MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL
NH-12 (Old NH-34), Simhat, Haringhata, Nadia -741249
Department of Information Technology
B.Sc. in Information Technology (Big Data Analytics)
Effective from academic session 20-21

Semester I							
Sl. No.	**CBCS Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC-1	BITBDAC101 BITBDAC191	Programming Fundamentals	4	0	4	**6**
2	CC-2	BITBDAC102	Discrete Structures	5	1	0	**6**
3	AECC-1	BITBDAA101	Soft skill	2	0	0	**2**
4	GE-1	BITBDAG101 BITBDAG102 BITBDAG103 BITBDAG104	1. MOOCS Basket 1 2. MOOCS Basket 2 3. MOOCS Basket 3 4. MOOCS Basket 4	4 / 5	0 / 1	4 / 0	**6**
				Total Credit			**20**

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Programming Fundamentals	
Course Code: BITBDAC101 BITBDAC191	**Semester: I**
Duration: 36 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.	Implement your algorithms to build programs in the C programming language
2.	Use data structures like arrays, linked lists, and stacks to solve various problems
3.	Understand and use file handling in the C programming language
Objective:	
Sl. No.	
1.	To write efficient algorithms to solve various problems
2.	To understand and use various constructs of the programming language
3.	To apply such as conditionals, iteration, and recursion in programming
Pre-Requisite:	
Sl. No.	

1.	**Basic Knowledge of Computer System**		
Contents		**Hrs./week**	
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 andAssociativity 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**	**16**
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**	**16**
05	**Structures and File** Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self-Referential Structures, Unions, Type Definition (typedef), Enumerated Types. Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.	**6**	**18**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Skills to be developed:
Intellectual skills:

1. The ability to learn concepts and apply them to other problems. ...
2. Basic mathematical skills.
3. A passion for problem solving.
4. Confidence around a computer programming Language.

List of Practical: Sl. No. 1 to10 compulsory & at least three from the rest)

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 displayit.
3. Write a c program to add 2 numbers entered by the user and display theresult.
4. Write a c program to calculate the area and perimeter of acircle.
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 ornot.
7. Write a C program to input angles of a triangle and check whether triangle is valid ornot.
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 whileloop.
12. Write a c program to print all the odd numbers in a givenrange.
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 givenrange.

15. Write a c program to add even numbers in a given range.
16. Write a c program to find the factorial of a givennumber.
17. Write a c program to find whether a number is prime ornot.
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 usingrecursion.
21. Write a c program to check whether a number is an Armstrong number ornot.
22. Write a c program to find g.c.d. and l.c.m. of two numbers usingfunction.

Assignments:

1. Based on theory lectures.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
YashavantKanetkar,	Let us C	13th Edition	BPB Publication
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

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

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

C	1,2,3,4,5			5	3	15	

- Only multiple choice type 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 objectivequestions 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 Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)
Subject: Discrete Structures

Course Code: BITBDAC102	**Semester: I**
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.	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:	
Sl. No.	
1.	**Knowledge of basic algebra**
2.	**Ability to follow logical arguments.**

Contents		**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.	**10**	**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.	**10**	**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.)	**10**	**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).	**8**	**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.	**10**	**18**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**52**	**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
Kenneth H. Rosen	Discrete Mathematics and its Applications		Tata Mc.Graw Hill
eymourLipschutz, M.Lipson	Discrete Mathematics		Tata Mc.Graw Hill
Reference Books:			
V. Krishnamurthy	Combinatorics:Theory		East-West Press

		and Applications					
Kolman, Busby Ross		Discrete Mathematical Structures				Prentice Hall International	
End Semester Examination Scheme.			**Maximum Marks-70.**			**Time allotted-3hrs.**	
Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 5**	**10**	**10**				
B	**1 to 5**			**5**	**3**	**5**	**60**
C	**1 to 5**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in theobjective 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: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Soft Skills	
Course Code: BITBDAA101	**Semester: I**
Duration: 36 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.	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.	Touse 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.
Pre-Requisite:	
Sl. No.	
1.	Basic knowledge of English Language.

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**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**	**15**
02	**Essay Writing** Descriptive – Comparative – Argumentative – Thesis statement- Structure of opening / concluding paragraphs – Body of the essay.	**5**	**5**
03	**Reading Comprehension** Global – Contextual – Inferential – Select passages from recommended text.	**5**	**10**
04	**Business Correspondence** Letter Writing – Formal.Drafting.Biodata- Resume′- Curriculum Vitae.	**5**	**8**
05	**Report Writing** Structure, Types of report – Practice Writing.	**5**	**5**
06	**Communication skills** Public Speaking skills, Features of effective speech, verbal-nonverbal.	**5**	**15**
07	**Group discussion** Group discussion – principle – practice	**5**	**12**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**

	Total:	**40**	**100**

Assignments:
Based on theory lectures.
List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
R.C. Sharma and K.Mohan	Business Correspondence and Report Writing		Tata McGraw Hill , New Delhi , 1994
.Gartside	Model Business Letters		Pitman , London , 1992
Reference Books:			
Mark MaCormack	Communication		
John Metchell	How to write reports		
S R Inthira&amp, V Saraswathi	Enrich your English – a) Communication skills b) Academic skills		CIEFL &amp, OUP
Longman	Longman Dictionary of Contemporary English/Oxford Advanced Learner's Dictionary of Current English		OUP , 1998
Maxwell Nurnberg and Rosenblum Morris	All About Words		General Book Depot, New Delhi , 1995
	A Text Book for English for Engineers &amp, Technologists		

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1.	Computer
2.	Audio Devices
3.	Visual Devices
4.	Language lab Devices and the dedicated 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	1,2,3,4,5, 6	10	10				
B	3, 4, 5, 6			5	3	5	60
C	1,2,3,4,5, 6			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in theobjective part.
- Specific instruction to the students to maintain the order in answering objectivequestions 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 Assignments		**10**	
On Spot Experiment		**40**	
Viva voce		**10**	**60**

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** MOOCS	
Course Code: BITBDAG101/BITBDAG102/BITBDAG103/BITBDAG104	**Semester: I**
Duration: Min 8 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: NA**
Tutorial: 1	**Attendance: 0**
Practical: 0	**Continuous Assessment: 0**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA
Contents	
Students will select General Elective subject from MOOCS Basket which is provided them.	

Semester II							
Sl. No.	**CBCS Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC-3	BITBDAC201 BITBDAC291	Data Structure and Algorithm with Python	4	0	4	**6**
2	CC-4	BITBDAC202 BITBDAC292	Operating System	4	0	4	**6**
3	AECC-2	BITBDAA201	Environmental Science	2	0	0	**2**
4	GE-2	BITBDAG201 BITBDAG202 BITBDAG203 BITBDAG204	1. MOOCS Basket 1 2. MOOCS Basket 2 3. MOOCS Basket 3 4. MOOCS Basket 4	4/5	0/1	4/0	**6**
Sessional							
5	SEC-1	BITBDAS281	Project and Entrepreneurship	0	0	4	**2**
				Total Credit			**22**

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Data Structure and Algorithm with Python	
Course Code: BITBDAC201 & BITBDAC291	**Semester: II**
Duration: 36 Hrs	**Maximum Marks:100+100**
Teaching Scheme	**Examination Scheme**
Theory: 4	**End Semester Exam:70**
Tutorial: 0	**Attendance: 5**
Practical: 4	**Continuous Assessment: 25**
Credit: 4+2	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60
Aim:	
Sl. No.	

1.	The point of this course is to give you a vibe for algorithms and data structures as a focal area of what it is to be a computer science student.
2.	You ought to know about the way that there are regularly a few calculations for some issue, and one calculation might be superior to another, or one calculation better in certain conditions and another better in others.
3.	You should have some idea of how to work out the efficiency of an algorithm.
4.	You will be able to use and design linked data structures
5.	You will learn why it is good programming style to hide the details of a data structure within an abstract data type.
6.	You should have some idea of how to implement various algorithm using python programming.

Objective:

Sl. No.	
1.	To impart the basic concepts of data structures and algorithms.
2.	To understand concepts about searching and sorting techniques.
3.	To understand basic concepts about stacks,queues,lists,trees and graphs.
4.	To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

Pre-Requisite:

Sl. No.	
1	Basics of programming language.
2	Logic building skills.

Contents		**Hrs./week**	
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.	**4**	**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.	**4**	**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)	**4**	**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).	**5**	**15**
08	**Searching and Sorting** Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Merge Sort, Quick sort, Shell Sort, Comparison of Sorting Techniques	**6**	**15**
09	**Hashing** Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collision by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function.	**5**	**5**
	Sub Total:	**36**	**70**

	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Skills to be developed:

Intellectual skills:

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

List of Practical:

1. Implementation of array operations.
2. Stacks and Queues: adding, deleting elements .
3. Circular Queue: Adding & deleting elements
4. Merging Problem : Evaluation of expressions operations on Multiple stacks & queues
5. Implementation of linked lists: inserting, deleting, 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 subject teacher.

List of Books

Text Books:

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

Michael H. Goldwasser, Michael T. Goodrich, and Roberto Tamassia	**Data Structures and Algorithms in Python**	**1118476735, 9781118476734**	**John Wiley & Sons**
Rance D Necaise	**Data Structures and Algorithms Using Python**	**9788126562169**	**John Wiley & Sons**
Reference Books:			
Sartaj Sahni	**DataStructures, Algorithms and applications in C++**	**Second Edition**	**Universities Press**
List of equipment/apparatus for laboratory experiments:			
Sl. No.			
1.	Computer with moderate configuration		
2.	Python 2.7 or higher and other softwares as required.		

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

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question 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**	**60**

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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

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

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Operating System			
Course Code: BITBDAC202 BITBDAC292		**Semester: II**	
Duration: 36		**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.	General understanding of structure of modern computers		
2.	Purpose, structure and functions of operating systems		
3.	Illustration of key OS aspects by example		
Objective:			
Sl. No.			
1.	To learn the fundamentals of Operating Systems.		
2.	To learn the mechanisms of OS to handle processes and threads and their communication		
3.	To learn the mechanisms involved in memory management in contemporary OS		
4.	To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols		
5.	To know the components and management aspects of concurrency management		
6.	To learn programmatically to implement simple OS mechanisms		
Pre-Requisite:			
Sl. No.			
1.	Strong programming skills (Knowledge of C)		
2.	Computer architecture		
3.	Elementary data structures and algorithms		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**

01	**Introduction** Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.	**3**	**5**
02	**Processes** Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.	**8**	**20**
03	**Inter-process Communication:** Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.	**4**	**5**
04	**Deadlocks** Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.	**4**	**10**
05	**Memory Management** Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).	**8**	**10**
06	**I/O Hardware** I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.	**6**	**10**

07	**Disk Management** Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk	**3**	**10**
	reliability, Disk formatting, Boot-block, Bad blocks.		
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. Can be able to Identify the purpose of the analysis.
2. Can be considered a reliable source of information.
3. Can able to use a variety of techniques to extend the original idea.

List of Practical:

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 Bankers algorithm for Dead Lock Avoidance
7. 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
10. Implement Paging Technique f memory management.
11. Implement Threading & Synchronization Applications

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
AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia	Operating System Concepts Essentials	978-1-119-32091-3	
William Stallings	Operating Systems: Internals and Design Principles	5th Edition	Prentice Hall of India
Reference Books:			
Charles Crowley	Operating System: A Design-oriented Approach	1st Edition	Irwin Publishing
J. Nutt, Addison-Wesley	Operating Systems: A Modern Perspective	2nd Edition	

Maurice Bach	Design of the Unix Operating Systems	8th Edition	Prentice-Hall of India
Daniel P. Bovet, Marco Cesati	Understanding the Linux Kernel	3rd Edition	O'Reilly and Associates

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	**Computer**
2.	**Linux/Ubantu operating system**

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**				**60**
B	**1 to 7**			**5**	**3**	**5**	
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 objectivequestions 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**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Environmental Science			
Course Code: BITBDAA201		**Semester: II**	
Duration: 36 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 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		
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		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Basic ideas of environment, basic concepts, man, society &amp, environment, their interrelationship. Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non- renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. Materials balance: Steady state conservation system, steady state system with non-conservative pollutants, step function. Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management, Anthropogenic degradation like Acid rain-	**3**	**10**

	cause, effects and control. Nature and scope of Environmental Science and Engineering.		
02	**Ecology** Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function. Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban), Food chain [definition and one example of each food chain], Food web. Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.	**7**	**10**
03	**Air pollution and control** Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere,Tropopause and Mesopause. Energy balance:Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food.Global warming and its consequence, Control of Global warming. Earth's heat budget. Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification. Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).	**6**	**10**
04	**Water Pollution and Control** Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes,	**6**	**15**

	pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH. Lake: Eutrophication [Definition, source and effect]. Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only) Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Wastewater treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic.		
05	**Land Pollution** Lithosphere, Internal structure of earth, rock and soil 1L Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes, Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).	**4**	**10**
06	**Pollution** Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise] Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level,(18hr Index), Ldn. Noise pollution control.	**5**	**10**
07	**Environmental Management** Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol.	**5**	**5**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
G. M.Masters,	Introduction to Environmental		Prentice-Hall of India Pvt. Ltd., 1991
	Engineering and Science		
Reference Books:			

A. K. De	Environmental Chemistry		New Age International

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

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

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objectivequestions 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: B.Sc. in Information Technology (Big Data Analytics) **Subject:** MOOCS	
Course Code: BITBDAG201/BITBDAG202/BITBDAG20/BITBDAG204	**Semester: II**
Duration: Min 8 Weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: 100**
Tutorial:1	**Attendance: 0**
Practical: 0	**Continuous Assessment: 0**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA
Contents	
Students will select subjects from MOOCS Basket which is provided them.	

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Project and Entrepreneurship	
Course Code: BITBDAS281	**Semester: II**
Duration: 48 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: 100**
Tutorial: 0	**Attendance: 0**
Practical: 4	**Continuous Assessment: 0**
Credit: 2	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60
Contents	
Students will do projects on application areas of latest technologies and current topics of societal relevance.	

Semester III							
Sl. No.	**CBCS Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC-5	BITBDAC301 BITBDAC391	Database Management System	4	0	4	**6**
2	CC-6	BITBDAC302 BITBDAC392	Machine Learning	4	0	4	**6**
3	CC-7	BITBDAC303	Introduction to Big Data	5	1	0	**6**
4	GE-3	BITBDAG301 BITBDAG302 BITBDAG303 BITBDAG304	1. MOOCS Basket 1 2. MOOCS Basket 2 3. MOOCS Basket 3 4. MOOCS Basket 4	4 / 5	0 / 1	4 / 0	**6**
5	SEC-2	BITBDAS381	Object-Oriented Programming	1	0	4	**3**
			Total Credit				**27**

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Database Management System	
Course Code: BITBDAC301 & BITBDAC391	**Semester: III**
Duration: 36	**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 store and transform data into information
2.	To organize the data in the form of table, schema and report forms

3.	To provide security of data
4.	Data is stored in either hierarchical form or a navigational form
Objective:	
Sl. No.	
1.	Understand the uses the database schema and need for normalization
2.	Experience with SQL
3.	Use different types of physical implementation of database
4.	Use database for concurrent use
Pre-Requisite:	
Sl. No.	
1.	Elementary knowledge about computers including some experience using UNIX or Windows
2.	Computer Programming & Utilization

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Database system architecture** Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.	**6**	**15**
02	**Relational query languages** Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.	**12**	**25**

03	**Storage strategies** Indices, B-trees, hashing.	**6**	**10**
04	**Transaction processing** Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.	**8**	**15**
05	**Advanced topics** Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.	**4**	**5**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Skills to be developed:

Intellectual skills:

1. Can be able to implement the plan .
2. Can be able to use a variety of techniques to extend the original idea.
3. Can be able to analyze relevant data.
4. Can be considered valid by the fact of it.

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key , Foreign key, NOT NULL to thetables.
3. Write a sql statement for implementing ALTER,UPDATE and DELETE
4. Write the queries to implement the joins
5. Write the query for implementing the following functions: MAX(),MIN(),AVG(),COUNT()
6. Write the query to implement the concept of Intergrity constrains
7. Write the query to create the views
8. Perform the queries for triggers

9. Perform the following operation for demonstrating the insertion , updation and deletion using the referential integrity constraints.
10. Write the query for creating the users and theirrole.

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**
Abraham Silberschatz, Henry F. Korth, S. Sudarshan	Database System Concepts	6th Edition	McGraw-Hill
R. Elmasri and S. Navathe	Fundamentals of Database Systems	5th Edition	Pearson Education

Reference Books:

J. D. Ullman	Principles of Database and Knowledge – Base Systems		Computer Science Press
Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley	Foundations of Databases		

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer/Laptop
2.	Oracle /Mysql

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

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

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Machine Learning	
Course Code: BITBDAC302 & BITBDAC392	**Semester: IV**
Duration: 36	**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 learn R
2.	To introduce the basic concepts and techniques of Machine Learning
3.	To develop the skills in using recent machine learning software for solving practical problems

Objective:

Sl. No.	
1.	To expose to basic terms and terminologies of Machine Learning.
2.	To study the various algorithms related to supervised and unsupervised learning.
3.	To understand the different types of Machine Learning models and how to use them.

Pre-Requisite:

Sl. No.	
1.	Strong programming skills (Knowledge of C)
2.	Data computational skill

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction To R** Introduction to mechanism for statistics, data analysis, and	**3**	**5**

	machine learning; Introduction of R Programming, How to install and run R, Use of R help files, R Sessions, R Objects Vectors, Attributes, Matrices, Array, Class, List, Data Frames etc. Operators in R. R Programming Structures, Control Statements, Loops, Repeat and Break, R-Function, RVector Function, Recursive Function in R. R Packages (Install and Use), Input/Output Features in R, Reading or Writing in File. Data Manipulation in R. Rearranging data, Random Number and Simulation, Statistical methods like min, max, median, mean, length R Programming Structures, Control Statements, Loops, Repeat and Break, R-Function, RVector Function, Recursive Function in R.		
02	**Supervised Learning (Regression/Classification)** Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes. Linear models: Linear Regression, Logistic Regression, Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods Beyond Binary Classification: Multi-class/Structured Outputs, Ranking	**8**	**15**
03	**Unsupervised Learning** Clustering: K-means/Kernel K-means Dimensionality Reduction: PCA and kernel PCA Matrix Factorization and Matrix Completion Generative Models (mixture models and latent factor models)	**4**	**10**
04	Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)	**4**	**10**
05	Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning	**8**	**10**
06	Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian	**6**	**10**
	Learning and Inference		
07	Recent trends in various learning techniques of machine learning and classification methods	**3**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. Identify the purpose of the analysis.
2. To describe the relationship between factors of theanalysis.
3. Information can be useful, used to create new things to achieveobjective.
4. Can use a variety of techniques to extend the originalidea.

List of Practical:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSVfile.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. 4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test datasets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in theprogram.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for thisproblem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and drawgraphs.

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
Joseph Adler	R in a Nutshell		Oreilly
Kevin Murphy	Machine Learning: A Probabilistic Perspective		MIT Press
Reference Books:			
Trevor Hastie, Robert Tibshirani, Jerome Friedman	The Elements of Statistical Learning		Springer

Christopher Bishop	Pattern Recognition and Machine Learning		Springer
Jared P. Lander	R for Everyone: Advanced Analytics and Graphics		Paperback

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	**Computer**
2.	**R 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 7**	**10**	**10**				**60**
B	**1 to 7**			**5**	**3**	**5**	
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 objectivequestions 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**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject: Introduction to Big Data**	
Course Code: BITBDAC303	**Semester: III**
Duration: 36 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.	Understand big data for business intelligence
2.	Learn business case studies for big data analytics.
3.	Understand nosql big data management.
4.	Perform map-reduce analytics using Hadoop and related tools

Objective:

Sl. No.	
1.	Understand the fundamentals of Big cloud and data architectures.
2.	Understand HDFS file structure and Mapreduce frameworks, and use them to solve complex problems, which require massive computation power
3.	Use relational data in a Hadoop environment, using Hive and Hbase tools of the Hadoop Ecosystem..
4.	Understand the Comparison with traditional databases.

Pre-Requisite:

Sl. No.	
1.	Database Management Systems.
2.	Object Oriented Programming Through Java

Contents		Hrs./week	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Big Data** What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.	**6**	**10**
02	**Introduction to NoSQL** Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.	**10**	**20**
03	**Hadoop** History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features Hadoop environment.	**12**	**20**

04	**Frameworks** Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation 5 of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.	**8**	**20**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**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**
Tom White	Hadoop: The Definitive Guide	Third Edition	O'reilly Media
Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos	Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data		McGrawHill Publishing

Reference Books:

Anand Rajaraman and Jeffrey David Ullman	Mining of Massive Datasets		CUP
Bill Franks	Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics		John Wiley& sons
Glenn J. Myatt	Making Sense of Data		John Wiley & Sons

Pete Warden	Big Data Glossary		O'Reilly

List of equipment/apparatus for laboratory experiments:

Sl. No.	
3.	Computer with moderate configuration
4.	Linux os or VM
5.	Hadoop 2.x or higher and other software 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 4**	**10**	**10**				
B	**1 to 4**			**5**	**3**	**5**	**60**
C	**1 to 4**			**5**	**3**	**15**	

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

Examination Scheme for end semester examination:

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

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

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** MOOCS	
Course Code: BITBDAG301/BITBDAG302/BITBDAG303/BITBDAG304	**Semester: III**
Duration: Min 8 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: NA	**End Semester Exam: NA**
Tutorial:	**Attendance: 0**
Practical: 0	**Continuous Assessment: 0**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA
Contents	
Students will select subjects from MOOCS Basket which is provided them.	

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Object-Oriented Programming	
Course Code: BITBDAS381	**Semester: III**
Duration: 36	**Maximum Marks: 100+100**
Teaching Scheme	**Examination Scheme**
Theory: 1	**End Semester Exam: 70**
Tutorial: 0	**Attendance : 5**
Practical:4	**Continuous Assessment:25**
Credit: 3	**Practical Sessional internal continuous evaluation:40**
	Practical Sessional external examination:60

Aim:

Sl. No.	
1.	To understand Basic concepts of OOPs
2.	To Learn programming by class and object model
3.	Get knowledge Java programming

Objective:

Sl. No.	
1.	To learn the fundamentals of Java programming such as data types, variables and arrays.
2.	To study the syntax and necessity of decision making and iterative statements.
3.	To create a class and invoke the methods.
4.	To instigate programming in overloading of methods.
5.	To emphasize the concept of packages.
6.	To learn the exception handling routines.

Pre-Requisite:			
Sl. No.			
1.	The fundamental point in learning programming		
2.	Basic knowledge of algorithms and procedural programming		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction:** Why object orientation, History and development of object oriented programming language, concepts of object oriented programming language. Difference between OOP and other conventional programming – advantages and disadvantages. Data types, variables. Array, operators. String, I/O. Control statements. Object oriented design: Major and minor elements, class fundamentals. Declaring objects, instantiation of class, introducing methods. Constructing objects using constructor. Static variable, constants. Visibility modifiers.	**4**	**20**
02	**Object Properties:** Introduction to basic features of a class (encapsulation, polymorphism etc) Data field encapsulation. Passing objects to methods. Array of objects, 'This' keyword Relationships among objects: aggregation, composition, dependency, links. Relationship among classes: association, aggregation. Meta class, meta object. Grouping constructs.	**4**	**25**
03	**Basic concepts of object oriented programming using Java:** Using objects as parameters, closure look at argument passing, returning objects. Introducing access control, Final keyword, garbage collection, Nested and inner classes. Class abstraction and encapsulation, Overloading of methods (overloading of constructor). Super class, subclasses, super keyword, inheritance, types, member access. Multilevel hierarchy, process of constructor calling in inheritance. Overriding methods, overriding vs. overloading, polymorphism. Abstract class, interface & comparison between abstract class and interface Packages, importing packages. Exception handling basics, types, using try &catch, throw, throws & finally. Threading, synchronization & priorities, thread class, creating thread. Basic applet programming. Life cycle.	**4**	**25**

	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. Students will be able to implement basic data structure and control statements in object oriented programming.
2. Student will be able to design class with its basic features.
3. Students can write programs using Java to implement OOP
4. Student will be able to design object oriented programs with the concept of object, class, abstraction, encapsulation, inheritance etc. to provide flexibility, modularity and re-usability in programming.
5. They can also be able to design Meta classes and grouping construct.

List of Practical:

1. Introduction to Java and JDK
2. Java Fundamentals - Data Types, Control Loops
3. Java Fundamentals - Wrapper Classes, Arrays
4. Classes and Objects 5 Inheritance
5. Abstract Class & Interface
6. File I/O and Exception Handling
7. Graphical User Interface (GUI) Programming with Java Swing
8. Applets
9. Java Threads

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
Rambaugh, James Michael, Blaha	Object Oriented Modelling and Design		Prentice Hall
Patrick Naughton, Herbert Schildt	The complete reference-Java2		TMH
Reference Books:			
Sourav Sahay	”Object-Oriented Programming with C++		Oxford
Blaha, Rumbaugh	Object-Oriented Modeling and Design with UML		Pearson Ed
. Ali Bahrami	Object Oriented System Development		Mc Graw Hill

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1.	**Computer**
2.	**JDK**

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 3**	**10**					

B	**1 to 3**		**10**	**5**	**3**	**5**	**60**
C	**1 to 3**			**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 objectivequestions 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**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

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

Semester IV							
Sl. No.	**CBCS Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC-8	BITBDAC401 BITBDAC491	Computer Networks	4	0	4	**6**
2	CC-9	BITBDAC402 BITBDAC492	Software Engineering	4	0	4	**6**
3	CC-10	BITBDAC403 BITBDAC493	Foundation in Big Data Analysis and Hadoop	4	0	4	**6**
4	GE-4	BITBDAG401	1. MOOCS Basket 1 2. MOOCS Basket 2 3. MOOCS Basket 3 4. MOOCS Basket 4	4 / 5	0 / 1	4 / 0	**6**
Sessional							
6	SEC-3	BITBDAS481	Minor Project and Entrepreneurship I	0	0	4	**4**
						Total Credit	**28**

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)

Subject: Computer Networks

Course Code: BITBDAC401 & BITBDAC491	**Semester: IV**
Duration: 36	**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 computer networks.
2.	To gain knowledge of several layers and network architectures

3.	To gain knowledge of communication through networks, protocols and alghorithms.
Objective:	
Sl. No.	
1.	Understand the division of network functionalities into layers.
2.	Be familiar with the components required to build different types of networks Be exposed to the required functionality at each layer
3.	Learn the flow control and congestion control algorithms
Pre-Requisite:	
Sl. No.	
1.	Understanding of algorithms
2.	Understanding of basic computer architecture

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**FUNDAMENTALS & LINK LAYER** Building a network – Requirements – Layering and protocols – Internet Architecture – Network software – Performance ; Link layer Services – Framing – Error Detection – Flow control	**7**	**14**
02	**MEDIA ACCESS & INTERNETWORKING** Media access control – Ethernet (802.3) – Wireless LANs – 802.11 – Bluetooth – Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP,ICMP)	**7**	**14**
03	**ROUTING** Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM)	**7**	**14**
04	**TRANSPORT LAYER**	**8**	**14**

	Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements		
05	**APPLICATION LAYER** Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS – SNMP	**7**	**14**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. Identify the components required to build different types of networks
2. Choose the required functionality at each layer for given application
3. Identify solution for each functionality at each layer
4. Trace the flow of information from one node to another node in thenetwork

List of Practical:

Hand on experiments based on theory lectures.

Assignments:

Adhered to theory curriculum as conducted by the subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Larry L. Peterson, Bruce S. Davie	Computer Networks: A Systems Approach	Fifth	Morgan Kaufmann Publishers

Behrouz A. Forouzan	Data Communication and Networking	Fourth	Tata McGraw – Hill
James F. Kurose, Keith W. Ross	Computer Networking – A Top-Down Approach Featuring the Internet	Fifth	Pearson Education

Reference Books:

Nader. F. Mir	Computer and Communication Networks		Pearson Prentice Hall Publishers
Ying-Dar Lin, Ren-Hung Hwang, Fred Baker	Computer Networks: An Open Source Approach		McGraw Hill Publisher

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer with Internet Connection

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

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

- Only multiple choice type 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 objectivequestions 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 Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Software Engineering			
Course Code: BITBDAC402 & BITBDAC492		**Semester: IV**	
Duration: 36 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.	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 software.		
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.			
2.	**Basic Knowledge of Computer System**		
Contents		**3 Hrs./week**	
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.	**7**	**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.	**7**	**20**
04	ERP, MRP, CRM, Software maintenance SCM, concept of standards [ISO and CMM]	**10**	**15**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

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
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

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

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

- Only multiple choice type 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 objectivequestions 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 Assignments		**10**	
On Spot Experiment		**40**	
Viva voce		**10**	**60**

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)

Subject: Foundation in Big Data Analysis and Hadoop

Course Code: BITBDAC403 & BITBDAC493	**Semester: IV**
Duration: 36 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.	Understand big data for business intelligence
2.	Learn business case studies for big data analytics.
3.	Perform map-reduce analytics using Hadoop and related tools

Objective:

Sl. No.	
1.	Understand the Big Data concepts in real time scenario
2.	Understand the big data systems and identify the main sources of Big Data in the real world.
3.	Demonstrate an ability to use Hadoop framework for processing Big Data for Analytics.
4.	Evaluate the Map reduce approach for different domain problems.

Pre-Requisite:

Sl. No.	
1.	Database Management Systems.
2.	Object Oriented Programming Through Java

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications, Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.Apache Hadoop– Moving Data in and out of Hadoop – Understanding inputs and outputs ofMapReduce - Data Serialization, Problems with traditional large-scale systems-Requirements for a new approach-Hadoop – Scaling-Distributed Framework- Hadoop v/s RDBMS-Brief history of Hadoop. Examples of MapReduce, Using Elastic MapReduce, Comparison of local versus EMR Hadoop.	**8**	**10**
02	**CONFIGURATIONS OF HADOOP** Hadoop Processes (NN, SNN, JT, DN, TT)-Temporary directory – UI	**12**	**20**

	Common errors when running Hadoop cluster, solutions.Setting up Hadoop on a local Ubuntu host: Prerequisites, downloading Hadoop, setting up SSH, configuring the pseudo-distributed mode, HDFS directory, NameNode, Understanding MapReduce:Key/value pairs,TheHadoop Java API for MapReduce, Writing MapReduce programs, Hadoop-specific data types, Input/output. Developing MapReduce Programs: Using languages other than Java with Hadoop,Analysing a large dataset.		
03	**ADVANCED MAPREDUCE TECHNIQUES** Simple, advanced, and in-between Joins, Graph algorithms, using language-independent data structures. Hadoop configuration properties - Setting up a cluster, Cluster access control, managing the NameNode, Managing HDFS, MapReduce management, Scaling.	**14**	**20**
04	**HADOOP STREAMING** Hadoop Streaming - Streaming Command Options - Specifying a Java Class as the Mapper/Reducer - Packaging Files With Job Submissions - Specifying Other Plug-ins for Jobs.	**8**	**20**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. The HDFS file system, MapReduce frameworks are studied in detail.
2. Hadoop tools like Hive, and Hbase, which provide interface to relational databases, are also covered as part of this course work.
3. Ability to implement algorithms to perform various operations on Mapreduce,Pig,Hive

List of Practical:

1. Word count application in Hadoop.

2. Sorting the data using MapReduce.
3. Finding max and min value in Hadoop.
4. Implementation of decision tree algorithms using MapReduce.
5. Implementation of K-means Clustering using MapReduce.
6. Genertion of frequent Itemset using MapReduce
7. Count the number of missing and invalid values through joining two large givendatasets.
8. Using hadoop's map-reduce, Evaluating Number of Products Sold in Each Country in the online shopping portal. Dataset is given.
9. Analyze the sentiment for product reviews, this work proposes a MapReduce technique provided by Apache Hadoop.
10. Trend Analysis based on Access Pattern over Web Logs using Hadoop.
11. Service Ra_ng Predic_on by Exploring Social Mobile Users Geographical Loca_ons.

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
Tom White	Hadoop: The Definitive Guide	Third Edition	O'reilly Media
Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos	Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data		McGrawHill Publishing

Reference Books:

Anand Rajaraman and Jeffrey David Ullman	Mining of Massive Datasets		CUP
Bill Franks	Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics		John Wiley& sons

Glenn J. Myatt	Making Sense of Data		John Wiley & Sons
Pete Warden	Big Data Glossary		O'Reilly

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer with moderate configuration
2.	Linux os or VM
3.	Hadoop 2.x or higher and other software 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 4**	**10**	**10**				
B	**1 to 4**			**5**	**3**	**5**	**60**
C	**1 to 4**			**5**	**3**	**15**	

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

Examination Scheme for end semester examination:

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

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** MOOCS	
Course Code: BITDSG401/BITDSG402/BITDSG403/ BITDSG404	**Semester: IV**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: NA**
Tutorial: 1	**Attendance: 0**
Practical: 0	**Continuous Assessment: 0**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA
Contents	
Students will select subjects from MOOCS Basket which is provided them.	

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Minor Project and Entrepreneurship I	
Course Code: BITBDAS481	**Semester: IV**
Duration: 72 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: 100**
Tutorial: 0	**Attendance: 0**
Practical: 8	**Continuous Assessment: 0**
Credit: 4	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60
Contents	
Students will do projects on application areas of latest technologies and current topics of societal relevance.	

Semester V							
Sl. No.	**CBCS Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC-11	BITBDAC501 BITBDAC591	Internet of Things	4	0	4	**6**
2	CC-12	BITBDAC502 BITBDAC592	Advanced Big Data Analytics	4	1	4	**6**
3	DSE-1	BITBDAD501	Elective-I	5	1	0	**6**
			A. Pattern Recognition				
			B. Web Analytics				
			C. Data Mining and Data Warehousing				
			D. Data Visualisation				
4	DSE-2	BITBDAD502	Elective-II	5	1	0	**6**
			A. XML and Web Services				
			B. Multimedia Systems				
			C. Knowledge Discovery Techniques				
			D. Wireless Networking				
Sessional							
5	SEC-4	BITBDAS581	Industrial Training and Internship	0	0	0	**2**
			Total Credit				**26**

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Internet of Things	
Course Code: BITBDAC501 & BITBDAC591	**Semester: V**
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.	Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks		
2	Able to understand the application areas of IOT		
3	Able to understand building blocks of Internet of Things and characteristics		
Objective:			
Sl. No.			
1.	To Understand the vision of IoT from a global context.		
2	To Determine the Market perspective of IoT.		
3	To Use of Devices, Gateways and Data Management in IoT.		
4	To Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.		
5	To Building state of the art architecture in IoT.		
Pre-Requisite:			
Sl. No.			
1.	Fundamentals of Programming		
2.	Mathematics		
3	Digital Electronics		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**INTRODUCTION TO IoT** Introduction to IoT - Definition and Characteristics, Physical Design Things- Protocols, Logical Design- Functional Blocks, Communication Models- Communication APIs Introduction to measure the physical quantities, IoT Enabling Technologies – Wireless Sensor Networks, Cloud Computing Big Data Analytics, Communication Protocols- Embedded System- IoT Levels and Deployment Templates.	8	15

02	**IoT & M2M** Machine to Machine, Difference between IoT and M2M, Software define Network **Challenges in IoT** Design challenges, Development challenges, Security challenges, Other challenges	8	15
03	**IoT PROGRAMMING** Introduction to Smart Systems using IoT - IoT Design Methodology- IoT Boards (Rasberry Pi, Arduino) and IDE - Case Study: Weather Monitoring- Logical Design using Python, Data	12	25
	types & Data Structures- Control Flow, Functions- Modules- Packages, File Handling - Date/Time Operations, Classes- Python Packages of Interest for IoT.		
04	**Domain specific applications of IoT** Home automation, Industry applications, Surveillance applications, Other IoT applications	8	15
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical

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
Yasuura, H., Kyung, C.-M., Liu, Y., Lin, Y.-L.	Smart Sensors at the IoT Frontier		Springer International Publishing
ArshdeepBahga and Vijay Madisetti	Internet of Things: Hands-on Approach,		Hyderabad University Press, 2015.

KazemSohraby, Daniel Minoli and TaiebZnati	Wireless Sensor Networks: Technology. Protocols and Application		Wiley Publications, 2010.
Reference Books:			
Kyung, C.-M., Yasuura, H., Liu, Y., Lin, Y.-L.	Smart Sensors and Systems		Springer International Publishing
Edgar Callaway	Wireless Sensor Networks: Architecture and Protocols		Auerbach Publications, 2003.
Holger Karl and Andreas Willig	Protocols and Architectures for Wireless Sensor Networks		John Wiley & Sons Inc., 2005
Carlos De MoraisCordeiro and Dharma PrakashAgrawal	Ad Hoc and Sensor Networks: Theory and Applications		World Scientific Publishing, 2011

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer ,Different sensor

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 objectivepart.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)

Subject: Advanced Big Data Analytics

Course Code: BITBDAC502 & BITBDAC592	**Semester: V**
Duration: 36	**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 in MapReduce, pig ,spark , SCALA and SPARK ,Hive, SQOOP, Tableau programming.

Objective:

Sl. No.	Understanding of the MapReduce paradigm and Hadoop ecosystem
1.	develop data analysis skills with Hive and Pig
2.	be able to analyze temporal, geospatial, text, and graph data with Spark
3.	Learn how to use machine learning algorithms on large datasets and analyze outcomes with Mahout (Hadoop) and (Spark)

Pre-Requisite:

Sl. No.	
1.	Data Science & Analytics,
2.	Big Data Analytics, ,
3.	Database Management System
4.	HDFS and MapReduce

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Advanced MapReduce:** MapReduce Joins, Sorting, Counters in MapReduce, Real Time MapReduce	**3**	**5**
02	**PIG:** Introduction, Execution Modes, Pig Latin Basics, PIG OperatorsJoining data-sets, user defined functions	**8**	**15**
03	**Hive:** Hive overview and concepts, Comparison with traditional Databases, HiveQL, Hive tables, Partitioning, Bucketing, Joins	**3**	**5**
04	**SQOOP:** Introduction, SQOOP Connectors, Import and Export using SQOOP	**4**	**10**

05	**SCALA and SPARK:** **SCALA:** What is Scala? Basic Operations, variable types, control structure, for each loop, functions, procedures, array, higher order functions, Class in Scala, getters and setters, constructor, singletons, traits **SPARK:** Spark Components & its Architecture, Spark Deployment Modes, Spark RDDs, RDD operations, transformations and actions, data loading and saving, Key-Value Pair RDDs, RDD Persistence, SPARK SQL, data frames and datasets, JSON and Parquet file formats,	**9**	**15**
06	**Tableau:** Tableau installation, Data type, file type, tool type, show me menu, Type of data source supported by, how to connect different data source, edit metadata, filter fields, filter data source, type of charts, filter data, data joining, data blending, extract data, adding filter data, apply filter on chart and data, number functions, string functions.	**6**	**15**
07	**Big Data Issues:** Privacy, Visualization, Compliance and Security	**3**	**5**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

After successful completion of the course students should be able to

1. To understand several key big data technologies used for storage, analysis and manipulation of data.
2. To recognize the key concepts of Hadoop framework, MapReduce, Pig, Hive, SQOOP, Spark.
3. Data Visualization using Tableau

List of Practical:

1. Configure HIVE with MySQL and perform queries for Create, Alter & Drop Table (for both managed and external tables)
2. Perform advanced HIVE queries (index, view, order by, group by, joins, subqueries, cluster by)
3. Configure PIG and implement various PIG commands, implement same programs using PIG script
4. Perform import and export database/tables from/to hadoop/RDBMS using Sqoop (Use various options like custom number of mappers, delimiters, change default directory,etc.)
5. Implement advanced mapreduce programsusing joins, counters and sorting
6. Implement various tasks with Apache Spark (verify installation, create RDD, execute word count transformation, cache transformations and check output)
7. Perform Data Visualization using various Tableau features
8. Prepare a case study/survey presentation on Big Data security andvisualization

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
Michael Minelli, Michelle Chambers, and AmbigaDhiraj	Big Data, Big Analytics: Emerging		
Tom White	Hadoop: The Definitive Guide	Third Edition	O'Reilley, 2012

Reference Books:

Eben Hewitt	Cassandra: The Definitive Guide		O'Reilley, 2010

P. J. Sadalage and M. Fowler	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence		Addison-Wesley Professional, 2012

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	**Computer**
2.	**Apache Hadoop 2 .x or above**

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**				**60**
B	**1 to 7**			**5**	**3**	**5**	
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 questionsshould 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**

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Pattern Recognition	
Course Code: BITBDAD501A	**Semester: V**
Duration: 36	**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.	
5.	To solve practical problems in natural language processing using statistical techniques.
6.	Handle generic issues in information retrieval and processing.
7.	Process and categorize the information retrieved from sources.

Objective:

Sl. No.	
4.	To introduce the Natural Language Processing Methods.
5.	To educate information retrieval from search engines.
6.	To explain various statistical methods for natural language processing

Pre-Requisite:

Sl. No.	
1	Programming knowledge
2	Mathematics

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Basics of pattern recognition** Bayesian decision theory Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions	**6**	**5**

	Discrete features		
02	**Parameter estimation methods** Maximum-Likelihood estimation, Gaussian mixture models, Expectation-maximization method Bayesian estimation	**8**	**15**
03	**Hidden Markov models for sequential pattern classification** Discrete hidden Markov models, Continuous density hidden Markov models	**9**	**15**
04	**Dimension reduction methods** Fisher discriminant analysis, Principal component analysis, Parzen-window method, K-Nearest Neighbour method, Non-parametric techniques for density estimation	**6**	**20**
05	**Linear discriminant function based classifier** Perceptron, Support vector machines Non-metric methods for pattern classification Non-numeric data or nominal data,n Decision trees	**7**	**15**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**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
S. Theodoridis and K. Koutroumbas	Pattern Recognition	4th Ed.	Academic Press, 2009
R. O. Duda, P. E. Hart and D. G. Stork	Pattern Classification		John Wiley, 2001.

Reference Books:

C. M. Bishop	Pattern Recognition and Machine Learning		Springer, 2006

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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each	Question to be	Question to be

		question	set	answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**3**	**3**

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Web Analytics	
Course Code: BITBDAD501B	**Semester: V**
Duration: 36	**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.	Explore various parameters used for web analytics and their impact.
2.	Explore the use of tools and techniques of web analytics.
3.	Get experience on websites, web data insights and conversions

Objective:

Sl. No.	
1.	To know the importance of qualitative data, get insights and techniques.
2.	To develop customer-centric approach in dealing with data
3.	To know the principles, tools and methods of web intelligence
4.	To apply analytics for business situations

Pre-Requisite:

Sl. No.	
1.	Data computational Skill

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction To Web Analytics** A Brief history of Web Analytics ,Web Analytics Terminology , Traditional Web Analytics , Web Analytics 2.0 ,Capturing Data-Tools Selection – Quality Aspects ,Implementing Best Practices.	**3**	**5**
02	**Web Data Collection** Web Traffic Data ,Web Transactional Data ,Web Server Data , Page Weights , Usability Studies ,User Submitted Information , Integrating Form based data ,Web Data Sources , Server Log Files , Page Tags , Click stream Data ,Outcomes Data ,Research Data ,Competitive Data.	**6**	**15**
03	**Web Analytics Strategy** Component of Web Analytics Strategy , Customer Centric Focus – ,Business Problem Solving Focus , Reporting vs Analysis , IT and Business Strength ,Clickstream vs Web 2.0 , Vendor Specific Options and Issues.	**7**	**15**
04	**Metrics and KPIs**	**7**	**15**

	Measuring Reach , Measuring Acquisition , Measuring Conversion , Measuring Retention , Focus on 'Critical Few', Key Performance Indicators , Case Studies.		
05	**Data Analysis** Customer centricity , Lab Usability Studies , Usability Alternatives , Surveys, Heuristic Evaluations , Web enabled user research options , Competitive Intelligence Analysis	**8**	**15**
06	**Web Analytics Tools** Content organization tool , Process measurement tools, Visitor Segmentation Tools, Campaign Analysis , Commerce Measurement Tools , Google Analytics, Piwik Web Analytics ,Yahoo Web Analytics , Emerging Analytics: Social, Video, Mobile.	**5**	**5**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**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
Avinash Kaushik	Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity	1st Edition,	Sybex

Michael Beasley	Practical Web Analytics for User Experience: How Analytics can help you Understand your Users	2013	Morgan Kaufmann
Hansen, Derek, Ben Sheiderman, Marc Smith	Analyzing Social Media Networks with NodeXL: Insights from a Connected World		Morgan Kaufmann, 2010
Reference Books:			
Bing Liu	Web Data Mining: Exploring Hyperlinks, Content, and Usage Data	2nd Edition,	Springer
Justin Cutroni	Google Analytics	2010	O'Reilly
Eric Fettman, Shiraz Asif, Feras Alhlou	Google Analytics Breakthrough	2016	John Wiley & sons,

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**				**60**
B	**1 to 6**			**5**	**3**	**5**	

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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)

Subject: Data Mining & Data Warehousing

Course Code: BITBDAD501C	**Semester: V**
Duration: 36	**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.	Understand the functionality of the various data mining and data warehousing component
2.	Appreciate the strengths and limitations of various data mining and data warehousing models

Objective:

Sl. No.	
1.	Be familiar with mathematical foundations of data mining tools..
2.	Understand and implement classical models and algorithms in data warehouses and data mining
3.	Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
4.	Master data mining techniques in various applications like social, scientific and environmental context.
5.	Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Pre-Requisite:

Sl. No.	
1.	Knowledge of DBMS
2.	Analytical Knowledge

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives,scalable methods;	**3**	**10**

02	Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns,	**6**	**10**
03	Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis;	**6**	**10**
04	Mining Data Streams, Methodologies for stream data processing and stream data systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis;modulation for communication, filtering, feedback control systems.	**10**	**20**
05	Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining.	**6**	**10**
06	Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis.	**5**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**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**
Paulraj Ponniah	Data Warehousing		Wiley India

	Fundamentals for IT Professionals		
Alex Berson and Stephen J. Smith	Data Warehousing, Data Mining, & OLAP	Second Edition	Tata McGraw Hill Education
Reference Books:			
Ralph Kimball	Data warehouse Toolkit		Wiley India
Jiawei Han and M Kamber	Data Mining Concepts and Techniques	Second Edition	Elsevier Publication
G Dong and J Pei	Sequence Data Mining		Springer

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**				**60**
B	**1 to 6**			**5**	**3**	**5**	
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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Data Visualisation	
Course Code: BITBDAD501D	**Semester: V**
Duration: 36	**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.	Recognize the basics of data visualization
2.	Analyze visualization design options and select appropriate one for implementation
3.	Apply visualization techniques for various data analysis tasks
4.	Develop visualization and evaluate the design solution

5.	Apply these techniques to mine real-life situations
6.	Describe the different visualization models
Objective:	
Sl. No.	
1.	To provide insight about the importance of data visualization.
2.	To expose the design options in data visualization.
3.	To analyze the charts and plots used for suitable data type.
4.	To construct and evaluate visualization on real time data
5.	To provide insight about the importance of data visualization.
6.	To showcase the applications of data visualization
Pre-Requisite:	
Sl. No.	
1.	Basic Mathematical knowledge
2.	Programming skill

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** The context of data visualization-Visualization as a discovery tool-The bedrock of visualization knowledge-Defining data visualization-Visualization skills-Data Visualization methodology-Visualization design objectives-Setting the purpose and identifying the key factors-Visualization‟s function-Visualization‟s tone-Key factors of visualization project-Eight hats of Data visualization design.	**6**	**10**
02	**Data And Visualization Design Options**	**6**	**15**

	Importance of editorial focus-Preparing and familiarizing the data-Refining the editorial focus-Use of visual analysis-example-conceiving and reasoning visual design options-Visualization anatomy-data representation-visualization anatomy- creating interactivity-annotation-arrangement.		
03	**Taxonomy Of Data Visualization Methods** Data visualization methods-choosing the appropriate chart type-charts comparing categories-charts Accessing hierarchies and part-to-whole relationships-charts showing changes over time-charts for plotting connections and relationships-plots for showing Geo-Spatial data.	**9**	**15**
04	**Construction And Evaluation Of Design Solution** Constructing visualizations-technology-visualization software, Applications and - programs-charting-statistical and analysis tools-programming environments-tools for mapping-The construction process-approaching the finishing line-post Launch evaluation.	**9**	**15**
05	**Applications Of Data Visualization** Applications of visualization-visual analysis of social data: economic and social conditions of countries, qualitative comparison of schools-multi-dimensional data in Medicine and Pharmacology: Ophthalmological data analysis, Analysis of heart rate, Ophthalmological Binding Affinity-Correlation based visualization.	**6**	**15**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**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
WARD, GRINSTEIN, KEIM	Interactive Data Visualization: Foundations, Techniques, and Applications		Natick : A K Peters, Ltd
E. Tufte	The Visual Display of Quantitative Information		Graphics Press
Reference Books:			
Andy Kirk	Data Visualization: A Successful Design Process	978-1-84969-346-2, 2012	Packt publishing
Gintautas Dzemyda, Olga Kurasova, Julius Žilinskas	Multidimensional Data Visualization: Methods and Applications	9781441902351, 2013	springer
Stephanie D. H. Evergreen	Effective Data Visualization: The Right Chart for the Right Data	978-1506303055, 2016	SAGE publications

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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** XML and Web Services	
Course Code: BITBDAD502A	**Semester: V**
Duration: 36	**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.	Create web based application with the suitable markup languages like XML or HTML
2.	Develop database driven web applications using various web designing tools.
3.	Build and consume web services
4.	Develop web service enabled applications.
5.	Construct, deploy and call web services using the existing web technologies.

Objective:

Sl. No.	
1.	To edify evolution of web services and their architecture.
2.	To describe, discover & develop web services.
3.	To inculcate in-built programming skill needed to provide a web service.

4.	To incorporate comprehensive introduction to the programming tools required to build and maintain websites
5.	To facilitate how to build XML applications with DTD and style sheets.
6.	To practice the technologies in building the web services.

Pre-Requisite:

Sl. No.	
1	HTML
2	Java

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Role Of XML - XML and The Web - XML Language Basics - SOAP - Web Services - Revolutions Of XML - Service Oriented Architecture (SOA).	**6**	**10**
02	**XML Technology** XML Technology, XML - Name Spaces - Structuring With Schemas and DTD - Presentation Techniques - Transformation - XML Infrastructure	**9**	**20**
03	**SOAP** Overview Of SOAP - HTTP - XML-RPC - SOAP: Protocol - Message Structure - Intermediaries - Actors - Design Patterns And Faults - SOAP With Attachments.	**9**	**20**
04	**WEB Services** Overview - Architecture - Key Technologies - UDDI - WSDL - ebXML - SOAP And Web Services In E-Com - Overview Of .NET And	**9**	**10**

	J2EE.		
05	**XML Security** Security Overview - Canonicalization - XML Security Framework - XML Encryption - XML Digital Signature - XKMS Structure - Guidelines For Signing XML Documents - XML In Practice.	**3**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**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
Frank. P. Coyle	XML, Web Services And The Data Revolution		Pearson Education, 2002.
Ramesh Nagappan , Robert Skoczylas and Rima PatelSriganesh	Developing Java Web Services		Wiley Publishing Inc., 2004

Reference Books:

Sandeep Chatterjee, James Webber	Developing EnterpriseWeb Services		Pearson Education, 2004
McGovern, et al	Java Web Services Architecture		Morgan Kaufmann Publishers,2005

Gustavo A, Fabio C, Harumi K, Vijay M.	Web Services: Concepts, Architectures and Applications		Springer (Universities Press), 2004

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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Multimedia Systems	
Course Code: BITBDAD502B	**Semester: V**
Duration: 36	**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	Construct mathematical transformations for multimedia signals.
2	Analyse and process the multimedia signals such as images, audio, video.
3	Acquire the basic concepts of multimedia tools and process in design.
4	Illustrate design process of implementing multimedia systems.
5	Apply multimedia technology in various scenarios.

Objective:

Sl. No.	
1.	To provide the basics of multimedia systems and processing of multimedia signals.

2.	To gain knowledge on multimedia tools and processes.
3.	To design multimedia systems in systematic approach.
4.	To produce information on user interface design.
5.	To identify the major applications of multimedia systems.
6.	To insight the research areas of multimedia systems.
Pre-Requisite:	
Sl. No.	
1.	Basic Knowledge of image and Vedio

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications Text and Audio Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption;	**6**	**10**
02	**Audio:** Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate,Sampling Size, Quantization), Audio Formats, Audio tools, MIDI Storage models and Access Techniques Magnetic media, optical media, file systems (traditional, multimedia)	**8**	**15**

	Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD		
03	**Image and Video Database** Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- k-d trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing	**8**	**15**
04	**Document Architecture and Content Management** Content Design and Development, General Design Principles Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG),Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications.	**9**	**20**
05	**Multimedia Applications** Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors.	**5**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**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

Ralf Steinmetz and Klara Nahrstedt	Multimedia: Computing, Communications & Applications		Pearson Ed
Nalin K. Sharda	Multimedia Information System		PHI
Reference Books:			
Fred Halsall	Multimedia Communications		Pearson Ed
Koegel Buford	Multimedia Systems		Pearson Ed
Fred Hoffstetter	Multimedia Literacy		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 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 objectivequestions

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject**: Knowledge Discovery Techniques	
Course Code BITBDAD502C	**Semester: V**
Duration: 36	**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.	Acquire skills for applying knowledge discovery techniques
2.	Appraise both business and technical considerations in the context of applicable domains
3.	Deploy integrated methodologies and models for gain insights through knowledge

	discovery process
4.	Comparatively explore varied algorithms in the realm of knowledge discovery
5.	Identify and build models/methods for analysis
6.	Determine suitability of data models for different domain-specific analysis

Objective:

Sl. No.	
1.	To discuss Knowledge Discovery techniques/methods and their application.
2.	To help the students to extract useful knowledge from large volumes of data
3.	To expose to various issues, constraints and consideration in knowledge discovery process
4.	To make aware of industry standard processes involved in knowledge discovery
5.	To introduce newer paradigm like privacy preservation, real-time discovery and such others
6.	To explore applicability varied domains like healthcare, e-commerce, security, etc.

Pre-Requisite:

Sl. No.	
1	Basic knowledge on Machine Learning
2	Basic knowledge on Artificial Intelligence

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction KDD and Data Mining - Data Mining and Machine Learning, Machine Learning and Statistics, Generalization as Search, Data Mining and Ethics	**3**	**5**

02	Knowledge Representation - Decision Tables, Decision Trees, Classification Rules, Association Rules, Rules involving Relations, Trees for Numeric Predictions, Neural Networks, Clusters.	**6**	**10**
03	Decision Trees - Divide and Conquer, Calculating Information, Entropy, Pruning, Estimating Error Rates, The C4.5 Algorithm Evaluation of Learned Results- Training and Testing, Predicting Performance, Cross-Validation	**7**	**15**
04	Classification Rules - Inferring Rudimentary Rules, Covering Algorithms for Rule Construction, Probability Measure for Rule Evaluation, Association Rules, Item Sets, Rule Efficiency	**6**	**10**
05	Numeric Predictions - Linear Models for Classification and Numeric Predictions, Numeric Predictions with Regression Trees, Evaluating Numeric Predictions	**7**	**15**
06	Artificial Neural Networks – Perceptrons, Multilayer Networks, The Backpropagation Algorithm Clustering - Iterative Distance-based Clustering, Incremental Clustering, The EM Algorithm	**7**	**15**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**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
Maimon, oded	Data mining and		

	knowledge discovery handbook		
Muhammad Usman	Improving Knowledge Discovery through the Integration of Data Mining Techniques	1st Edition ISBN:9781466685130 , 2015	IGI Global

Reference Books:

Kweku-Muata Osei-Bryson, Corlane Barclay	Knowledge Discovery Process and Methods to Enhance Organizational Performance	1st Edition ISBN: 978-1482212365, 2015	Auerbach Publications,

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**				**60**
B	**1 to 6**			**5**	**3**	**5**	

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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)

Subject: Wireless Networking

Course Code: BITBDAD502D	**Semester:V**
Duration: 36	**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.	Acquiring capability to work with heterogeneous networks.
2.	Apply the knowledge of various mobile operating systems like Android to develop mobile computing applications.
3.	Developing mobile computing applications by analyzing their characteristics and requirements.

Objective:

Sl. No.	
1.	To discuss about advanced learning in the field of wireless communication.
2.	To expose the students to the concepts of wireless devices and mobile computing.
3.	To provide a knowledge about various operating systems available currently for developing mobile computing applications
4.	To discuss various issues related to security of mobile computing environment

Pre-Requisite:

Sl. No.	
1.	Basic Networking Knowledge

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**INTRODUCTION** Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in MobileComputing:	**9**	**15**

	Resource poorness, Bandwidth, energy etc. WIRELESS LOCAL AREA NETWORKS:IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues		
02	**WIRELESS CELLULAR NETWORKS** 1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems, Spread spectrum Technologies.	**9**	**15**
03	WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview WIRELESS SENSOR NETWORKS Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.	**9**	**15**
04	WIRELESS PANs Bluetooth AND Zigbee, Introduction to Wireless Sensors	**3**	**10**
05	**SECURITY** Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication.	**3**	**10**
06	**ADVANCED TOPICS** IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks.	**3**	**5**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**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
Schiller J.	Mobile Communications		Addison Wesley 2000
Stallings W.	Wireless Communications and Networks		Pearson Education 2005

Reference Books:

Stojmenic Ivan	Handbook of Wireless Networks and Mobile Computing		John Wiley and Sons Inc 2002
Yi Bing Lin and ImrichChlamtac	Wireless and Mobile Network Architectures		John Wiley and Sons Inc 2000

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**				**60**
B	**1 to 6**			**5**	**3**	**5**	
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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)

Subject: Industrial Training and Internship

Course Code: BITBDAS581	**Semester: V**
Duration: NA	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: 100**
Tutorial: 0	**Attendance: 0**
Practical: 0	**Continuous Assessment: 0**
Credit: 2	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA

Contents

Students be encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break.

Semester VI							
Sl. No.	**CBCS Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory							
1	CC-13	BITBDAC601 BITBDAC691	Cloud Computing	4	0	4	**6**
2	CC-14	BITBDAC602 BITBDAC692	Data Analytics	4	0	4	**6**
3	DSE-4	BITBDAD601	Elective-III [MOOCS]				
			A. Deep Learning	4 / 5	0 / 1	4 / 0	**6**
			B. Soft Computing				
			C. Social Media Mining				
			D. Neural Networks				
Sessional							
4	SEC-5	BITBDAS681	Grand Viva	0	0	2	**1**
5	SEC-6	BITBDAS682	Seminar	0	2	0	**2**
6	DSE-5	BITBDAD683	Major Project & Entrepreneurship II	0	0	8	**4**
						Total Credit	25

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Cloud Computing	
Course Code: BITBDAC601 & BITBDAC691	**Semester: VI**
Duration: 36	**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: The main aim of this subject to enhance student knowledge with following concept

Sl. No.	
1.	Core concepts of the cloud computing
2.	Concepts in cloud infrastructures
3.	Concepts of cloud storage
4.	Cloud programming models

Objective:

Sl. No.	
1.	To learn how to use Cloud Services.
2.	To implement Virtualization
3.	To implement Task Scheduling algorithms.
4.	Understand the impact of engineering on legal and societal issues involved and different security aspect.

Pre-Requisite:

Sl. No.			
1.	Knowledge of computer systems, programming and debugging, with a strong competency in at least one language (such as Java/Python), and the ability to pick up other languages as needed.		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Definition of Cloud Computing and its Basics** Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service Platform as a Service, Software as a Service with examples of services/ service providers, models – Infrastructure as a Service, Cloud Reference model, Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing, A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients, 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)	**6**	**15**
02	**Use of Platforms in Cloud Computing** Concepts of Abstraction and Virtualization Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF) Porting of applications in the Cloud: The simple Cloud API and	**14**	**20**

	AppZero Virtual Application appliance,Concepts of Platform as a Service, 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., 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, 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)	**8**	**20**
04	**Concepts of Services and Applications** Service Oriented Architecture: Basic concepts of message-based	**8**	**15**

	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		
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Skills to be developed:

Intellectual skills:

1. Students are able to develop different algorithms related to Cloud Computing.
2. Students are able to assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application.

List of Practical: Hands-on experiments related to the course contents

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Barrie Sosinsky	Cloud Computing Bible	2013	Wiley India Pvt. Ltd

Rajkumar Buyya ,Christian Vecchiola, S. Thamarai Selvi	Mastering Cloud Computing	2013	McGraw Hill Education (India) Private Limited
Reference Books:			
Anthony T. Velte	Cloud computing: A practical approach		Tata Mcgraw-Hill
Dr. Kumar Saurabh	Cloud Computing		Wiley India
Moyer	Building applications in cloud:Concept, Patterns and Projects		Pearson
List of equipment/apparatus for laboratory experiments:			
Sl. No.			
1.	**Computer with moderate configuration with high speed internet connection**		
2.	**Python , java**		

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**				**60**
B	**1 to 4**			**5**	**3**	**5**	
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 objectivequestions 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**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Data Analytics	
Course Code: BITBDAC602 & BITBDAC692	**Semester: VI**
Duration: 36	**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	Basic statistical analysis techniques for experimental data generation and collection, aiming at design, analytic modeling and implementation of systems. Covers basics from the areas of statistics, simulation, event queueing

Objective:

Sl. No.	
1.	Identification of relevant variables
2.	Data screening and coding
3.	Visualisation data by plot

Pre-Requisite:

Sl. No.	

1.	Introductory Statistics/Probability theory Calculus		
2.	Prior training in R/Python		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Simulation of random variables from discrete, continuous, multivariate distributions and stochastic processes, Graphical representation of data by histograms, frequency polygon, Pie chart, ogives, boxplot and stem-leaf.	**8**	**15**
02	Measures of central tendency, dispersion, measures of skewness and kurtosis.	**6**	**15**
03	Fitting of polynomials, exponential curves and plotting of probability distributions,Regression analysis, scatter plot, residual analysis.	**8**	**15**
04	Correlation and regression. Test of significance (t and F tests).	**6**	**10**
05	Random number generation, ANOVA both one way and two way, Graphical representation of multivariate data, Cluster analysis, Principal component analysis for dimension reduction	**8**	**15**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

Upon completion of the course students will be able to

1. Choose methods adequately corresponding to the objectives of a researchproject
2. Collect, store, process and analyze data according to high standards
3. Conduct empirical research in management and marketing using modern analytic software tools
4. Develop and apply new research methods
5. Solve economic and managerial problems using best practices of data analysis using modern computational tools

List of Practical:

Hand on practical based on theory paper

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
Gardener, M	Beginning R: The Statistical Programming Language		Wiley Publications ,2012

Reference Books:

Braun W J, Murdoch D J	A First Course in Statistical Programming with R		Cambridge University Press. New York,2007

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	**Computer**
2.	**Software Python/R**

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 questionsshould 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**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Deep Learning	
Course Code: BITBDAD601A	**Semester: VI**
Duration: 36	**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 improve the performance of a Deep Learning model
2.	to the reduce the optimization function which could be divided based on the classification and the regression problems

Objective:

Sl. No.	
1.	To acquire knowledge on the basics of neural networks.
2.	To implement neural networks using computational tools for variety of problems.
3.	To explore various deep learning algorithms.

Pre-Requisite:

Sl. No.	
1.	Calculus, Linear Algebra
2.	Probability & Statistics

3	Ability to code in R/Python

Contents		Hrs./week	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.	**3**	**5**
02	**Feed forward neural network** Artificial Neural Network, activation function, multi-layer neural network, cardinality, operations, and properties of fuzzy relations.	**6**	**10**
03	**Training Neural Network** Risk minimization, loss function, backpropagation, regularization, model selection, and optimization.	**6**	**15**
04	**Conditional Random Fields**		**15**
	Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.	**9**	
05	**Deep Learning** Deep Feed Forward network, regularizations, training deep models, dropouts, Convolution Neural Network, Recurrent Neural Network, Deep Belief Network.	**6**	**15**
06	**Deep Learning research** Object recognition, sparse coding, computer vision, natural language	**6**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**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
Goodfellow, I.,Bengio,Y., and Courville A.,	Deep Learning		MIT Press
Satish Kumar	Neural Networks: A Classroom Approach		Tata McGraw-Hill

Reference Books:

Bishop, C. ,M.	Pattern Recognition and Machine Learning		Springer
Yegnanarayana, B.	Artificial Neural Networks		PHI Learning Pvt. Ltd
Golub, G.,H., and Van Loan,C.,F.	Matrix Computations		JHU Press

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				**60**
B	**1 to 6**			**5**	**3**	**5**	
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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)

Subject: Soft Computing

Course Code: BITBDAD601B	**Semester: VI**
Duration: 36	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	**End Semester Exam: 70**
Tutorial: 1	**Attendance : 5**
Practical:0	**Continuous Assessment:25**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination:NA

Aim:	
Sl. No.	
1.	Enumerate the theoretical basis of soft computing
2.	Explain the fuzzy set theory
3.	Discuss the neural networks and supervised and unsupervised learning networks
4.	Demonstrate some applications of computational intelligence
5.	Apply the most appropriate soft computing algorithm for a given situation
Objective:	
Sl. No.	
1.	Enumerate the strengths and weakness of soft computing
2.	Illustrate soft computing methods with other logic driven and statistical method driven approaches
3.	Focus on the basics of neural networks, fuzzy systems, and evolutionary computing
4.	Emphasize the role of euro-fuzzy and hybrid modeling methods
5.	Trace the basis and need for evolutionary computing and relate it with other soft computing approaches
Pre-Requisite:	
Sl. No.	
1	Mathematical knowledge

Contents		**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.	**2**	**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	**11**	**20**
	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		

03	Neural Network Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, BiologicalNeurons and Artificial neural network; model of artificial neuron. Learning Methods : Hebbian, competitive, Boltzman etc., Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Back-propagation and multi layer networks. Competitive learning networks: Kohonenself organizing networks, Hebbian learning; Hopfield Networks. Neuo-Fuzzy modelling: Applications of Neural Networks: Pattern Recognition and classification	**11**	**20**
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	**8**	**15**
05	Other Soft Computing techniques: Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm	**4**	**10**
	Optimization (PSO).		
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**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 Chakraborty	A beginners approach to Soft Computing		Pearson
Kumar Satish	Neural Networks: A Classroom Approach,1/e		TMH

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

Group	Unit	Objective Questions (MCQ only with the correct answer)	Subjective Questions

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

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

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject** Social Media Mining	
Course Code: : BITBDAD601C	**Semester: VI**
Duration: 36	**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 provides students a hands-on introduction to scalable graph mining
2	Data analysis on social networks
3	Focusing on ways to handle large-scale networks efficiently

Objective:

Sl. No.	
1.	Understand the basic concepts of social networks
2.	Understand the fundamental concepts in analyzing the large-scale data that are derived from social networks
3.	Implement mining algorithms for social networks
4.	Perform mining on large social networks and illustrate the results.

Pre-Requisite:

Sl. No.	
1	The students should have a basic algorithmic and programming background
2	basic knowledge in the fields of graph theory

Contents		Hrs./week	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Social Network Mining, Graph Models and Node Metrics** Introduction to social network mining. Illustration of various social network mining tasks with real-world examples. Data characteristics unique to these settings and potential biases due to them. Social Networks as Graphs. Random graph models/ graph generators (Erd¨os-R´enyi, power law, preferential attachment, small world, stochastic block models, kronecker graphs), degree distributions. Models of evolving networks. Node based metrics, ranking algorithms (Pagerank). Gephi graph visualization and exploration software – practice.	**8**	**15**
02	**Social-Network Graph Analysis** Social network exploration/ processing: graph kernels, graph classification, clustering of social-network graphs, centrality measures, community detection and mining, degeneracy (outlier detection and centrality), partitioning of graphs. SNAP system for large networks analysis and manipulation.	**6**	**10**
03	**Social-Network Graph Analysis and Properties** Social network exploration/ processing and properties: Finding overlapping communities, similarity between graph nodes, counting triangles in graphs, neighborhood properties of graphs. Pregel paradigm and Apache Giraph graph processing system.	**8**	**15**
04	**Information Diffusion in Social Networks** Strategic network formation: game theoretic models for network creation/ user behavior in social networks. Information diffusion in graphs: Cascading behavior, spreading, epidemics,	**8**	**15**

	heterogeneous social network mining, influence maximization, outbreak detection. Opinion analysis on social networks: Contagion, opinion formation, coordination and cooperation.		
05	**Dynamic Social Networks, Applications and Research Trends** Dynamic social networks, Link prediction, Social learning on networks. Special issues in Information and Biologicalnetworks. Important applications of social network mining related to the above topics. Research trends.	**6**	**15**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	**Computer**

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
David Easley and Jon Kleinberg	Networks, crowds, and markets		Cambridge University Press

Reference Books:

Jure Leskovec, Anand Rajaraman and Jeffrey David Ullman	Mining of massive datasets		Cambridge University Press

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	**Computer**

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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Neural Networks	
Course Code: BITBDAD601D	**Semester: VI**
Duration: 36	**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.	Develop algorithms simulating human brain.
2.	Implement Neural Networks in Tensor Flow for solving problems.
3.	Explore the essentials of Deep Learning and Deep Network architectures.
4.	Define, train and use a Deep Neural Network for solving real world problems that require artificial Intelligence based solutions.

Objective:

Sl. No.	

1.	To acquire knowledge on the basics of neural networks.
2.	To implement neural networks using computational tools for variety of problems.
3.	To explore various deep learning algorithms.

Pre-Requisite:

Sl. No.	
1.	Calculus, Linear Algebra
2.	Probability & Statistics
3.	Ability to code in R/Python

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.	**3**	**5**
02	**Feed forward neural network** Artificial Neural Network, activation function, multi-layer neural network,cardinality, operations, and properties of fuzzy relations.	**6**	**10**
03	**Training Neural Network** Risk minimization, loss function, backpropagation, regularization, model selection, and optimization.	**6**	**15**
04	**Conditional Random Fields** Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.	**9**	**15**

05	**Deep Learning** Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network.	**6**	**15**
06	**Deep Learning research** Object recognition, sparse coding, computer vision, natural language	**6**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. Can be able to analyze relevant data.
2. Can be able to identify a solution for the problem.
3. Can be able to provide the basis for the analysis.

List of Practical:

Hand on experiments based on theory paper Neural Networks

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
Goodfellow, I.,Bengio,Y., and Courville A.,	Deep Learning		MIT Press
Satish Kumar	Neural Networks: A Classroom Approach		Tata McGraw-Hill
Reference Books:			
Bishop, C. ,M.	Pattern Recognition and Machine Learning		Springer
Yegnanarayana, B.	Artificial Neural Networks		PHI Learning Pvt. Ltd
Golub, G.,H., and Van Loan,C.,F.	Matrix Computations		JHU Press
List of equipment/apparatus for laboratory experiments:			
Sl. No.			
1.	**Computer**		

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**				**60**
B	**1 to 6**			**5**	**3**	**5**	

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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Big Data Analytics)

Subject: Grand Viva

Course Code: BITBDAS681	**Semester: VI**
Duration:12	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: 100**
Tutorial: 0	**Attendance: 0**
Practical: 2	**Continuous Assessment: 0**
Credit: 1	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA

Contents

Students will give a viva from all the subjects that they have covered in the course.

Name of the Course: B.Sc. in Information Technology (Data Science) **Subject:** Seminar	
Course Code: BITBDAS682	**Semester: VI**
Duration:	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: 100**
Tutorial: 2	**Attendance: 0**
Practical: 0	**Continuous Assessment: 0**
Credit: 2	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60
Contents	
Students will present a presentation on application areas of latest technologies and current topics of societal relevance.	

Name of the Course: B.Sc. in Information Technology (Big Data Analytics) **Subject:** Major Project & Entrepreneurship II	
Course Code: BITBDAD683	**Semester: VI**
Duration: 48 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: 100**
Tutorial: 0	**Attendance: 0**
Practical: 8	**Continuous Assessment: 0**
Credit: 4	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60
Contents	

Students will do projects on application areas of latest technologies and current topics of societal relevance.