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 (Cyber Security)

Effective from academic session 2022-23

Semester I							
Sl. No.	**CBCS Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC-1	BITCSC101 BITCSC191	Programming Fundamentals	4	0	4	6
2	CC-2	BITCSC102	Discrete Structures	5	1	0	6
3	AECC-1	BITCSA101	Soft Skill	2	0	0	2
4	GE-1	BITCSG101 BITCSG102 BITCSG103 BITCSG104	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 (Cyber Security) **Subject: Programming Fundamental**	
Course Code: BITCSC101 BITCSC191	**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		**4 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 and Associativity of Operators, Type Conversions.	**6**	**10**
02	**Conditional Control Statements** Bitwise Operators, Relational and Logical Operators, If, If- Else, Switch-Statement and Examples. Loop Control Statements: For, While, DoWhile and Examples. Continue, Break and Goto statements Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. Recursion- Recursive Functions.. Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.	**8**	**10**
03	**Pre-processors and Arrays** Pre-processor 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 to 10 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 a circle.
5. Write a C program to find maximum between two numbers.
6. Write a C program to check whether a number is divisible by 5 and 11 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 ornot.
9. Write a C program to input basic salary of an employee and calculate its Gross salary according to following:
   Basic Salary <= 10000 : HRA = 20%, DA = 80%
   Basic Salary <= 20000 : HRA = 25%, DA = 90%
   Basic Salary > 20000 : HRA = 30%, DA = 95%
10. Write a c program to print “welcome” 10 times.
11. Write a c program to print first n natural numbers using while loop.
12. Write a c program to print all the odd numbers in a given range.
13. Write a c program to add first n numbers using while loop.
14. Write a c program to print all numbers divisible by 3 or 5 in a givenrange.
15. Write a c program to add even numbers in a givenrange.
16. Write a c program to find the factorial of a givennumber.
17. Write a c program to find whether a number is prime or not.
18. Write a c program to print the reverse of a number.
19. Write a c program to add the digits of a number.
20. Write a c program to print the Fibonacci series in a given range using recursion.
21. Write a c program to check whether a number is an Armstrong number or not.
22. Write a c program to find g.c.d. and l.c.m. of two numbers using function.

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
Yashavant Kanetkar,	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		

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End Semester Examination Scheme.		**Maximum Marks-70.**		**Time allotted-3hrs.**			
Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	**Total Marks**	**No of question to be set**	**To answer**	**Marks per question**	**Total Marks**
A	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 theobjective part.
- Specific instruction to the students to maintain the order in answering objective questions shouldbe 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 (Cyber Security) **Subject: Discrete Structures**	
Course Code: BITCSC102	**Semester: I**
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.	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		**4 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.	**7**	**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.	**8**	**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.)	**7**	**14**
04	**Algebraic Structure** Binary composition and its properties definition of	**6**	**10**

	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).		
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.	**8**	**18**
	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**
Kenneth H. Rosen	Discrete Mathematics and its Applications		Tata Mc.Graw Hill
seymour Lipschutz, M.Lipson	Discrete Mathematics		Tata Mc.Graw Hill
Reference Books:			
V. Krishnamurthy	Combinatorics:Theory and Applications		East-West Press
Kolman, Busby Ross	Discrete Mathematical Structures		Prentice Hall International

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

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

	5						

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

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Cyber Security)
Subject: Soft Skills

Course Code: BITCSA101	**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.	To use English effectively for study purpose across the curriculum
3.	To use R,W,L,S and integrate the use of four language skills, Reading, writing , listening and speaking.
4.	To revise and reinforce structures already learnt.

Pre-Requisite:

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

Contents		**2 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,	**6**	**15**

	Structure of sentences – Active / Passive Voice – Direct / Indirect Narration.		
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. Bio data - 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**

Practical:

Skills to be developed:

Intellectual skills:

1. Skill of Grammar
2. Various writing skills
3. Skill of reading English text
4. Skill of effective written communication

Motor Skills:

1. Skill of using Correct body language while giving a presentation
2. Various non-verbal communication skills
3. Skill of using correct gestures and expressions while speaking publicly
4. Essential approach and attitude in Group Discussion or Viva

List of Practical:

1. Honing 'Listening Skill' and its sub skills through Language Lab Audio device.
2. Honing 'Speaking Skill' and its sub skills.
3. Helping those master Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation / Stress / Intonation / Pitch & Accent) of connected speech.
4. Honing 'Conversation Skill' using Language Lab Audio –Visual input, Conversational Practice Sessions (Face to Face / via Telephone, Mobile phone & Role Play Mode).
5. Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success.
6. GD Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD.
7. Honing 'Reading Skills' and its sub skills using Visual / Graphics/Diagrams /Chart Display/Technical/Non-Technical Passages, Learning Global / Contextual / InferentialComprehension.
8. Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input, PracticeSessions

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	

B.Sc. in Information Technology (Cyber Security)
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- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions shouldbe 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**

Semester II							
Sl. No.		**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC-3	BITCSC201 BITCSC291	Data Structure and Algorithm with Python	4	0	4	**6**
2	CC-4	BITCSC202 BITCSC292	Operating System	4	0	4	**6**
3	AECC-2	BITCSA201	Environmental Science	2	0	0	**2**
4	GE-2	BITCSG201 BITCSG202 BITCSG203 BITCSG204	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	BITCSS281	Minor Project and Entrepreneurship I	0	0	4	**2**
						Total Credit	**22**

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Data Structure and Algorithm with Python and Data Structure and Algorithm with Python Lab	
Course Code: BITCSC201 and BITCSC292	**Semester: II**
Duration: 36 Hrs.	**Maximum Marks:**200
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

B.Sc. in Information Technology (Cyber Security)
Effective from academic session 2022-23

Aim:	
Sl. No.	
1.	The point of this course is to give you a vibe for algorithms and data structures as a focal area of what it is to be a computer science student.
2.	You ought to know about the way that there are regularly a few calculations for some issue, and one calculation might be superior to another, or one calculation better in certain conditions and another better in others.
3.	You should have some idea of how to work out the efficiency of an algorithm.
4.	You will be able to use and design linked data structures
5.	You will learn why it is good programming style to hide the details of a data structure within an abstract data type.
6.	You should have some idea of how to implement various algorithm using python programming.
Objective:	
Sl. No.	
1.	To impart the basic concepts of data structures and algorithms.
2.	To understand concepts about searching and sorting techniques.
3.	To understand basic concepts about stacks, queues, lists, trees and graphs.
4.	To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures
Pre-Requisite:	
Sl. No.	
1.	Basics of programming language.
1.	Logic building skills.

Contents		**3 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-	**4**	**7**

	queue, Priority Queues.		
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 timeefficiency.
2. Knowledge of advanced abstract data type (ADT) and data structures and theirimplementations.
3. Ability to implement algorithms to perform various operations on data structures.

List of Practical:

1. Implementation of array operations.
2. Stacks and Queues: adding, deleting elements.
3. Circular Queue: Adding & deleting elements
4. Merging Problem : Evaluation of expressions operations on Multiple stacks & queues
5. Implementation of linked lists: inserting, deleting, and inverting a linked list.
6. Implementation of stacks & queues using linked lists:
7. Polynomial addition, Polynomial multiplication
8. Sparse Matrices: Multiplication, addition.
9. Recursive and Non Recursive traversal of Trees Threaded binary tree traversal. AVL tree implementation Application of Trees.

10. Application of sorting and searching algorithms Hash tables' implementation: searching, inserting and deleting, searching & sorting techniques.

Assignments:

Based on the curriculum as covered by 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
1.	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**				
				5	**3**	**5**	**60**
B	**1 to 9**						
				5	**3**	**15**	
C	**1 to 9**						

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

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Effective from academic session 2022-23

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 (Cyber Security) **Subject:** Operating System and Operating System Lab	
Course Code: BITCSC202 BITCSC292	**Semester: II**
Duration: 36	**Maximum Marks: 200**
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		**4 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 reliability, Disk formatting, Boot-block, Bad blocks.	**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. 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: Sl. No. 1& 2 compulsory & at least three from the rest)
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/Ubuntu 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**	**5**	**3**	**5**	**60**
B	**1 to 7**			**5**	**3**	**15**	
C	**1 to 7**						

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

Examination Scheme for end semester examination:

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

A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**3**	**3**

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 (Cyber Security) **Subject: Environmental Science**	
Course Code: BITCSA201	**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		**4 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	**3**	**5**

	like Flood, earthquake, Landslide-causes, effects and control/management, Anthropogenic degradation like Acid rain-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	**Noise 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**	**5**
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 Engineering and Science		Prentice-Hall of India Pvt. Ltd., 1991

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 B C	1 to 7 1 to 7 1 to 7	10	10	5 5	3 3	5 15	60

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

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Minor Project and Entrepreneurship I	
Course Code: BITCSS281	**Semester: II**
Duration: 36 Hrs	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	End Semester Exam: 100
Tutorial: 0	Attendance:
Practical: 4	Continuous Assessment:
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

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 (Cyber Security)
Effective from academic session 2022-23

Sl. No.	CBCS Category	Course Code	Course Name	L	T	P	Credits
Theory + Practical							
1	CC-5	BITCSC301 BITCSC391	DBMS and SQL injection Attack	4	0	4	6
2	CC-6	BITCSC302 BITCSC392	Information Security	4	0	4	6
3	CC-7	BITCSC303	Ethical Hacking	5	1	0	6
4	GE-3	BITCSG301	A.Climate Change and Health B. Environmental Law and Policy C. Environmental Informatics D. Health Informatics	5	1		6
5	SEC-2	BITCSS391	Web Development	0	0	4	2
						Total Credit	26

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** DBMS and SQL injection Attack and DBMS and SQL injection Attack Lab	
Course Code: BITCSC301 + BITCSC391	**Semester: III**
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.	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 algorithms.

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**

B.Sc. in Information Technology (Cyber Security)
Effective from academic session 2022-23

Chapter	Name of the Topic	Hours	Marks
01	**Database Management System Concepts** Introduction, Significance of Database, Database System Applications; Data Independence; Data Modeling for a Database; Entities and their Attributes, Entities, Attributes, Relationships and Relationships Types, Advantages and Disadvantages of Database Management System, DBMS Vs RDBMS	**3**	**6**
02	**Database System Architecture** Three Level Architecture of DBMS, The External Level or Subschema, The Conceptual Level or Conceptual Schema, The Internal Level or Physical Schema, Mapping; MySQL Architecture; SQL Server 2000 Architecture; Oracle Architecture; Database Management System Facilities, Data Definition Language, Data Manipulation Language; Database Management System Structure, Database Manager, Database Administrator, Data Dictionary; Distributed Processing, Information and Communications Technology System (ICT), Client / Server Architecture	**3**	**6**
03	**Database Models and Implementation** Data Model and Types of Data Model, Relational Data Model, Hierarchical Model, Network Data Model, Object/Relational Model, Object-Oriented Model; Entity-Relationship Model, Modeling using E-R Diagrams, Notation used in E-R Model, Relationships and Relationship Types; Associative Database Model	**3**	**6**
04	**File Organization for Conventional DBMS** Storage Devices and its Characteristics, Magnetic Disks, Physical Characteristics of Disks, Performance Measures of Disks, Optimization of Disk-Block Access; File Organization, Fixed-Length Records, Variable-Length Records, Organization of records in files; Sequential file Organization; Indexed Sequential Access Method (ISAM); Virtual Storage Access Method (VSAM)	**4**	**7**
05	**An Introduction to RDBMS** An informal look at the relational model; Relational Database Management System; RDBMS Properties, The Entity-Relationship Model; Overview of Relational Query Optimization; System Catalog in a Relational DBMS, Information Stored in the System Catalog, How Catalogs are Stored	**3**	**6**
06	**SQL – 1** Categories of SQL Commands; Data Definition; Data Manipulation Statements, SELECT - The Basic Form, Subqueries, Functions, GROUP BY Feature, Updating the Database, Data Definition Facilities	**3**	**6**
07	**SQL – 2**	**3**	**7**

	Views; Embedded SQL *, Declaring Variables and Exceptions, Embedding SQL Statements; Transaction Processing, Consistency and Isolation, Atomicity and Durability		
08	**Relational Algebra** Basic Operations, Union (U), Difference (-), Intersection (), Cartesian Product (x); Additional Relational Algebraic Operations, Projection (), Selection (), JOIN ( ), Division ()	**3**	**7**
09	**Relational Calculus** Tuple Relational Calculus, Semantics of TRC Queries, Examples of TRC Queries; Domain Relational Calculus; Relational ALGEBRA vs Relational CALCULUS	**3**	**6**
10	**Normalization** Functional Dependency; Anomalies in a Database; Properties of Normalized Relations; First Normalization; Second Normal Form Relation; Third Normal Form; Boyce-Codd Normal Form (BNCF); Fourth and Fifth Normal Form	**4**	**7**
11	**SQL Injection** Introduction to Injection Attacks; Data Store Injection; Introduction to XML, JavaScript and SQL injection attacks; Different Statement Injection; UNION Operator; Database Fingerprinting	**4**	**6**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**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: 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
A.Silberschatz, H.F. Korth, S.Sudarshan	Database System Concepts	6th Edition	McGraw Hill
Raghurama Krishnan, Johannes	Database Management Systems	3rd edition	McGrawHill Education

Gehrke			
Reference Books:			
Bipin C. Desai	Introduction to Database Systems	11th edition	West Group
Hector Garcia-Molina,Jeffrey D. Ullman, Jennifer Widom	Database Systems: The Complete Book	2nd edition	Pearson
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 11**	**10**	**10**				
B	**1 to 11**			**5**	**3**	**5**	**60**
C	**1 to 11**			**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**

B.Sc. in Information Technology (Cyber Security)
Effective from academic session 2022-23

Name of the Course: B.Sc. in Information Technology (Cyber Security)			
Subject: Information Security			
Course Code: BITCSC302 BITCSC392		**Semester: III**	
Duration: 36 Hrs.		**Maximum Marks: 200**	
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.	This introductory course is aimed at giving basic understanding about system security.		
2.	This entry-level course covers a broad spectrum of security topics and is based on real-life examples to create system security interest in the students		
3.	A balanced mix of technical and managerial issues makes this course appealing to attendees who need to understand the salient facets of information security basics and the basics of risk management.		
Objective:			
Sl. No.			
1.	Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.		
2.	Gain familiarity with prevalent network and distributed system attacks, defences against them, and forensics to investigate the aftermath.		
3.	Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.		
4.	Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges		
Pre-Requisite:			
Sl. No.			
1.	Not Required		
Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Information and Network Security fundamentals** Overview of Networking Concepts Basics of Communication Systems, Transmission Media, Topology and Types of Networks, TCP/IP Protocol, Wireless Networks, The Internet Information Security Concepts Information Security Overview: Background and Current Scenario, Types of Attacks, Goals for Security, E-commerce Security Security Threats and Vulnerabilities Overview of Security threats, Weak / Strong Passwords and Password Cracking, Insecure Network connections, Malicious Code Cybercrime and Cyber terrorism Cryptography Introduction to Cryptography, Digital Signatures, Public Key infrastructure, Applications of Cryptography, Tools and techniques of	**16**	**20**

	Cryptography		
02	**Security Management** Security Management Practices Overview of Security Management, Security Policy, Risk Management, Ethics and Best Practices Security Laws and Standards Security Assurance, Security Laws, International Standards, Security Audit	**8**	**10**
03	**Information and Network Security** Server Management and Firewalls User Management, Overview of Firewalls, Types of Firewalls, DMZ and firewall features Security for VPN and Next Generation Technologies VPN Security, Security in Multimedia Networks, Various Computing Platforms: HPC, Cluster and Computing Grids, Virtualization and Cloud Technology and Security	**6**	**20**
04	**System and Application Security** Security Architectures and Models Designing Secure Operating Systems, Controls to enforce security services, Information Security Models System Security Desktop Security, Email security, Database Security	**6**	**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 ability to learn concepts and apply them to other problems.
2. A passion for problem finding.
3. Confidence around different computer application tools.

List of Practical:

1. Application of AVISPA Tool
2. Study of Network Security fundamentals - Ethical Hacking, Social Engineering practices.
3. Study of System threat attacks - Denial of Services.
4. Study of Sniffing and Spoofing attacks.
5. Study of Techniques uses for Web Based Password Capturing.
6. Study of Different attacks causes by Virus and Trojans.
7. Study of Anti-Intrusion Technique – Honey pot.
8. Study of Symmetric Encryption Scheme – RC4.
9. Study of IP based Authentication.

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
B. A. Forouzan	Data Communications and Networking	3rd Ed	TMH

A. S. Tanenbaum		Computer Networks		4th Ed		Pearson Education/PHI	
Reference Books:							
W. Stallings		Data and Computer Communications		5th Ed		PHI/ Pearson Education	
Atul Kahate		Cryptography & Network Security				TMH	
End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**							
Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1,2,3,4,5	10	10				
B	3, 4, 5			5	3	5	60
C	1,2,3,4,5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions shouldbe 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 (Cyber Security) **Subject:** Ethical Hacking	
Course Code: BITCSC303	**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.	To learn Network Foot printing, Collect System Information, Collect Organization's information		
Objective:			
Sl. No.			
1.	To understand Legal aspects of penetration testing		
2.	To develop Practical hacking exercise		
Pre-Requisite:			
Sl. No.			
1.	Basic knowledge of programming		
Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Key issues plaguing the information security world, incident management process, and penetration testing	**2**	**5**
02	**Footprinting** Various types of footprinting, footprinting tools, and Countermeasures	**2**	**5**
03	**Network Scanning and Enumeration** Network scanning techniques and scanning countermeasures. Enumeration techniques and enumeration countermeasures.	**2**	**10**
04	**Attacks** System hacking methodology, steganography, steganalysis attacks, and covering tracks Different types of Trojans, Trojan analysis, and Trojan Countermeasures. Working of viruses, Virus analysis, computer worms, malware analysis procedure, and countermeasures, Packet sniffing techniques and how to defend against sniffing. Social Engineering techniques, identify theft, and social engineering countermeasures. DoS/DDoS attack techniques, botnets, DDoS attack tools, and DoS/DDoS countermeasures. Session hijacking techniques and countermeasures	**10**	**15**
05	**Web Server Attacks** Different types of web server attacks, attack methodology, and Countermeasures. SQL injection attacks and injection detection tools. Various cloud computing concepts, threats, attacks, and security techniques and tools	**8**	**15**
06	**Cryptography** Different types of cryptography ciphers, Public Key Infrastructure (PKI), cryptography attacks, and cryptanalysis tools	**6**	**10**
07	**Penetration Testing** Various types of penetration testing, security audit, vulnerability assessment, and penetration testing roadmap	**6**	**10**

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

Assignments:

Based on lecture

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Jon Erickson	Hacking: The Art of Exploitation	2nd Edition	No_Starch_Press
Reference Books:			
	The_.Basics.of_.Hacking. and_.Penetration.Testing		Syngress

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**				
				5	**3**	**5**	**60**
B	**1 to 7**						
				5	**3**	**15**	
C	**1 to 7**						

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

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Web Development	
Course Code: BITCSS391	**Semester: III**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	End Semester Exam: NA
Tutorial: 0	Attendance: NA

Practical:4	Continuous Assessment: NA
Credit:2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:

Sl. No.	
	To develop formal reasoning.
	Create habit of raising questions
	Knowledge regarding the use of markup languages in web development.
	Ability to communicate knowledge, capabilities and skills related to the computer engineer profession

Objective:

This Subject is useful for Making own Web page and how to host own web site on internet. Along with that Students will also learn about the protocols involve in internet technology.

Sl. No.	
	To make own web site and host their own web site on internet
	To gain knowledge about what are the technologies used in internet.
	To learn about the protocols involve in internet.

Practical:

Skills to be developed:

Intellectual skills:

1 Skill to analyze problems and to determine web based solutions.
2 Knowledge of advanced technology of web development.
3 Ability to implement queries to perform various operations on database.

List of Practical:

1 Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
2 Create your class timetable using table tag.
3 Create user Student feedback form (use textbox, text area , checkbox, radio button, select box etc.)
4 Create a web page using frame. Divide the page into two parts with Navigation links on left hand side of page (width=20%) and content page on right hand side of page (width = 80%). On clicking the navigation Links corresponding content must be shown on the right hand side.
5 Write html code to develop a webpage having two frames that divide the webpage into two equal rows and then divide the row into equal columns fill each frame with a different background color.
6 Create your resume using HTML tags also experiment with colors, text , link , size and also other tags you studied.
7 Design a web page of your home town with an attractive background color, text color, an Image, font etc. (use internal CSS).
8 Use Inline CSS to format your resume that you created.
9 Use External CSS to format your class timetable as you created.
10 Use External, Internal, and Inline CSS to format college web page that youcreated.
11 Develop a JavaScript to display today's date.
12 Develop simple calculator for addition, subtraction, multiplication and division operation

using JavaScript

13 Create HTML Page with JavaScript which takes Integer number as input and tells whether the number is ODD or EVEN.

14 Create DTD for above XML File.

15 Create XML Schema for above (Practical No. 18)

16 Create XSL file to convert above (refer Practical No. 17) XML file into XHTMLfile.

17 Write a php program to display today's date in dd-mm-yyyy format.

18 Write a php program to check if number is prime or not.

19 Create HTML page that contain textbox, submit / reset button. Write php program to display this information and also store into text file.

20 Write PHP Script for storing and retrieving user information from MySql table.

1. Design A HTML page which takes Name, Address, Email and Mobile No. From user (register.php)

21 Store this data in Mysql database / text file.

22 Students have to create a whole Website which contains above topics in Website.

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**
Steven Holzner,	HTML Black Book		Dremtech press.
Design, Knuckles,	Web Applications : Concepts and Real World		Wiley-India
Reference Books:			
P.J. Deitel & H.M.	Internet and World Wide Web How to program		Deitel Pearson

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1	Computer with moderate configuration
2	XAMPP and other software as required.

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

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Semester IV							
Sl. No.	**CBCS Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC-8	BITCSC401 BITCSC491	Computer Networks	4	0	4	6
2	CC-9	BITCSC402 BITCSC492	Software Engineering	4	0	4	6
3	CC-10	BITCSC403	Cyber Security: Vulnerabilities & Safeguards	5	1	0	**6**
4	GE-4	BITCSG401	*A. Digital Marketing* *B. Entrepreneurship Theory and Practice* *C. Project Management* *D. E-Commerce System Development*	5	1	0	**6**
Sessional							
6	SEC-3	BITCSS481	Minor Project and Entrepreneurship II	0	0	4	**2**
						Total Credit	**26**

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Computer Networks and Computer Networks Lab	
Course Code: BITCSC401 + BITCSC491	**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.	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 algorithms.
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		**3 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** Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements	**8**	**14**
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: 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 (Cyber Security) **Subject:** Software Engineering and Software Engineering Lab	
Course Code: BITCSC402 + BITCSC492	**Semester: IV**
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	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 analyse existing system to gather requirements for proposed system.
4	Gain skill to design and develop softwares.
Objective:	
Sl. No.	
1	To introduce the students to a branch of study associated with the development of a software product.
2	To gain basic knowledge about the pre-requisites for planning a software project.
3	To learn how to design of software
4	To enable the students to perform testing of a software.
Pre-Requisite:	
Sl. No.	
1.	None

Contents		**4 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.	**7**	**15**

	Concept of User Interface, Essence of UML. CASE tool.		
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		**30**
	Total:		**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
Reference Books:			
Ian Sommerville	Software Engineering		Addison-Wesley

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1	Computer with moderate configuration
2	MS-Project or similar software.

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

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

C	**1 to 4**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering 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:

Five No of Experiments			
			40

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**	**60**

Name of the Course: B.Sc. in Information Technology (Cyber Security)
Subject: Cyber Security: Vulnerabilities & Safeguards

Course Code: BITCSC403	**Semester: IV**
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.	To learn foundations of Cyber Security and Ethical Hacking analysis using programming languages like python.
2.	To learn various types of algorithms and its applications of Cyber Security and Ethical Hacking using forensic detection
3.	To learn python toolkit for required for programming Cyber Security, Ethical Hacking concepts
4.	To understand the concepts of Cyber Security, Ethical Hacking Forensic detection image

	processing, pattern recognition, and natural language processing.		
Objective:			
Sl. No.			
1.	Understand, appreciate, employ, design and implement appropriate security technologies and policies to protect computers and digital information.		
2.	Identify & Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time		
3.	Identify common trade-offs and compromises that are made in the design and development process of Information		
4.	Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection.		
Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Cyber Security** Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace.	**7**	**10**
02	**Cyber Security Vulnerabilities and Cyber Security Safeguards** Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management	**5**	**10**
03	**Securing Web Application, Services and Servers** Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.	**5**	**10**
04	**Intrusion Detection and Prevention** Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.	**6**	**10**
05	**Cryptography and Network Security** Introduction to Cryptography, Symmetric key Cryptography,	**5**	**10**

	Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer- IPSec.		
06	**Cyberspace and the Law** Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.	**5**	**10**
07	**Cyber Forensics** Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.	**5**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Erdal Ozkaya, Milad Aslaner	Hands-On Cybersecurity for Finance: Identify vulnerabilities and secure your financial services from security breaches	1 edition	Packt Publishing
Lester Evans	Cybersecurity: An Essential Guide to Computer and Cyber Security for Beginners, Including Ethical Hacking, Risk Assessment, Social Engineering, Attack and Defense Strategies, and Cyberwarfare	**ISBN-10:** 1791553583 **ISBN-13:** 978-1791553586	Independently published

Reference Books:			
Edward G. Amoroso, Matthew E. Amoroso	From CIA to APT: An Introduction to Cyber Security	**ISBN-10:** 1522074945 **ISBN-13:** 978-1522074946	Independently published
Brian Walker	Cyber Security: Comprehensive Beginners Guide to Learn the Basics and Effective Methods of Cyber Security	ISBN-10: 1075257670 ISBN-13: 978-1075257674	Independently published

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**

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Minor Project and Entrepreneurship II	
Course Code: BITCSS481	**Semester: IV**
Duration: 36 Hrs	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	End Semester Exam: 100
Tutorial: 0	Attendance:
Practical: 4	Continuous Assessment:
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 V							
Sl. No.	**CBCS Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory + Practical							
1	CC-11	BITCSC501	Information and Coding Theory	5	1	0	6
2	CC-12	BITCSC502	Cyber Law and IPR	5	1	0	6
3	DSE-1	BITCSD501	Elective-I	5	1	0	6
			A. Steganography				
			B. Threats in Mobile Application				
			C. Internet Technology				
			D. Digital Forensics				
4	DSE-2	BITCSD502	Elective-II	5	1	0	6
			A. Security Assessment and Risk Analysis				
			B. IoT and Security				
			C. ML for Security				
			D. Web Application Security				
Sessional							
5	SEC-4	BITCSS581	Industrial Training and Internship	0	0	0	2
			Total Credit				26

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Information and Coding Theory	
Course Code: BITCSC501	**Semester: V**
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.	Introduced to the basic notions of information and channel capacity.
2.	To introduce information theory, the fundamentals of error control coding techniques and their applications, and basic cryptography.
3.	To provide a complementary U/G physical layer communication
4.	**to convolutional and block codes, decoding techniques, and automatic repeat request (ARQ) schemes.**

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Objective:			
Sl. No.			
1.	Understand how error control coding techniques are applied in communication systems.		
2.	Able to understand the basic concepts of cryptography.		
3.	To enhance knowledge of probabilities, entropy, measures of information.		
Pre-Requisite:			
Sl. No.			
1.	Probability and Statistics		
Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**INFORMATION ENTROPY FUNDAMENTALS** Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.	**12**	**23**
02	**DATA AND VOICE CODING** Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC). Denial of Service Attacks, DOS-proof network architecture, Security architecture of World Wide Web, Security Architecture of Web Servers, and Web Clients, Web Application Security – Cross Site Scripting Attacks, Cross Site Request Forgery, SQL Injection Attacks, Content Security Policies (CSP) in web, Session Management and User Authentication, Session Integrity, Https, SSL/TLS, Threat Modeling, Attack Surfaces, and other comprehensive approaches to network design for security	**12**	**24**
03	**ERROR CONTROL CODING** Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.	**12**	**23**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Simon Haykin	Communication Systems	4th Edition	John Wiley and Sons, 2001
Fred Halsall	Multimedia Communications, Applications Networks Protocols and Standards		Pearson Education, Asia 2002

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Reference Books:			
Mark Nelson	Data Compression Book		Publication 1992
Watkinson J	Compression in Video and Audio		Focal Press, London, 1995

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

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

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

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Cyber Law and IPR	
Course Code: BITCSC502	**Semester: V**
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.	To provide knowledge related to auditing of computer systems, managing and mitigating risk situations in the organization and techniques for investigating financial frauds.

2.	To create awareness on cybercrime & IT law.		
3.	Provide the assistance to handle cybercrime.		
4.	To protect the girls against the cybercrime.		
Objective:			
Sl. No.			
1.	This course will look at the emerging legal, policy and regulatory issues pertaining to cyberspace and cybercrimes		
2.	To cover all the topics from fundamental knowledge of Information Technology and Computer Architecture so that the participant can use to understand various aspects of working of a computer.		
3.	To enable the participants appreciate, evaluate and interpret the case laws with reference to the IT Act and other Laws associated with the cyberspace.		
4.	To identify the emerging Cyberlaws, Cybercrime & Cyber security trends and jurisprudence impacting cyberspace in today's scenario.		
Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Cyberspace, Cybercrime and Cyber Law** The World Wide Web, Web Centric Business, e-Business Architecture, Models of e-Business, e-Commerce, Threats to virtual world. IT Act 2000 - Objectives, Applicability, Non-applicability, Definitions, Amendments and Limitations. Cyber Crimes- Cyber Squatting, Cyber Espionage, Cyber Warfare, Cyber Terrorism, Cyber Defamation. Social Media-Online Safety for women and children, Misuse of Private information.	**9**	**17**
02	**Regulatory Framework of Information and Technology Act 2000** Information Technology Act 2000, Digital Signature, E-Signature, Electronic Records, Electronic Evidence and Electronic Governance. Controller, Certifying Authority and Cyber Appellate Tribunal. (Rules announced under the Act), Network and Network Security, Access and Unauthorized Access, Data Security, E Contracts and E Forms.	**9**	**17**
03	**Offences and Penalties** Information Technology (Amendment) Act 2008 – Objective, Applicability and Jurisdiction; Various cyber-crimes under Sections 43 (a) to (j), 43A, 65, 66, 66A to 66F, 67, 67A, 67B, 70, 70A, 70B, 80 etc. along with respective penalties, punishment and fines, Penal Provisions for Phishing, Spam, Virus, Worms, Malware, Hacking, Trespass and Stalking; Human rights in cyberspace, International Co-operation in investigating cybercrimes.	**9**	**18**
04	**Indian Evidence Act & Intellectual property rights** Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts. Criminal Procedure Code. Cognizable and non-cognizable offences. Bailable and non-bailable offences. Sentences which the court of Chief Judicial Magistrate may pass. Indian Evidence Act – Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination of witnesses. Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141. Section 293 in the code of criminal procedure. Secondary EvidenceSection 65-B. Intellectual property rights.	**9**	**18**

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

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Karnika Seth	Computers, Internet and New Technology Laws		Lexis Nexis Buttersworth Wadhwa, 2012
Jonathan Rosenoer	Cyber Law: The Law of Internet		Springer- Verlag, New York, 1997
Reference Books:			
Sreenivasulu N.S	Law Relating to Intellectual Property		Patridge Publishing, 2013
Pavan Duggal	Cyber Law – The Indian Perspective		Saakshar Law Publications
Harish Chander	Cyber Laws and IT Protection		PHI Learning Pvt. Ltd, 2012

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**	**10**	**10**				
B	**1,2,3,4,**			**5**	**3**	**5**	**60**
C	**1,2,3,4**			**5**	**3**	**15**	

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

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Steganography	
Course Code: BITCSD501A	**Semester: V**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**

B.Sc. in Information Technology (Cyber Security)
Effective from academic session 2022-23

Theory: 5	**End Semester Exam: 70**
Tutorial: 1	**Attendance : 5**
Practical: 0	**Continuous Assessment: 25**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA

Aim:	
Sl. No.	
1.	To understand the fundamentals of Cryptography
2.	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
3.	To understand the various key distribution and management schemes

Objective:	
Sl. No.	
1.	To design security applications in the field of Information technology
2.	To understand how to deploy encryption techniques to secure data in transit across data networks
3.	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.

Pre-Requisite:	
Sl. No.	
1.	Cryptography

Contents		**3 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Terminologies used in Cryptography; Substitution Techniques – The Caesar Cipher, One-Time Pads, The Vernam Cipher, Book Cipher; Transposition Techniques – Encipherment/Decipherment Complexity, Digrams, Trigrams, and Other Patterns.	**7**	**14**
02	**Steganography and Watermarking** History of watermarking – Importance of digital watermarking – Applications – Properties – Evaluating watermarking systems. WATERMARKING MODELS & MESSAGE CODING: Notation – Communications – Communication based models – Geometric models – Mapping messages into message vectors – Error correction coding – Detecting multi-symbol watermarks.	**7**	**14**
03	**Encryption for Images& Videos**	**7**	**14**
04	**Steganography:** Steganography communication – Notation and terminology – Information theoretic foundations of steganography – Practical steganographic methods – Minimizing the embedding impact – Steganalysis	**7**	**14**
05	**Type of Attacks** Need for Security; Security Attack – Threats, Vulnerabilities, and Controls, Types of Threats (Attacks); Security Services – Confidentiality, Integrity, Availability; Information Security; Methods of Protection.	**8**	**14**

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

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
R.A. Mollin	An Introduction to Cryptography		Chapman & Hall, 2001
Silverman and Tate	Rational Points on Elliptic Curves		Springer 2005
Reference Books:			
Hankerson, Menezes, Vanstone	Guide to elliptic curve cryptography		Springer, 2004
Jones and Jones	Elementary Number Theory		Springer, 1998
Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker	Digital Watermarking and Steganography		Margan Kaufmann Publishers, New York, 2008

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 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**

B.Sc. in Information Technology (Cyber Security)
Effective from academic session 2022-23

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Threats in Mobile Application	
Course Code: BITCSD501B	**Semester: V**
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.	Get to know the most important security risks (OWASP Mobile Top 10) of mobile apps with the aid of intentionally vulnerable mobile apps for iPhone and Android.
2.	Give overview of security architecture of a Mobile.

Objective:	
Sl. No.	
1.	The security architecture of Android and iOS, you will be guided through various application vulnerabilities and the corresponding countermeasures
2.	To apply what you have learned to your company's mobile application projects and will gain the competence for secure development and evaluation (self-assessment) of mobile apps

Pre-Requisite:	
Sl. No.	
1.	Good understanding of mobile devices advantageous
2.	Ability to read and understand source code

Contents		**3 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Software and System Security** Control hijacking attacks – buffer overflow, integer overflow, bypassing browser memory protection, Sandboxing and Isolation, Tools and techniques for writing robust application software, Security vulnerability detection tools, and techniques – program analysis (static, concolic and dynamic analysis), Privilege, access control, and Operating System Security, Exploitation techniques, and Fuzzing	**7**	**14**
02	**Network Security & Web Security** Security Issues in TCP/IP – TCP, DNS, Routing (Topics such as basic problems of security in TCP/IP,, IPsec, BGP Security, DNS Cache poisoning etc), Network Defense tools – Firewalls, Intrusion Detection, Filtering, DNSSec, NSec3, Distributed Firewalls, Intrusion Detection tools, Threat Models, Denial of Service Attacks, DOS-proof network architecture, Security architecture of World Wide Web, Security Architecture of Web Servers, and Web Clients, Web Application Security – Cross Site Scripting Attacks, Cross Site Request Forgery, SQL Injection Attacks, Content Security Policies (CSP) in web, Session Management and User Authentication, Session Integrity, Https, SSL/TLS, Threat Modeling, Attack Surfaces, and other comprehensive approaches to network design for security	**8**	**14**
03	**Security in Mobile Platforms**	**7**	**14**

	Android vs. ioS security model, threat models, information tracking, rootkits, Threats in mobile applications, analyzer for mobile apps to discover security vulnerabilities, Viruses, spywares, and keyloggers and malware detection		
04	**Introduction to Hardware Security, Supply Chain Security** Threats of Hardware Trojans and Supply Chain Security, Side Channel Analysis based Threats, and attacks	**7**	**14**
05	**Issues in Critical Infrastructure and SCADA Security** Security issues in SCADA, IP Convergence Cyber Physical System Security threats, Threat models in SCADA and various protection approaches, Machine learning and SCADA Security	**7**	**14**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Scott J. Roberts, Rebekah Brown	Intelligence- Driven Incident Response: Outwitting the Adversary		O'Reilly Media, 2017
Henry Dalzie	How to Define and Build an Effective Cyber Threat Intelligence Capability		Elsevier Science & Technology, 2014
Reference Books:			
John Robertson, Ahmad Diab, Ericsson Marin, Eric Nunes, Vivin Paliath, Jana Shakarian, Paulo Shakarian,	DarkWeb Cyber Threat Intelligence Mining		Cambridge University Press, 2017
Bob Gourley	The Cyber Threat		Createspace Independent Pub, 2014
Wei-Meng Lee	Beginning AndroidTM 4 Application Development		John Wiley & Sons,2017

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 **C**	**1 to 5** **1 to 5**			**5** **5**	**3** **3**	**5** **15**	**60**

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

Examination Scheme for end semester examination:

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

Examination Scheme for Practical Sessional examination:

Name of the Course: B.Sc. in Information Technology (Cyber Security)
Subject: Internet Technology

Course Code: BITCSD501C	**Semester: V**
Duration: 36 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 5	End Semester Exam: 70
Tutorial: 1	Attendance : 5
Practical:0	Continuous Assessment: 25
Credit: 6	Practical Sessional internal continuous evaluation: NA
	Practical Sessional external examination: NA

Aim:

Sl. No.	
1	To gain comprehensive knowledge of Internet and its working.
2	Ability to use services offered by internet.
3	To enhance skill to develop websites using HTML , CSS, JS.

Objective:

Sl. No.	
1	To introduce the students to the network of networks -Internet.
2	To enable the students to use various services offered by internet.
3	To gain knowledge about the protocols used in various services of internet.
4	To understand the working and applications of Intranet and Extranet.

Pre-Requisite:

Sl. No.	
1	Understanding of basic programming logic.

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction to Networking Overview of Networking, Intranet, Extranet and Internet, Domain and	8	12

	Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP, Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6, Classful and Classless Addressing, Subnetting. NAT, IP masquerading, IPtables, Routing -Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast, Electronic Mail		
02	Web Programming Introduction to HTML, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Color name, Color value, Image Maps, area, attributes of image area, Extensible Markup Language (XML), CGI Scripts, GET and POST Methods.	8	15
03	Server Side Programming and Scripting Basic PHP Programming, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling, JavaScript basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation, Definition of cookies, Create and Store cookie.	8	15
04	Security Issues Network security techniques, Password and Authentication, VPN, IP Security, security in electronic transaction, Secure Socket Layer(SSL), Secure Shell (SSH), Introduction to Firewall, Packet filtering, Stateful, Application layer, Proxy.	**6**	**13**
05	Advance Internet Technology Internet Telephony (VoIP), Multimedia Applications, Multimedia over IP: RSVP, RTP, RTCP and RTSP. Streamingmedia, Codec and Plugins, IPTV, Search Engine Optimization, Metadata.	**6**	**15**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical
Skills to be developed:
Intellectual skills:

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

List of Practical:

1. As compatible to theory syllabus.

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
N.P. Gopalan and J. Akilandeswari	Web Technology: A Developer's Perspective		PHI

Reference Books:

Rahul Banerjee	Internetworking Technologies, An Engineering Perspective		PHI Learning

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer with moderate configuration

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

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

1. Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
2. 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:

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**	**60**

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Digital Forensics			
Course Code: BITCSD501D		**Semester: V**	
Duration: 36 Hrs.		**Maximum Marks: 200**	
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 provide computer forensics systems		
2.	To provide an understanding Computer forensics fundamentals		
3.	To analyze various computer forensics technologies		
Objective:			
Sl. No.			
1.	To identify methods for data recovery.		
2.	To apply the methods for preservation of digital evidence.		
Pre-Requisite:			
Sl. No.			
1.	Database System		
Contents		**3 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Computer Forensics Fundamentals** What is Computer Forensics?, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement — Computer Forensic Technology — Types of Business Computer Forensic Technology Computer Forensics Evidence and Capture: Data Recovery Defined — Data Back-up and Recovery — The Role of Back-up in Data Recovery — The Data-Recovery Solution.	**12**	**23**

02	**Evidence Collection and Data Seizure** Why Collect Evidence? Collection Options — Obstacles — Types of Evidence — The Rules of Evidence — Volatile Evidence — General Procedure — Collection and Archiving — Methods of Collection — Artifacts — Collection Steps — Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene — Computer Evidence Processing Steps — Legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image Verification and Authentication: Special Needs of Evidential Authentication — Practical Consideration —Practical Implementation.	**12**	**23**
03	**Computer Forensics analysis and validation** Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, and performing remote acquisitions Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project. Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case	**12**	**24**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. Understand the definition of computer forensics fundamentals
2. Describe the types of computer forensics technology.
3. Analyze various computer forensics systems.
4. Illustrate the methods for data recovery, evidence collection and data seizure.
5. Summarize duplication and preservation of digital evidence.

List of Practical:

Based on theory lectures.

Assignments:

Based on theory lectures.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
John R. Vacca	Computer Forensics, Computer Crime Investigation	2nd Edition	Firewall Media, New Delhi
Nelson, Phillips Enfinger, Steuart	Computer Forensics and Investigations		CENGAGE Learning
Reference Books:			
Keith J. Jones,	Real Digital Forensics		Pearson Education

Richard Bejtiich, Curtis W. Rose, Addison Wesley			
Tony Sammes and Brian Jenkinson	Forensic Compiling, A Tractitioneris Guide		Springer International edition
Christopher L.T. Brown	Computer Evidence Collection & Presentation		Firewall Media
Jesus Mena	Homeland Security, Techniques & Technologies		Firewall Media
Robert M. Slade	Software Forensics Collecting Evidence from the Scene of a Digital Crime		TMH 2005

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	**1,2,3**	**10**	**10**				
B	**1,2, 3**			**5**	**3**	**5**	**60**
C	**1,2,3,**			**5**	**3**	**15**	

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

Examination Scheme for end semester examination:

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

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**

B.Sc. in Information Technology (Cyber Security)
Effective from academic session 2022-23

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Security Assessment and Risk Analysis	
Course Code: BITCSD502A	**Semester: V**
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.	It will provide a background in the many aspects of security management associated with today's modern communications and networks
2.	It includes the fundamentals of Risk Analysis, Risk Management, Security Policy, Security Operations, Legal issues, Business issues and Secure Systems Development.

Objective:	
Sl. No.	
1.	Understand the role of Security Management in information technology
2.	Quantify the properties of Information Security systems
3.	Develop project plans for secure complex systems with knowledge of SANS 20 critical controls
4.	Demonstrate understanding of the role of firewalls, guards, proxy servers and intrusion detection in networks on a Linux OS with traffic analysis
5.	Evaluate the residual risk of a protected network

Pre-Requisite:	
Sl. No.	
1.	Application of cryptography

Contents		**3 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Risk Assessment** Understand the principles and terminology of risk; Probability, Likelihood, Threat, Vulnerability, Impact , Threat actor, Risk owner, Understand and describe the five key steps in risk management: Identify assets Identify threats and vulnerabilities, Assess the impact of threats and vulnerabilities on an organisation Identify ways to manage those threats and vulnerabilities, Monitor and report on risk management action, Discuss qualitative and quantitative approaches to risk assessment; Quantitative approaches (such as loss expectancy approaches (SLE/ARO)), Quantitative scalar approaches (such as High/Medium/Low), Illustrate how the results of an assessment can be presented; Financial impact, Dashboards, Heat maps, RAG.	**12**	**23**
02	**Risk Assessment: Threat and Vulnerabilities** Define and state the differences between: Threat, Vulnerability, Exploit, Attack, Describe and explain the following: Categories of threats The concept of a threat lifecycle The use of threat intelligence in an organisation. The uses of attribution, Discuss	**12**	**23**

	vulnerabilities, especially those relating to people and staff. Apprentices will understand how they can be exploited to attack an organisation; Phishing, Social engineering, Blended attacks, Describe common methods for finding vulnerabilities; Penetration testing Phishing simulators Social engineering attacks		
03	**Risk Assessment: Standards** Explain that risk assessment can be carried out using several methodologies or frameworks, but that it is better to select one methodology or framework for consistent and comparable results, List the common risk assessment methodologies or frameworks; ISO/IEC 27005, NIST, Risk Management, Framework, OCTAVE, FAIR, Compare common risk methodologies/frameworks; highlighting similarities and differences. Demonstrate how to select and then apply a risk methodology/framework in an organisation.	**12**	**24**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Mark Ryan M. Talabis and Jason L. Martin	Information Security Risk Assessment Toolkit: Practical Assessments through Data Collection and Data Analysis		Syngress, 2012
Reference Books:			
Douglas J. Landoll	The Security Risk Assessment Handbook: A Complete Guide for Performing Security Risk Assessments		CRC Press, 2011

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

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

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

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 (Cyber Security)

Effective from academic session 2022-23

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 (Cyber Security) **Subject:** IoT and Security	
Course Code: BITCSD502B	**Semester: V**
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.	Recognize IoT security and vulnerability threats.
2.	Understand different IoT protocols and their security measures.
3.	Interpret different IoT types of attacks.

Objective:	
Sl. No.	
1.	Understand IoT general models and security challenges.
2.	Interpret how to secure an IoT environment

Contents		**3 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**UNIT I IOT-SECURITY OVERVIEW IoTReference Model-** Introduction - Functional View,IoT Security Challenges-Hardware Security Risks - Hardcoded/Default Passwords -Resource Constrained Computations -Legacy Assets Connections - Devices Physical Security, Software Security Risks -Software Vulnerabilities -Data Interception - Identification of Endpoints -Tamper Detection, Lack of Industrial Standards	**7**	**14**
02	**UNIT II IOT- SECURITY &VULNERABILITY ISSUES IoT Security Requirements** -Data Confidentiality -Data Encryption -Data Authentication -Secured Access Control –IoT-Vulnerabilities – Secret-Key, Authentication/Authorization for Smart Devices - Constrained System Resources -Device Heterogeneity -Fixed Firmware.IoT Attacks -Side-channel Attacks -Reconnaissance -Spoofing -Sniffing - Neighbour -Discovery -Rogue Devices-Man-in-Middle	**7**	**14**
03	**UNIT III SECURED PROTOCOLS FOR IOT Infrastructure-IPv6 -** LowPAN , Identification-Electronic Product Code -uCode, Transport-Bluetooth - LPWAN, Data -MQTT -CoAP, Multi-layer Frameworks-Alljoyn,-IoTivity	**7**	**14**
04	**UNIT IV SECURING INTERNET OF THINGS ENVIRONMENT IoT Hardware** -Test Device Range-Latency and Capacity -	**7**	**14**

	Manufacturability Test -Secure from Physical Attacks, IoT Software - Trusted IoT Application Platforms, -Secure Firmware Updating - Network Enforced Policy -Secure AnalyticsVisibility and Control		
05	**UNIT V IOT ATTCAKS -CASE STUDY MIRAI Botnet Attack -**Iran's Nuclear FacilityStuxnet Attack -TeslaCryptojacking Attack -The TRENDnet WebcamAttack -The JeepSUV Attack -The Owlet Wi-Fi Baby Heart Monitor Vulnerabilities -St.Jude_Hackable Cardiac Devices	**8**	**14**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Alasdair Gilchrist	IoT Security Issues	ISBN: 9781501505621	O'Reilly

Reference Books:

Online Resource

1. https://www.postscapes.com/internet-of-things-protocols/
2. https://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html
3. https://www.cisco.com/c/en/us/about/security-center/secure-iot-proposed-framework.html
4. https://www.iotforall.com/5-worst-iot-hacking-vulnerabilities/

Filiol	Computer viruses: from theory to applications		Eric Springer Science & Business Media, 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**				
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**

B.Sc. in Information Technology (Cyber Security)
Effective from academic session 2022-23

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** ML for Security			
Course Code: BITCSD502C		**Semester: V**	
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.	To discuss the relationship between AI/ML and security/privacy;		
2.	To identity how AI/ML can be used to launch cyber-attacks;		
3.	To identify use cases for incorporating AI/ML for security and trust;		
4.	To identify use cases for defining security and trust of AI/ML;		
Objective:			
Sl. No.			
1.	Identify security requirements and capabilities of AI/ML enabled applications and services;		
2.	Identify security requirements and capabilities for security applications and services incorporating AI/ML		
3.	Able to identify ways forward for SG17 to undertake in its future study, including potential new work items.		
Pre-Requisite:			
Sl. No.			
1.	**AI and ML**		
Contents		**3 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Overview of information security, current security landscape, the case for security data mining 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	**12**	**23**
02	**Clustering and Learning** 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);Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests) Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning	**12**	**24**
03	**Advance Learning and Security**	**12**	**23**

	Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference; Anomaly Detection, Evasion Attacks, Membership Inference,Malware Analysis,Model Stealing & Watermarking, Poisoning, Network Traffic Analysis, Generative Adversarial Networks, Differential Privacy,Variational Auto-Encoders		
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
K.P. Soman, R.Loganathan, V.Ajay	Machine Learning with SVM and other Kernel methods		PHI Learning Private Limited,2009.
Shai Shalev-Shwartz, Shai Ben-David	Understanding Machine Learning: From Theory to Algorithms	1 edition	Cambridge University Press;
Reference Books:			
Kevin Murphy	Machine Learning: A Probabilistic Perspective		MIT Press, 2012
Trevor Hastie, Robert Tibshirani, Jerome Friedman	The Elements of Statistical Learning		Springer 2009
Christopher Bishop	Pattern Recognition and Machine Learning		Springer, 2007

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

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

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

Examination Scheme for end semester examination:

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

A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Web Application Security	
Course Code: BITCSD502D	**Semester: V**
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.	Be familiar with the capabilities of various Browser Proxies
2.	Be familiar with the capabilities of various Penetration Testing tools
3.	Be prepared to detect Access Control Vulnerabilities
4.	Be prepared to detect SQL Injection Vulnerabilities

Objective:

Sl. No.	
1.	Understand the concepts and terminology behind defensive, secure, coding
2.	Appreciate the magnitude of the problems associated with web application security and the potential risks associated with those problems
3.	Understand the use of Threat Modeling as a tool in identifying software vulnerabilities based on realistic threats against meaningful assets
4.	Understand the consequences for not properly handling untrusted data such as denial of service, cross-site scripting, and injections

Pre-Requisite:

Sl. No.	
1.	Basic knowledge of Web Application
2.	Understanding Internet Architectures

Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Application Security** HTTPS, HSTS, SMIME, PGP, SET, E-mail and IM security, DNSSec, eSMTPS, DKIM, MARC, DNSSec, SMTP STS	**9**	**17**
02	**Secure Configuration of Applications** Security Issues in TCP/IP – Web Server, Database Server, Email Server	**9**	**18**
03	**Security protocols at application level** PGP, HTTPS, SSH, etc. Proxy or application level gateways as security devices	**9**	**17**
04	**Vulnerabilities and Countermeasures** Popular OWASP Vulnerabilities and Countermeasures	**9**	**18**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Nitesb Dbanjani, Billy Rios & Brett Hardin	Hacking: The Next generation		O'reilly, 2009
Joel Scambray, Vincent Liu & Caleb Sima	Hacking Exposed Web Applications		McGraw-Hill Education, 2010
Reference Books:			
Mike Shema	Seven Deadliest Web Application Attacks		Elsevier, 2010

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**	**10**	**10**				
B	**1,3,4**			**5**	**3**	**5**	**60**
C	**1,2,3,4**			**5**	**3**	**15**	

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

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Industrial Training and Internship	
Course Code: BITCSS581	**Semester: V**
Duration: NA	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: 100**
Tutorial: 0	**Attendance: 0**
Practical: 2	**Continuous Assessment: 0**
Credit: 2	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: 100
Contents	
Students be encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break.	

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B.Sc. in Information Technology (Cyber Security)
Effective from academic session 2022-23

Semester VI							
Sl. No.	**CBCS Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
Theory							
1	CC-13	BITCSC601 BITCSC691	Cloud Computing	4	0	4	6
2	CC-14	BITCSC602	Biometric Security	5	1	0	6
3	DSE-4	BITCSD601	Elective-III **[MOOCS]**				
			A. Blockchain and Crypto currency	5	1	0	**6**
			B. Mobile Ad-hoc Network Security				
			C. Secure Software Design & Enterprise Computing				
			D. Big Data Analytics				
Sessional							
4	SEC-5	BITCSS681	Grand Viva	-	-	-	**1**
5	SEC-6	BITCSD682	Seminar	0	0	4	2
6	DSE-5	BITCSD681	Major Project and Entrepreneurship	0	0	8	**4**
						Total Credit	**25**

Semester	**Credit**
I	20
II	22
III	26
IV	26
V	26
VI	25
TOTAL	**145**

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Cloud Computing & Cloud Computing Lab	
Course Code: **BITCSC601** **BITCSC691**	**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		**3 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	**14**	**20**

	Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF) Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance,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 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,	**8**	**15**

	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**

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Effective from academic session 2022-23

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 (Cyber Security) **Subject:** Biometric Security	
Course Code: BITCSC602	**Semester: VI**
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.	Demonstrate knowledge of the basic physical and biological science and engineering principles underlying biometric systems
2.	Understand and analyze biometric systems at the component level and be able to analyze and design basic biometric system applications
3.	Be able to work effectively in teams and express their work and ideas orally and in writing.
4.	Identify the sociological and acceptance issues associated with the design and implementation of biometric systems
5.	Understand various Biometric security issues
Objective:	
Sl. No.	
1.	To provide students with understanding of biometrics, biometric equipment and standards applied to security.
Pre-Requisite:	
Sl. No.	
1.	Fundamental knowledge in Biometrics

Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Overview of Biometrics** Definitions, biometric modalities, basic applications, access control, security	**7**	**14**
02	**Biometric System Architecture** Scanning/digitizing, enhancement, feature extraction, classification, matching, searching and verification.	**7**	**14**
03	**Probability, statistics and estimation Random variables** Discrete and continuous distribution - pattern classification and recognition - Signals in time and frequency domain – multivariate statistical analysis.	**8**	**14**
04	**Algorithms** Face recognition Voice Recognition Fingerprint Recognition Iris Recognition Other biometric modalities: Retina, signature, hand geometry, gait, keystroke Quantitative analysis on the biometrics, Performance evaluation in Biometrics – false acceptance rate; false rejection rate.	**7**	**14**
05	**Multimodal Biometric systems** Biometric system integration, multimodal biometric systems: theory and applications, performance evaluation of multimodal biometric systems. Biometric System Security: Biometric attacks/tampering; solutions; biometric encryption	**7**	**14**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Benjamin Muller	Security, Risk and the Biometric State: Governing Borders and	1st Edition	Routledge, 2010

	Bodies		
Anil K jain, Patrick Flynn, Arun A.	Handbook of Biometrics		Springer, 2008
Reference Books:			
Julian D. M. Ashbourn	Biometrics: Advanced Identify Verification: The Complete Guide		Springer-verlag, 2000
: J. Wayman, A. Jain, D. Maltoni and D. Maio	Biometric Systems: Technology, Design and Performance Evaluation		Springer, 2005
List of equipment/apparatus for laboratory experiments:			
Sl. No.			
2.	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**				
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 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 (Cyber Security) **Subject:** Blockchain and Crypto currency	
Course Code: BITCSD601A	**Semester: VI**
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.	Explain cryptographic building blocks and reason about theirsecurity		
2.	Define Bitcoin's consensus mechanism		
3.	Learn how the individual components of the Bitcoin protocol make the whole system works: transactions, script, blocks, and the peer-to-peer network		
4.	Define how mining can be re-designed in alternative cryptocurrencies		
Objective:			
Sl. No.			
1.	To learn Blockchain systems: Nuts and Bolts		
2.	Able to analyse Decentralized systems		
3.	To understand Tokenization and ICOs		
4.	To describe Cryptography of Blockchain		
Pre-Requisite:			
Sl. No.			
1.	Database System		
2.	Cryptography		
3.	Basic Financial Knowledge		
Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**INTRODUCTION** Need for Distributed Record Keeping, Modeling faults and adversaries, Byzantine Generals problem, Consensus algorithms and their scalability problems, Why Nakamoto Came up with Blockchain based cryptocurrency? Technologies Borrowed in Blockchain – hash pointers, consensus, byzantine fault-tolerant distributed computing, digital cash etc.	**6**	**12**
02	**Basic Distributed Computing** Atomic Broadcast, Consensus, Byzantine Models of fault tolerance	**6**	**11**
03	**Basic Crypto primitives** Hash functions, Puzzle friendly Hash, Collison resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems	**6**	**11**
04	**Blockchain 1.0** Bitcoin blockchain, the challenges, and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use	**6**	**11**
05	**Blockchain 2.0** Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, Using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts	**6**	**12**
05	**Blockchain 3.0** Hyperledger fabric, the plug and play platform and mechanisms in permissioned blockchain	**6**	**11**

06	**Privacy, Security issues in Blockchain** Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks - -advent of algorand, and Sharding based consensus algorithms to prevent these	**6**	**12**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Don Tapscott , Alex Tapscott	Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies Is Changing the World Paperback		
Reference Books:			
William Mougayar	The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology		Wiley

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

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 6**	**10**	**10**				
B	**1 to 6**			**5**	**3**	**5**	**60**
C	**1 to 6**			**5**	**3**	**15**	

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

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Mobile Ad-hoc Network Security	
Course Code: BITCSD601B	**Semester: VI**
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.	Introduce students to need for Intrusion Detection Systems.
2.	Introduce students to different techniques for Intrusion Detection.
3.	Enable students to use various tools for Intrusion Detection Mechanisms.

Objective:	
Sl. No.	
1.	Realize the research aspects in the field of intrusion detection systems.
2.	Optimize performance of detection systems by employing various machine learning techniques.
3.	Apply knowledge of machine learning in system and network protection.

Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**INTRODUCTION:** Introduction to Mobile Ad-hoc Network Security, Understanding Intrusion Detection – Intrusion detection and prevention basics – IDS and IPS analysis schemes, Attacks, Detection approaches –Misuse detection – anomaly detection – specification based detection – hybrid detection THEORETICAL FOUNDATIONS OF DETECTION: Taxonomy of anomaly detection system – fuzzy logic – Bayes theorem – Artificial Neural networks – Support vector machine – Evolutionary computation – Association rules – Clustering	**7**	**14**
02	**ARCHITECTURE AND IMPLEMENTATION:** Centralized – Distributed – Cooperative Intrusion Detection – Tiered architecture	**7**	**14**
03	**JUSTIFYING INTRUSION DETECTION:** Intrusion detection in security – Threat Briefing –Quantifying risk – Return on Investment (ROI)	**8**	**14**
04	**APPLICATIONS AND TOOLS:** Tool Selection and Acquisition Process – Bro Intrusion Detection – Prelude Intrusion Detection – Cisco Security IDS – Snorts Intrusion	**7**	**14**

	Detection – NFR security		
05	**LEGAL ISSUES AND ORGANIZATIONS STANDARDS:** Law Enforcement / Criminal Prosecutions – Standard of Due Care – Evidentiary Issues, Organizations and Standardizations.	**7**	**14**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Rafeeq Rehman	Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID	First	Prentice Hall
Carl Enrolf, Eugene Schultz, Jim Mellander	Intrusion detection and Prevention		McGraw Hill
Earl Carter, Jonathan Hogue	Intrusion Prevention Fundamentals		Pearson Education
Reference Books:			
Ali A. Ghorbani, Wei Lu	Network Intrusion Detection and Prevention: Concepts and Techniques		Springer
Paul E. Proctor	The Practical Intrusion Detection Handbook		Prentice Hall
Ankit Fadia and Mnu Zacharia	Intrusiion Alert		Vikas Publishing house Pvt

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 inthe 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 (Cyber Security) **Subject:** Secure Software Design & Enterprise Computing	
Course Code: BITCSD601C	**Semester: VI**
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.	The course takes a software development perspective to the challenges of engineering software systems that are secure.
2.	This course addresses design and implementation issues critical to producing secure software systems.
3.	The course deals with the question of how to make the requirements for confidentiality, integrity, and availability integral to the software development process from requirements gathering to design, development, configuration, deployment, and ongoing maintenance

Objective:

Sl. No.	
1.	Understand various aspects and principles of software security.
2.	Devise security models for implementing at the design level
3.	Identify and analyze the risks associated with s/w engineering and use relevant models to mitigate the risks.
4.	Understand the various security algorithms to implement for secured computing and computer networks.
5.	Explain different security frameworks for different types of systems including electronic systems.

Pre-Requisites

	Software Engineering Fundamentals		
Contents		**3 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Defining computer security, the principles of secure software, trusted computing base, etc, threat modelling, advanced techniques for mapping security requirements into design specifications. Secure software implementation, deployment and ongoing management.	**7**	**14**
02	Software design and an introduction to hierarchical design representations. Difference between high-level and detailed design. Handling security with high-level design. General Design Notions. Security concerns designs at multiple levels of abstraction, Design patterns, quality assurance activities and strategies that support early vulnerability detection, Trust models, security Architecture & design reviews.	**7**	**14**
03	Software Assurance Model: Identify project security risks & selecting risk management strategies, Risk Management Framework, Security Best practices/ Known Security Flaws, Architectural risk analysis, Security Testing & Reliability (Penn testing, Risk- Based Security Testing, Abuse Cases, Operational testing , Introduction to reliability engineering, software reliability, Software Reliability approaches, Software reliability modelling.	**7**	**14**
04	Software Security in Enterprise Business: Identification and authentication, Enterprise Information Security, Symmetric and asymmetric cryptography, including public key cryptography, data encryption standard (DES), advanced encryption standard (AES), algorithms for hashes and message digests. Authentication, authentication schemes, access control models, Kerberos protocol, public key infrastructure (PKI), protocols specially designed for e-commerce and web applications, firewalls and VPNs. Management issues, technologies, and systems related to information security management at enterprises.	**8**	**14**
05	Security development frameworks. Security issues associated with the development and deployment of information systems, including Internet-based e-commerce, e-business, and e-service systems, as well as the technologies required to develop secure information systems for enterprises, policies and regulations essential to the security of enterprise information systems.	**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. To identify the various requirement development activities viz. elicitation, analysis, specification and verification for the given scenarios.
2. To identify the role of the software in today's world across a few significant domains related to day to day life
3. To identify the suitable software development model for the givenscenario

List of Practical: 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
W. Stallings	Cryptography and network security: Principles and practice	Fifth	Upper Saddle River, NJ: Prentice Hall
C. Kaufman, r. Perlman, & M. Speciner	Network security: Private communication in a public world	Second	Upper Saddle River, NJ:Prentice HalL
C. P. Pfleeger, S. L. Pfleeger	Security in Computing	Fourth	Upper Saddle River, NJ:Prentice Hall
Reference Books:			
Gary McGraw	Software Security: Building Security		Addison-Wesley
M. Merkow, & J. Breithaupt	Information security: Principles and practices.		Upper Saddle River, NJ:Prentice Hall

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**				
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 (Cyber Security)
Subject: Big Data Analytics

Course Code: BITCSD601D	**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 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		3 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 OperatorsJoinin 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 men, Type of data source supported by, how to connect different dat source, edit metadata, filter fields, filter data source, type of chart, 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**

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

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 questions should be given on top of the question paper.

Examination Scheme for end semester examination:

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

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Grand Viva	
Course Code: BITCSS681	**Semester: VI**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: 100**
Tutorial: 0	**Attendance: 0**
Practical: 0	**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 subject that they have covered in the course.	

Name of the Course: B.Sc. in Information Technology (Cyber Security) **Subject:** Major Project and Entrepreneurship	
Course Code: BITCSD681	**Semester: VI**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: 100**
Tutorial: 0	**Attendance: 0**
Practical: 4	**Continuous Assessment: 0**
Credit: 6	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA
Contents	
Students will do projects on application areas of latest technologies and current topics of societal relevance.	