python.
3.	You should have some idea of how to work with string, list, tuple and dictionary
4.	You will be able to use and design program using there advanced data structures
5.	You will learn to work with object oriented programming constructs in python

Objective:	
Sl. No.	
1.	To understand the Fundamentals of data types and operators
2.	To understand concepts about conditional statements in python
3.	To understand and implement string, List, Tuples and Dictionary.
4.	To understanding about object oriented programming in python.

Pre-Requisite:	
Sl. No.	
1.	Basics of programming language.
2.	Logic building skills.

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Python** Python variables, expressions, statements Variables, Keywords, Operators & operands, Expressions, Statements, Order of operations, String operations, Comments, Keyboard input, Example programs Functions Type conversion function, Math functions, Composition of functions, Defining own function, parameters, arguments, Importing functions, Example programs	**12**	**20**

02	**Conditions and iterations** Modulus operator, Boolean expression, Logical operators, if, if- else, if-elif-else, Nested conditions, Example programs Iteration while, for, break, continue, Nested loop, Example programs	**10**	**20**
03	**Recursion,Strings,List,Dictionaries,Tuples** Recursion Python recursion, Examples of recursive functions, Recursion error, Advantages & disadvantages of recursion Strings Accessing values in string, Updating strings, Slicing strings, String methods – upper(), find(), lower(), capitalize(), count(), join(), len(), isalnum(), isalpha(), isdigit(), islower(), isnumeric(), isspace(), isupper() max(), min(), replace(), split(), Example programs List Introduction, Traversal, Operations, Slice, Methods, Delete element, Difference between lists and strings, Example program **Dictionaries** Introduction, Brief idea of dictionaries & lists **Tuples** Introduction, Brief idea of lists & tuples, Brief idea of dictionaries & tuples	**12**	**20**
04	**Classes& Objects** Creating class, Instance objects, Accessing attributes, Built in class attributes, destroying objects, Inheritance, Method overriding, Overloading methods, Overloading operators, Data hiding, Example program	**10**	**10**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical: (Python Programming Lab)

Skills to be developed:

Intellectual skills:

1. Skill to understand the python environment and different data types.
2. Knowledge of advanced data structures and their operations in python.
3. Ability to implement algorithms to perform various operations on data structures in python

List of Practical:

3. Program to display name, college name and other messages.
1. Program using type() function to display different basic data types in python.
2. Program to input two numbers the find larger / smaller number.
3. Program to input three numbers and find largest and smallest number.
4. Program to determine Armstrong number / palindrome number.
5. Program to display the terms of a Fibonacci series.
6. Program to work with string.
7. Program to find largest / smallest number in a list/tuple.
8. Program to work with dictionary.
9. Program to create class / objects in python
10. Program to work with class constructors and other elements of OOP in python.
11. Programs involving NumPy with Pandas and Matplotlib.
12. Practice package installation and other basic application usage.

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**
Zed A. Shaw	Learn Python The Hard Way	New Edition	ADDISON-WESLEY
Dr. Pooja Sharma	Programming In Python	2nd Edition	BPB
Reference Books:			
Reema Thareja	Python Programming - Using Problem Solving Approach	New Edition	OXFORD UNIVERSITY PRESS

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1.	Computer with moderate configuration
2.	Python 3 or higher

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**	**5**	**3**	**5**	**60**

B **C**	**1 to 9** **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:

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**

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Name of the Course: BCA **Subject:** Entrepreneurship	
Course Code: BCAS401	**Semester: 4**
Duration: 48 Hrs.	**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**
	Practical Sessional external examination: NA

Aim:	
Sl. No.	
1.	To understand the function of the entrepreneur in the successful, commercial application of innovations.
2.	To investigate methods and behaviours used by entrepreneurs to identify business opportunities and put them into practice.
3.	To discuss how ethical behavior impacts on business decisions for a selected business startup.
4.	To build and check the feasibility of business projects and the development of the projects for the same. To provide the overview of Business Ethics and its importance.
5.	To understand the various Management and Business scenarios of Ethics. To get the overall knowledge on corporate culture and its impact on business.

Objective:	
Sl. No.	
1.	Develop an understanding the basics of Entrepreneurship and Entrepreneurship Behaviour
2.	Gain familiarity with Project Feasibility Analysis
3.	Develop a basic understanding of what is Creativity and Innovation
4.	Develop an understanding of how market operates and how resources can be mobilized.

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

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Entrepreneurship** Theories of Entrepreneurship, Role and Importance of Entrepreneur in Economic Growth. **Entrepreneurial Behaviour** Entrepreneurial Motivation, Need for Achievement Theory, Risk-taking Behavior, Innovation and Entrepreneur **Entrepreneurial Traits** Definitions, Characteristics of Entrepreneurs, Entrepreneurial Types, Functions of Entrepreneur	**10**	**20**
02	**Project Feasibility Analysis** Business Ideas – Sources, processing; Input Requirements,	**10**	**10**

	Sources of Financing, Technical Assistance, Marketing Assistance, Preparation of Feasibility Reports, Legal Formalities and Documentation.		
03	**Creativity** Introduction – Meaning - Scope – Types of Creativity – Importance of Creativity – Steps of Creativity **Innovation** Introduction –Steps in Innovation – Stages of of Innovation – Technology aspects in Innovation.	**10**	**20**
04	**Understanding the Market** Types of Business: Manufacturing, Trading and Services – Market Research - Concept, Importance and Process - Market Sensing and Testing **Resource Mobilization** Types of Resources - Human, Capital and Entrepreneurial tools and resources- Selection and utilization of human resources and professionals like Accountants, Lawyers, Auditors, Board Members, etc. Role and Importance of a Mentor- Estimating Financial Resources required. Methods of meeting the financial requirements – Debt vs. Equity	**14**	**20**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Arya Kumar	Entrepreneurship	2nd Edition	Pearson.
Chakraborty, Tridib	Introducing Entrepreneurship Development		Modern Book Agency.
Reference Books:			
Dr. Aruna Bhargava.	Everyday Entrepreneurs - The harbingers of Prosperity and creators of Jobs	New Edition	Modern Book Agency.

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

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of	Total	No of	To	Marks	Total Marks

		question to be set	Marks	question to be set	answer	per question	
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

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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 V							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC11	BCAC501 BCAC591	Internet Technology Internet Technology Lab	4	0	4	6
2	CC12	BCAC502 BCAC592	Computer Networking Computer Networking Lab	4	0	4	6
3	DSE-1	BCAD501	A. Cloud Computing B. Design & Analysis of Algorithm C. Information & Coding Theory D. Numerical and statistical Methods E. GUI Programming with .NET F. Theory of Computation G. Combinatorial Optimization H. Information Security	4 / 5	0 / 1	4 / 0	6
4	DSE-2	BCAD581	Industrial Training & Minor Project	4	0	4	**6**
						Total Credit	24

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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	8	15

	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.		
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, Application layer, Proxy.	**10**	**13**
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**	

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Name of the Course: BCA **Subject: Computer Networking**	
Course Code: BCAC502 + BCAC592	**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, Router, Gateway; Addressing : Internet address, classful address,Routing : techniques,static vs. dynamic routing ,Protocols: IP,	**6**	**10**

	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: BCAC592
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	Total Marks	No of question to	To answer	Marks per question	Total Marks

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		be set		be set			
A **B** **C**	**1 to 7** **1 to 7** **1 to 7**	**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**	

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Choice Based Credit System

Name of the Course: BCA **Subject: Cloud Computing**			
Course Code: BCAD501A		**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	**15**	**15**

	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 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.

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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**

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Name of the Course: BCA **Subject: Design and Analysis of Algorithms**	
Course Code: BCAD501B + BCAD591B	**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	**1 to 6**	**10**	**10**				

B **C**	**1 to 6** **1 to 6**			**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**	

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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	**20**	**24**

	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 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**

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
Syllabus of BCA
(Effective for 2020-2021 Admission Session)
Choice Based Credit System

Name of the Course: BCA **Subject:** Numerical and statistical Methods	
Course Code: BCAD501D	**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: Conventional Methods - Muller's Method - Bairstow's Method. Algebraic Equations: Gauss Elimination -Gauss-Jordan - LU Decomposition - Matrix Inverse -Gauss-Seidel	**8**	**14**
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	**12**	**14**

	deviation and coefficient of variation - Moments (upto 4th) - Measures of Skewness and Kurtosis for grouped and ungrouped data.		
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 applications		Prentice Hall of India
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** •	**1,2,3,4,5** **1,2,3,4,5**	**10**	**10**	**5**	**3**	**5**	**60**

● **C**	**1,2,3,4,5**			**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**

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Name of the Course: BCA **Subject: GUI Programming with .NET**			
Course Code: BCAD501E		**Semester: 5**	
Duration: 48 Hrs.		**Maximum Marks:** 100	
Teaching Scheme		**Examination Scheme**	
Theory: 5		End Semester Exam:70	
Tutorial: 1		Attendance: 5	
Practical: 0		Continuous Assessment: 25	
Credit: 5+1		Practical Sessional internal continuous evaluation: 0	
		Practical Sessional external examination: 0	
Aim:			
Sl. No.			
1.	The aim is to make student efficient in windows programming.		
2.	Students can create the application which is fully object oriented.		
3.	Students can interoperate with other languages such as Asp.net , C#		
Objective:			
Sl. No.			
1.	Understanding the concept of windows programming with .Net platform		
2.	Understand the concept of windows component and different control statements		
3.	Understand and implement OOP concepts and database connectivity in .Net platform.		
Pre-Requisite:			
Sl. No.			
2.	Basics of programming language.		
2.	Logic building skills.		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Visual Basic .NET and the .NET Framework** Introduction to .net framework -Features, Common Language Runtime (CLR), Framework Class Library (FCL), Visual Studio.Net – IDE, Languages Supported, Components, Visual Programming, VB.net- Features, IDE- Menu System, Toolbars, Code Designer, Solution Explorer, Object Browser, Toolbox, Class View Window, Properties Window, Server Explorer, Task List, Output Window, Command Window	**5**	**10**
02	**Elements of Visual Basic .net** Properties, Events and Methods of Form, Label, Text Box,	**10**	**10**

	List Box, Combo Box, Radio Button, Button, Check Box, Progress Bar, Date Time Picker, Calendar, Picture Box, Scroll bar, Group Box, ToolTip Timer		
03	**Programming in Visual basic .net** Data Types, Keywords, Declaring Variables and Constants, Operators, Understanding Scope and accessibility of variables, Conditional Statements- If- Then, If-Then-Else, Nested If, Select Case, Looping Statement- Do loop, For Loop, For Each-Next Loop, While Loop, Arrays- Static and Dynami	**10**	**20**
04	Functions, Built-In Dialog Boxes, Menus and Toolbar Menus and toolbars- Menu Strip, Tool Strip, Status Strip, Built-In Dialog Boxes – Open File Dialogs, Save File Dialogs, Font Dialogs, Color Dialogs, Print Dialogs, Input Box, Message Box, Interfacing With End user- Creating MDI Parent and Child, Functions and Procedures- Built-In Functions- Mathematical and String Functions, User Defined Functions and Procedures	**5**	**10**
05	**Object Oriented Programming** Object Oriented Programming- Creating Classes , Objects, Fields, Properties, Methods, Events , Constructors and destructors, Exception Handling- Models, Statements, File Handling- UsingFile Stream Class, File Mode, File Share, File Access Enumerations, Opening or Creating Files with File Stream Class, Reading and Writing Text using StreamReader and StreamWriter Classes, Data Access withADO.Net – What are Databases?, Data Access with Server Explorer, Data Adapter and Data Sets, ADO.NET Objects and Basic SQL. Connection with Sql Server	**14**	**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 the subject teacher.

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Fred Barwell	Professional VB.NET	2nd edition	WROX Publication
Jesse	Learning Visual Basic. NET	New Edition	O'RELLY

Liberty			
Reference Books:			
Paul Vick	The Visual Basic .Net Programming Language	Second Edition	Universities Press
List of equipment/apparatus for laboratory experiments: (If Required)			
Sl. No.			
1.	Computer with moderate configuration		
2.	VB.net 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 9**	**10**	**10**				
				5	**3**	**5**	**60**
B	**1 to 9**						
				5	**3**	**15**	
C	**1 to 9**						

- 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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Name of the Course: BCA **Subject:** Theory of Computation	
Course Code: BCAD501F	**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	**15**	**20**

	Machine, Language acceptability, decidability, halting problem, Recursively enumerable and recursive languages, unsolvability problems.		
	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	**1 to 4**	**10**	**10**				
B	**1 to 4**			**5**	**3**	**5**	**70**
C	**1 to 4**			**5**	**3**	**15**	

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- 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**

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
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Choice Based Credit System

Name of the Course: BCA **Subject:** Combinatorial Optimization	
Course Code: BCAD501G	**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 -	**12**	**14**

	examples, closure properties, Convex Hull of a set		
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**

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
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Choice Based Credit System

Name of the Course: BCA **Subject: Information Security**	
Course Code: BCAD501H	**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.	
2.	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 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	**15**	**20**

	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	Total	No of	To	Marks	Total Marks

		question to be set	Marks	question to be set	answer	per question	
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

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Name of the Course: BCA **Subject: Industrial Training & Minor Project**	
Course Code: BCAD581	**Semester: 5**
Duration: 4/6 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 100
Tutorial: 0	Attendance: NA
Practical: 4	Continuous Assessment: NA
Credit: 4+2	Sessional internal continuous evaluation: 0
	Sessional internal examination: 100

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

Practical/ Sessional Examination: Examiner-		
Industrial Visit Certificate	**30**	
Minor Project Demo/ Q&A	**50**	
Overall Viva Voce	**20**	**100**

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Semester VI							
Sl. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC13	BCAC601 BCAC691	Unix and Shell programming Unix and Shell programming Lab	4	0	4	6
2	CC14	BCAC602	Cyber Security	5	1	0	6
3	DSE-3	BCAD601	A. Introduction to Data Science B. Introduction to AI and Machine Learning C. Digital Image Processing D. Digital Marketing. E. E-Commerce F. Advanced Database and PL/SQL G. Soft Computing	4 / 5	0 / 1	4 / 0	6
4	DSE-4	BCAD681	Major Project and Grand Viva-Voce	4	0	4	**6**
						Total Credit	24

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Name of the Course: BCA **Subject: Unix and Shell Programming**			
Course Code: BCAC601 and BCAC691		**Semester: 6**	
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 aim is to make students aware of multi user operating system environment		
2.	The aim is to make students get familiar with CUI based command and Editors		
3.	The aim is to make student get familiar with Shell programming		
Objective:			
Sl. No.			
1	Students should develop an understanding of CUI commands and multi user environment		
2	Students should develop an understanding of files, attributes, process, and filters.		
3	Students should develop an understanding of Shell programming, system administrative commands.		
Pre-Requisite:			
Sl. No.			
1.	Knowledge of operating the computer system		
2.	NA		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**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)	**5**	**5**

02	**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	**5**	**10**
03	**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	**5**	**10**
04	**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)	**5**	**10**
05	**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)	**5**	**10**
06	**Customization**	**5**	**10**

	Use of environment variables, Some common environment variables (HOME, PATH, LOGNAME, USER, TERM, PWD, PS1, PS2), Aliases, Brief idea of command history **Filters** Prepare file for printing (pr), Custom display of file using head and tail, Vertical division of file (cut), Paste files (paste), Sort file (sort), Finding repetition and non-repetition (uniq), Manipulating characters using tr, Searching pattern using grep, Brief idea of using Basic Regular Expression (BRE), Extended Regular Expression (ERE), and egrep, grep –E		
07	**Introduction to shell script** Simple shell scripts, Interactive shell script, Using command line arguments, Logical operator (&&, ||), Condition checking (if, case), Expression evaluation (test, []), Computation (expr), Using expr for strings, Loop (while, for), Use of positional parameters **System Administration** Essential duties of UNIX system administrator, Starting and shutdown, Brief idea about user account management (username, password, home directory, group id, disk quota, terminal etc.)	**10**	**15**
	Sub Total:	**44**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**48**	**100**

Practical: (Unix and Shell Programming Lab)

Skills to be developed:

Intellectual skills:

4. Skill to work on different unix/linux based commands.
5. Knowledge of advanced administrative command and perform intermediate level shell programming.

List of Practical:

1. Calendar, Display system date, Message display, Calculator, Password changing, Knowing who are logged in, Knowing System information

2. 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 (..)

6. 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
7. 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

8. Types of shell, Pattern matching, Escaping, Quoting, Redirection, Pipe, tee, Command substitution, Shell variables
9. Display process attributes, Display System processes, Background jobs, Reduce priority, Sending job to background and foreground, Listing jobs
10. Prepare file for printing, Custom display of file using head and tail, Vertical division of file, Paste files, Sort file, Finding repetition and non- repetition, Manipulating characters using, Searching pattern
11. Introduction to VI/VIM editor, Different commands of the editor, File editing in the editor
12. Simple shell scripts, Interactive shell script, Using command line arguments, Logical operator (&&, ||), Condition checking (if-then, if-then-else-fi, if-then—elif-else-fi, case), Expression evaluation (test, []), Computation (expr), Using expr for strings, Loop (while, for, until, continue), Use of positional parameters
13. Simple implementation of basic LINUX commands, utilities, filters etc. using shell scripts

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**
Sumitava Das	UNIX-Concepts & Applications		TMH
Peek	Learning UNIX Operating System		SPD/O'REILLY
Reference Books:			
Srirengan	Understanding UNIX		PHI

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1.	Computer with moderate configuration
2.	Unix/Linux OS 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 to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 9**	**10**	**10**	**5**	**3**	**5**	**60**

B **C**	**1 to 9** **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:

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**

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
Syllabus of BCA
(Effective for 2020-2021 Admission Session)
Choice Based Credit System

Name of the Course: **BCA** Subject: **Cyber Security**	
Course Code: BCAC602	Semester: 6
Duration: **48 Hrs.**	**Maximum Marks**: 100
Teaching Scheme	**Examination Scheme**
Theory: 5	End Semester Exam: 70
Tutorial: 1	Attendance : 5
Practical: 0	Continuous Assessment: 25
Credit: 5+1	Practical Sessional internal continuous evaluation: 0
	Practical Sessional external examination: 0

Aim:

Sl. No.	
1	This course is aimed at giving basic understanding about the Cyber Security
2	This course is aimed at providing knowledge about cyber threats, attacks and cyber laws.
3	This course is aimed at familiarizing the concepts of malware, hacking and ways to safeguard your system.

Objective:

Sl. No.	
1	Develop an overall understanding of defending data in cyberspace
2	Develop an understanding of different protocols, cyber crimes, cyber laws and vulnerabilities in digital world.
3	Develop an understanding of how to stay secure amidst cyber threats and malware attacks.

Pre-Requisite:

Sl. No.	
1.	None

Contents

Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Fundamentals** Fundamentals of data communication and networking, Network Reference Models: OSI and TCP/IP Models, 3 way handshake and TCP flags, Network address translation (NAT) concept, Network Transmission media and network devices Information Security definition, Information security goals (Confidentiality, Integrity and availability), Basic concepts of Cryptography and Steganography	**8**	**10**
02	**Hacking Concepts** Hacking, Types of Hacking/Hackers, what is Cybercrime, Types of cybercrime, Classifications of Security attacks (Passive Attacks and Active Attacks) Essential Terminology (Threat, Vulnerability, Target of Evaluation, Attack, Exploit). Concept of ethical hacking,	**10**	**15**

	Phase of Ethical Hacking, Hacktivism **Cyber Law** Cyber terrorism, Cyber laws, What offences are covered under these laws (Hacking, Data theft, Identity theft (including Password Theft), Email spoofing, Sending offensive messages, Voyeurism, Cyber terrorism) Punishment for cyber crime in India		
03	**Malware** About Malware, Types of Malware (Virus, worm, Trojan horse, spyware, adware, ransomware), Type of Computer Viruses(File Virus, Boot sector virus, Macro virus, Electronic mail (email) virus, Multi-variant virus) some indications of a malware attacks, Popular Antivirus programs, basic idea of how antivirus identifies a virus (Signature-based detection, Heuristics-based detection , Cloud based detection) about Virus Total website DOS, IDS, IPS Denial of service attack, Distributed Denial of service attack, Intrusion Detection System, Intrusion Prevention System, snooping, Eavesdropping, Key loggers and Firewall, BOTs/BOTNETS (Zombies). Web Application Based Threats Cross-site scripting, SQL injection, Command injection, Buffer overload, Directory traversal, Phishing scams, Drive by downloads	**12**	**20**
04	**Wireless Networking** Concept of wireless networking, Wireless standards, Common term used in wireless networking (WLAN, Wireless, Wireless Access point, cellular, Attenuation, Antenna, Microwave, Jamming, SSID, Bluetooth, Wi-Fi hotspots) What is Wi-Fi, Wireless attacks(War Driving, War Walking: War Flying, War Chalking, Blue Jacking) , How to secure wireless networks **Protocols & Proxy** TOPICS: Some protocols (HTTP, HTTPS, FTP, SSH, TELNET, SMTP, DNS, POP3, and related ports), proxy concept, different types of proxy (forward and reverse proxy concept), proxy chain	**12**	**15**
05	**Stay Secure in digital World** Usage of Password, Different types of password (Biometric, Pattern based Graphical password, Strong Password technique, Types of Password attacks Steps to stay secure in digital World, have strong password, encrypt your data, security suit software, firewall setup, update	**2**	**10**

	OS		
	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 Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Mayank Bhusan Rajkumar Singh Rathore Aatif Jamshed	Fundamentals of Cyber Security (Principle, Theory and Practices)		BPB Publications
Behrouz A. Forouzan	Data communication and Networking		McGraw Hill Education (India) Pvt. Ltd.
Reference Books:			
William Manning	Certified Ethical Hacker Certification Exam		Emereo
Nina Godbole Sunit Belapure	Cyber Security : Understanding cyber crimes, computer forensics and legal perspective		Wiley India

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.

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
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Choice Based Credit System

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

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
Syllabus of BCA
(Effective for 2020-2021 Admission Session)
Choice Based Credit System

Name of the Course: BCA **Subject: Introduction to Data Science**	
Course Code: BCAD601A	**Semester: 6th**
Duration:48 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 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** 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).	**6**	**10**
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** Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists.	**4**	**5**
	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 C	1 to 10 1 to 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**

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
Syllabus of BCA
(Effective for 2020-2021 Admission Session)
Choice Based Credit System

Name of the Course: BCA **Subject: Introduction to AI and Machine Learning**	
Course Code: BCAD601B & BCAD691B	**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**	**9**	**14**

	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		
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 informatics, robotics, medical imaging, etc.-ML and deep learning libraries overview: e.g. scikit-learn, Keras, Theano	**9**	**14**
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	**8**	**14**

	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		
	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	Total	No of	To	Marks	Total Marks

		question to be set	Marks	question to be set	answer	per question	
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

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
Syllabus of BCA
(Effective for 2020-2021 Admission Session)
Choice Based Credit System

Name of the Course: BCA **Subject:** Digital Image Processing	
Course Code: BCAD601 C+ BCAD691C	**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	**8**	**20**

	domain - Low pass filtering, High pass filtering.		
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	**Subjective Questions**

		correct answer)					
		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**	

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
Syllabus of BCA
(Effective for 2020-2021 Admission Session)
Choice Based Credit System

Name of the Course: BCA **Subject: Digital Marketing**	
Course Code: BCAD601D	**Semester: 6**
Duration: 48 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: 0
	Practical Sessional external examination: 0

Aim:	
Sl. No.	
1	This course is aimed at giving basic understanding about the Digital marketing
2	This course is aimed at familiarizing the different styles & strategies of Digital Marketing
3	This course is aimed at providing plans and campaigns that are digitally becoming more prevalent in the current scenario.

Objective:	
Sl. No.	
1.	Develop an understanding of Digital marketing concepts.
2.	Develop and execute transformational digital Marketing Strategies and best practices
3.	Understand the digital customer behavior and identify demand metrics to effectively measure and optimize marketing in the current scenario.

Pre-Requisite:	
Sl. No.	
1.	NA

Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Overview** About Digital Marketing, Difference between Traditional Marketing and Digital Marketing, Benefits of using digital media, Inbound and Outbound Marketing, Online marketing POEM: (Paid, Owned, and Earned Media), Components of Online Marketing (Email, Forum, Social network, Banner, Blog)	**5**	**10**
02	**Search Engine Optimization (SEO)** About SEO, Need of an SEO friendly website, Search Engine, Role of Keywords in SEO, Off-page Optimization, On-page Optimization concepts, Organic SEO vs Non-organic SEO	**5**	**10**
03	**Social Media Marketing (SMM)** About Social Media Marketing, Different types of Social Media Marketing	**5**	5

04	**Content Marketing** About Content Marketing, Goals of Content Marketing, Types Of Contents, etc.	**5**	**5**
05	**Online Advertising** About Online Advertising, Advantages of Online Advertising, Paid versus Organic, Pay Per Click (PPC) Model. Basic concepts CPC, PPC, CPM, CTR, CR	**5**	**5**
06	**Email Marketing** About Email marketing, Email newsletters, Digests, Dedicated Emails, Lead Nurturing, Sponsorship Emails and Transactional Emails, Drawbacks of Email Marketing	**5**	**5**
07	**MobileMarketing** About Mobile Marketing, Objectives of Mobile Advertising, Creating a Mobile Marketing Strategy, About SMS Marketing	**5**	**10**
08	**Online Marketing Types** Basics of Affiliate Marketing, Viral Marketing, Influencer Marketing. Referral Marketing **Web analytics** AboutWebAnalytics,TypesofWebAnalytics(On-site,Off-site),ImportanceofWebAnalytics	**5**	**15**
09	**OnlineMarketingImpact** Impact, Pros &Cons	**4**	**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 Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Vandana Ahuja	Digital Marketing	1st edition	Oxford

Reference Books :

PROF. SURABHI SINGH	Digital Marketing	New edition	MEWAR UNIVERSITY PRESS

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	NA
2.	NA

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

Group	**Unit**	**Objective**	**Subjective Questions**

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
Syllabus of BCA
(Effective for 2020-2021 Admission Session)
Choice Based Credit System

		Questions (MCQ only with the correct answer)					
		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 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

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Name of the Course: BCA **Subject: E-Commerce**			
Course Code: BCAD601E		**Semester: 6**	
Duration: 48 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: 0	
		Practical Sessional external examination: 0	
Aim:			
Sl. No.			
1.	This course is aimed at giving basic understanding about the Online Commerce.		
2	This course is aimed at familiarizing the different theories related to online payment, sales and purchase.		
3	This course is aimed at providing knowledge about online transaction security.		
Objective:			
Sl. No.			
1	Develop an understanding of E-Commerce		
2	Develop a basic understanding of Purchase, Sales and Payment Method using online platform		
3	Develop an understanding of developing a online business with high security.		
Pre-Requisite:			
Sl. No.			
1.	Some knowledge of Internet and networking		
Contents			
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to E-Commerce** E-Commerce and its types (B2B, B2C, C2B, C2C etc), Advantages, Disadvantages and Application areas of E-Commerce, E- Commerce Framework, Introduction to M-Commerce	**10**	**10**
02	**Internet and Network Security** E-Commerce and Internet, IP Address, DNS, ISP, URL, Modes of Internet Connectivity with reference to E-Commerce transactions, Web Architecture, VPN	**10**	**20**
03	**Electronic Payment Methods and Digital Currencies** Differences between Traditional Payment Methods and Electronic Payment Methods, Types of Electronic Payment Methods, E-Commerce Secure Payment System, Digital Certificate and Digital Signature, SSL, SET, Cyber Cash Model, Digicash, Smart Card, EDI	**10**	**10**

04	**Introduction to MIS and ERP** MIS-Definition, Working, Application, DSS, Data Processing, End-user Computing, Introduction to ERP and ERP Systems, ERP Functional Modules, ERP selection issues	**6**	**20**
05	**Information System Prospective of ERP** Introduction to OLAP, OLTP, Knowledge Base System, MRP, Supply Chain Management – Definition, Components, Process, Customer Relationship Management – Definition, Objectives, Benefits,Process,BusinessProcessReengineering– Definition,Advantages,Process	**8**	**10**
	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 Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Adesh K Pandey	Introduction to E-Commerce and ERP		S K Kataria and Sons
Ritender Goel	E-Commerce		New Age International

Reference Books :

Joseph	E-Commerce and Managerial Perspective		PHI

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	NA
2.	NA

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**				
				5	**3**	**5**	**60**
B	**1 to 9**						
				5	**3**	**15**	

C	**1 to 9**						

- 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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Name of the Course: BCA **Subject: Advanced DBMS with PL-SQL**			
Course Code: BCAD601F + BCAD691F		**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	**4**	**20**

	Hierarchies of Database Elements, Concurrency Control by Timestamps, Concurrency Control by Validation, Database recovery management		
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 WesleyI
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**	

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Name of the Course: BCA **Subject:** Soft Computing	
Course Code:BCAD601G	**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

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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.	**12**	**20**

	Neuo-Fuzzy modelling: 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 & Machine Learning		Pearson/PHI
Samir Roy &Udit	A beginners approach		Pearson

Chakraborty	to Soft Computing		
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**

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Name of the Course: BCA **Subject: Major Project and Grand Viva-Voce**	
Course Code: BCAD681	**Semester: 6**
Duration: 48 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	**End Semester Exam: NA**
Tutorial: 0	**Attendance : NA**
Practical: 4	**Continuous Assessment: NA**
Credit:6	**Practical/ Sessional internal continuous evaluation: 0**
	Practical /Sessional external examination: 100

Aim:	
Sl. No.	
1	Analyze and apply the role of different software for the final Project
2	Building team work.
3	Divide work load among team members
4	Deliver the project within time

Objective:	
Sl. No.	
1	Understand and use different languages and platforms for application development
2	Work with other team members .
3	Understand the importance of team work and delivery of software projects within a specific time frame.

Practical/ Sessional Examination: Examiner-		
Major Project documentation	**20**	
Minor Project Demo/ Q&A	**50**	
Grand Viva Voce covering the whole syllabus	**30**	**100**