Dr. M.G.R.
EDUCATIONAL AND RESEARCH INSTITUTE
DEEMED TO BE UNIVERSITY
University with Graded Autonomy Status
(An ISO 21001 : 2018 Certified Institution)
Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India.

NAAC ACCREDITED WITH GRADE **A**

DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

DECLARATION

I, **Dr. N. KANYA,** Head of Information Technology, hereby declare that this copy of the syllabus (B. Tech – Information Technology - Full Time 2018 Regulation after CDC with Universal Human Values) is the final version which is being taught in the class and uploaded in our University website. I assure that the Syllabi available in our University website is verified and found correct. The Curriculum and Syllabi have been ratified by our Academic Council / Vice Chancellor.

DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation
B.Tech – Information Technology (Full Time)
Curriculum and Syllabus 2018 Regulation – To be implemented from 2021-2022 Batch

S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
III SEMESTER							
1	BMA18008	Discrete Mathematics	Ty	3	1/0	0/0	4
2	BIT18001	Data Structures and Algorithms	Ty	3	0/0	0/0	3
3	BCS18002	Object Oriented Programming with C++	Ty	3	0/0	0/0	3
4	BEC18I03	Information Theory and Coding	Ty	3	1/0	0/0	4
5	BEC18I01	Digital Systems	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BHS20ET5	Universal human values 2: Understanding harmony	ETL	1	0/1	3/0	3
2	BIT18L01	Data Structures and Algorithms Lab	Lb	0	0/0	3/0	1
3	BCS18L02	Object Oriented Programming with C++ Lab	Lb	0	0/0	3/0	1
4	BEC18IL1	Digital Systems Lab	Lb	0	0/0	3/0	1
Credits Sub Total							23

S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
IV SEMESTER							
1	BMA18016	Statistics for Computer Engineers	Ty	3	1/0	0/0	4
2	BCS18004	Database Management Systems	Ty	3	0/1	0/0	4
3	BIT18002	System Software & Operating System	Ty	3	0/1	0/0	4
4	BEC18I02	Microprocessors and Microcontrollers	Ty	3	0/0	0/0	3
5	BHS18NC1/ BHS18NC2	The Indian Constitution*/ The Indian Traditional Knowledge*	Ty	2	0/0	0/0	NC
PRACTICALS*							
1	BCS18ET1	Java Programming	ETL	1	0/1	3/0	3
2	BCS18L03	Database Management Systems Lab	Lb	0	0/0	3/0	1
3	BIT18L02	System Software and Operating System Lab	Lb	0	0/0	3/0	1
4	BEC18IL2	Microprocessors and Microcontrollers Lab	Lb	0	0/0	3/0	1
5	BIT18TS1	Technical Skill I	Lb	0	0/0	3/0	1
6	BEN18SK1	Soft Skill I (Career & Confidence Building)	ETL	0	0/0	3/0	1
Credits Sub Total							23

C: Credits L: Lecture T: Tutorial S.Lr: Supervised Learning P: Problem / Practical R: Research Ty/Lb/ETL: Theory /Lab/Embedded Theory and Lab   * Internal Evaluation

B.Tech – Information Technology (Full Time) – 2018 Regulation After CDC of Universal Human Values

		V SEMESTER					
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BCS18009	Object Oriented Software Engineering	Ty	3	1/0	0/0	4
2	BCS18007	Computer Networks	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective I	Ty	3	0/0	0/0	3
4	BXX18OEX	Open Elective I	Ty	3	0/0	0/0	3
		PRACTICALS*					
1	BCS18ET2	Computer Graphics	ETL	1	0/1	3/0	3
2	BCS18L08	Object Oriented Software Engineering Lab	Lb	0	0/0	3/0	1
3	BCS18L05	Network Programming Lab	Lb	0	0/0	3/0	1
4	BIT18TS2	Technical Skill II	Lb	0	0/0	3/0	1
						Credits Sub Total	19

		VI SEMESTER					
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BCS18010	Data Warehousing and Data Mining	Ty	3	0/0	0/3	4
2	BIT18003	Web Technology and Web Services	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective II	Ty	3	0/0	0/0	3
4	BXX18OEX	Open Elective II	Ty	3	0/0	0/0	3
		PRACTICALS*					
1	BCS18ET3	PHP/MySQL	ETL	1	0/1	3/0	3
2	BCS18L11	Data Mining Lab	Lb	0	0/0	3/0	1
3	BIT18L03	Web Technology and Web Services Lab	Lb	0	0/0	3/0	1
4	BEN18SK2	Soft Skill II (Qualitative and Quantitative Skills)	ETL	0	0/0	3/0	1
5	BIT18L04	Mini Project/In plant Training/Industrial Training	Lb	0	0/0	3/0	1
6	BIT18TS3	Technical Skill III	Lb	0	0/0	3/0	1
						Credits Sub Total	21

C: Credits L: Lecture T: Tutorial S. Lr : Supervised Learning P : Problem / Practical

R : ResearchTy/Lb/ETL: Theory/Lab/Embedded Theory and Lab*Internal evaluation

		VII SEMESTER					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
1	BIT18006	Cloud Technology	Ty	3	0/0	0/0	3
2	BXX18EXX	Elective III	Ty	3	0/0	0/0	3
3	BCS18012	Open Source Scripting Languages	Ty	3	0/0	0/0	3
4	BMG18002	Management Concepts and Organizational Behavior	Ty	3	0/0	0/0	3
		PRACTICALS*					
1	BXX18OLX	Open Lab	Lb	0	0/0	3/0	1
2	BIT18ET1	Mobile Application Development	ETL	1	0/1	3/0	3
3	BIT18L05	Cloud Application Development Lab	Lb	0	0/0	3/0	1
4	BIT18L06	Scripting Languages Lab	Lb	0	0/0	3/0	1
5	BIT18L07	Project Phase – 1	Lb	0	0/0	3/3	2
6	BHS18FLX	Foreign Language	Lb	0	0/0	3/0	1
					Credits Sub Total		21

		VIII SEMESTER					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
1	BIT18005	Wireless Communication	Ty	3	0/0	0/3	4
2	BXX18EXX	Elective 4	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective 5	Ty	3	0/0	0/0	3
		PRACTICALS*					
1	BIT18L08	Project (Phase – II)	Lb	0	0/0	12/12	8

Credits Sub Total: 18

C: Credits L: Lecture T: Tutorial S.Lr: Supervised Learning P: Problem / Practical R: Research Ty/Lb/ETL: Theory /Lab/Embedded Theory and Lab   * Internal Evaluation

S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/Lb/ETL	L	T/S.Lr	P/R	C
ELECTIVE -I (Common to CSE&IT)							
1	BCS18E01	Image Processing	Ty	3	0/0	0/0	3
2	BCS18E02	Geographical Information Systems	Ty	3	0/0	0/0	3
3	BCS18E03	Database Tuning	Ty	3	0/0	0/0	3
4	BCS18E04	Component Based Technology	Ty	3	0/0	0/0	3
5	BCS18E05	E-Commerce	Ty	3	0/0	0/0	3
6	BCS18E06	Artificial Intelligence	Ty	3	0/0	0/0	3
7	BCS18E07	Human Computer Interaction	Ty	3	0/0	0/0	3
8	BCS18E08	Wireless and Mobile Networking	Ty	3	0/0	0/0	3
9	BCS18005	Design And Analysis of Algorithms	Ty	3	0/0	0/0	3

S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/Lb/ETL	L	T/S.Lr	P/R	C
ELECTIVE -II							
1	BCS18E09	Web Mining	Ty	3	0/0	0/0	3
2	BCS18E10	Web Data Design and Management	Ty	3	0/0	0/0	3
3	BCS18E11	Risk Management	Ty	3	0/0	0/0	3
4	BCS18E12	Cryptography and Network Security	Ty	3	0/0	0/0	3
5	BCS18E13	Mobile Adhoc Networks	Ty	3	0/0	0/0	3
6	BCS18E14	TCP/IP Design and Implementation	Ty	3	0/0	0/0	3
7	BCS18E15	Cyber Forensics and Internet Security	Ty	3	0/0	0/0	3
8	BCS18E16	Database Security	Ty	3	0/0	0/0	3
9	BCS18E17	Management Information Systems	Ty	3	0/0	0/0	3

S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/Lb/ETL	L	T/S.Lr	P/R	C
ELECTIVE –III							
1	BCS18E18	Data Science and Big Data Analytics	Ty	3	0/0	0/0	3
2	BCS18E19	Network Forensics	Ty	3	0/0	0/0	3
3	BCS18E20	Internet of Things	Ty	3	0/0	0/0	3
4	BCS18E21	Social Computing	Ty	3	0/0	0/0	3
5	BCS18E22	Enterprise Architecture	Ty	3	0/0	0/0	3
6	BCS18EXX	Subject based on Industry Demand	Ty	3	0/0	0/0	3
7	BCS18E23	Optimization Techniques	Ty	3	0/0	0/0	3

		ELECTIVE –IV & V					
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BCS18E24	Information Storage Management	Ty	3	0/0	0/0	3
2	BCS18E25	Network Infrastructure Management	Ty	3	0/0	0/0	3
3	BCS18E26	Foundations of Parallel Programming	Ty	3	0/0	0/0	3
4	BCS18E27	Virtualization	Ty	3	0/0	0/0	3
5	BCS18E28	Hadoop Distributed File System	Ty	3	0/0	0/0	3
6	BCS18E29	Mobile Databases	Ty	3	0/0	0/0	3
7	BCS18E30	Web Engineering	Ty	3	0/0	0/0	3
8	BCS18E31	4G Networks	Ty	3	0/0	0/0	3
9	BCS18E32	Enterprise Resource Planning	Ty	3	0/0	0/0	3
10	BCS18E33	Supply Chain Management	Ty	3	0/0	0/0	3
11	BCS18E34	Mainframe Computing	Ty	3	0/0	0/0	3
12	BCS18E35	Neuro Fuzzy Computing	Ty	3	0/0	0/0	3
13	BCS18E36	Web Content Management	Ty	3	0/0	0/0	3
14	BCS18E37	Machine Learning	Ty	3	0/0	0/0	3
15	BCS18E38	M-Commerce	Ty	3	0/0	0/0	3
16	BCS18E39	Real Time Systems	Ty	3	0/0	0/0	3
17	BCS18E40	Distributed Computing	Ty	3	0/0	0/0	3

Credit Summary

Semester : 1 **: 20**

Semester : 2 **: 16**

Semester : 3 **: 22**

Semester : 4 **: 23**

Semester : 5 **: 19**

Semester : 6 **: 21**

Semester : 7 **: 21**

Semester : 8 **: 18**

Total Credits : 160

S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/Lb/ETL	L	T/S.Lr	P/R	C
		Open Electives					
1	BIT18OE1	Web Design	Ty	3	0/0	0/0	3
2	BIT18OE2	Digital Marketing	Ty	3	0/0	0/0	3
3	BIT18OE3	Information Security Management	Ty	3	0/0	0/0	3
4	BIT18OE4	Introduction to Multimedia	Ty	3	0/0	0/0	3

S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/Lb/ETL	L	T/S.Lr	P/R	C
		Open Lab					
1	BCS18OL1	Visual Programming Lab	Lb	0	0/0	3/0	1
2	BCS18OL2	Web Design Lab	Lb	0	0/0	3/0	1
3	BCS18OL3	Python Programming Lab	Lb	0	0/0	3/0	1
4	BCS18OL4	Computer Network Lab	Lb	0	0/0	3/0	1
5	BCS18OL5	PHP / MySQL Programming Lab	Lb	0	0/0	3/0	1

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2018 Regulation

SEMESTER – III

Subject Code : BMA18008	Subject Name : DISCRETE MATHEMATICS	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite : None	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :
- To understand the Basic concepts in Logic and Predicate calculus
- To understand the Basic concepts in Combinatorics
- To understand the Basic concepts in Group theory
- To understand the Basic concepts in Lattices
- To understand the Basic concepts in Graph theory

COURSE OUTCOMES (COs) :
Students completing the course were able to

CO1	Find the summation of the given series logical equations and predicate calculus.
CO2	To determine the functions of permutation and combination.
CO3	To understand the concept of group theory and analysis operation of set operations.
CO4	Apply knowledge and concepts in finding the derivative of given function and to find the maxima / minima of the given function using lattices.
CO5	Evaluate the partial / total differentiation and maxima / minima of a function of several variables.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H			M	M			H	H		H
CO2	H	H			H	L						H
CO3	H	H			M				M	H		L
CO4	H	H			L				M	H		M
CO5	H	H				M			M	M		H

H/M/L indicates strength of correlation   H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
	√								

B.Tech – Information Technology (Full Time) – 2018 Regulation After CDC of Universal Human Values

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DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BMA18008	DISCRETE MATHEMATICS	Ty	3	1/0	0/0	4

(Common to II yr. / III Sem. B.Tech (Full Time), I yr. / I Sem. B.Tech (Part Time) - CSE,IT)

OBJECTIVES :
- To understand the Basic concepts in Logic and Predicate calculus
- To understand the Basic concepts in Combinatorics
- To understand the Basic concepts in Group theory
- To understand the Basic concepts in Lattices
- To understand the Basic concepts in Graph theory

UNIT I   LOGIC   12 Hrs

Statements – Truth Table – Connectives – Normal Forms – Predicate Calculus – Inference Theory.

UNIT II   COMBINATORICS   12 Hrs

Mathematical Induction – Pigeon Hole Principle – Principle of Inclusion and Exclusion – Recurrence Relations – Generating Functions.

UNIT III   GROUPS   12 Hrs

Basic Concepts – Groups – Subgroups – Homomorphism – Kernel – Cosets – Lagrange's theorem (simple theorems and problems).

UNIT IV   LATTICES   12 Hrs

Partial ordering – Posets – Hasse Diagram – Lattices – Properties of lattices – Sub lattices – Special lattices – Boolean Algebra(Definition & simple problems).

UNIT V   GRAPHS   12 Hrs

Introduction to Graphs – Terminology – Matrix representation of Graphs: Incidence matrix, Adjacency matrix – Graph Isomorphism – Connectivity – Euler and Hamiltonian Paths (simple theorems and problems).

Total Hours: 60

TEXT BOOKS:
1. Veerarajan T., *Discrete Mathematics*, Tata McGraw Hill Publishing Co., (2008).
2. Tremblay J.P., Manohar R., *Discrete Mathematical structures with applications to Computer science*, Tata McGraw Hill Publishing Co., (2008).

REFERENCE BOOKS:
1. *Kolman, Busby, Ross, Discrete Mathematical Structures, Pearson, (2014).*
2. *Kenneth Rosen, Discrete Mathematics and its applications (SIE), Tata McGraw Hill Publishing Co., (2007).*

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DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

Subject Code: **BIT18001**	Subject Name : **DATA STRUCTURES AND ALGORITHMS**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Ty	3	1/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Master the implementation of linked data structures such as linked lists and binary trees
- Be familiar with advanced data structures such as AVL trees and hash tables.
- Be familiar with several sub-quadratic sorting algorithms including quicksort, mergesort and heapsort
- Be familiar with some graph algorithms such as shortest path and minimum spanning tree
- Be familiar with various algorithm design methods and its application

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student will be able to choose appropriate data structure as applied to specified problem definition
CO2	Student will be able to handle operations like searching, insertion, deletion, traversing mechanism on various data structures.
CO3	Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
CO4	Students will be able to use linear and non-linear data structures like stacks, queues , linked list etc
CO5	Students will be aware of various Algorithmic design methods used in problem solving.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	L	H	M	L	L	L	L	L	M	M
CO2	H	H	H	L	M	L	M	M	H	L	M	M
CO3	H	M	H	H	H	M	L	M	H	L	M	M
CO4	H	H	H	H	M	L	M	M	H	L	M	M
CO5	H	M	H	H	H	M	L	M	H	L	M	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			PSO6
CO1	H	H	L	L	H	M	M	L
CO2	H	H	M	L	H	M	M	L
CO3	H	M	L	L	H	M	M	L
CO4	H	H	L	L	H	H	L	L
CO5	H	M	L	L	H	M	M	L

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18001	DATA STRUCTURES AND ALGORITHMS	Ty	3	1/0	0/0	3

OBJECTIVES:
- Master the implementation of linked data structures such as linked lists and binary trees
- Be familiar with advanced data structures such as AVL trees and hash tables.
- Be familiar with several sub-quadratic sorting algorithms including quicksort, mergesort and heapsort
- Be familiar with some graph algorithms such as shortest path and minimum spanning tree

Be familiar with various algorithm design methods and its application

UNIT I   LINEAR DATA STRUCTURES   12 Hrs

Algorithm Basics and Analysis-List-Stacks- Queues - Implementation and Applications - Singly linked list-Doubly linked Lists-Applications

UNIT II   NON LINEAR DATA STRUCTURES   12 Hrs

Trees – Binary Trees – Binary Search Tree Implementation – Tree Traversals – AVL trees- 2-3 tree, 2- 3- 4 tree.

UNIT III   SEARCHING AND SORTING TECHNIQUES   12 Hrs

Types of searching - Linear and Binary Searching Analysis – types of sorting-Quick Sort - Heap Sort - Merge Sort - Selection Sort - Bubble Sort - Insertion Sort – Sorting Comparison.

UNIT IV   GRAPH ALGORITHMS   12 Hrs

Graph Operations – DFS – BFS - Applications of Graphs - Minimum Cost Spanning Tree - Kruskal's Algorithm - Prim's Algorithm

UNIT V   ALGORITHM DESIGN METHODS   12 Hrs

Greedy method – Traveling Sales Person Problem - Divide and Conquer – Strassen's Matrix Multiplication - Dynamic Programming - Knapsack problem- Back Tracking – N Queens Problem .

Total Hours: 60

TEXT BOOKS :
1.   Horowitz, E. Sahani, S. & Mehta.(2007) Fundamentals of Data Structures in C++, Galgotia.

REFERENCE BOOKS:
1. *Weiss Mark Allen (2007) Data Structures and Algorithm Analysis in C, (3rd ed.), Pearson*
2. *Horowitz, E. Sahni&SanguthevarRajasekaran.(2007) Fundamentals of Computer Algorithms, Galgotia Publications*

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Subject Code: BCS18002	Subject Name : OBJECT ORIENTED PROGRAMMING WITH C++		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BES18ET2		Ty	3	0/1	0/0	3

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- The students will be able to distinguish OOP features with procedural Oriented and analyze these features to a real world object,
- To analyze generic data type for the data type independent programming which relate it to reusability.
- To understand the concepts of Java programs and develop basic networking programs using Java

COURSE OUTCOMES (COs) : (3- 5)

CO1	Object Oriented Programming and to analyze characteristics of OOP
CO2	To implement OOP in various applications
CO3	Files & I/O
CO4	Exception Handling
CO5	To develop an application using C++

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M	H	M	H	H	M	H	H	H
CO2	H		M	L	H	H	H	H	M	M	H	H
CO3	H	H	M		H	H	M	M	H	H	H	H
CO4	H	H	M	L		H	H	M	H	H	M	M
CO5	H	M	L	M	H	H	H	H	M	L	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	H	H
CO2	H	M	H	H	M	H
CO3	M	H	M	L	M	H
CO4	H	H	M	H	M	H
CO5	H	M	M	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18002	OBJECT ORIENTED PROGRAMMING WITH C++	Ty	3	0/1	0/0	3

OBJECTIVES:

- The students will be able to distinguish OOP features with procedural Oriented and analyze these features to a real world object,
- To analyze generic data type for the data type independent programming which relate it to reusability.
- To understand the concepts of Java programs and develop basic networking programs using Java

UNIT I   BASICS, TOKENS, EXPRESSIONS   12 Hrs

Software Evolution, Procedure Oriented Programming, Object Oriented Programming Paradigm, Basic Concepts of OOP, Benefits of OOP, Object Oriented Languages, Features of OOP. How OOP Differ from POP. Applications of OOP, A Simple C++ Program, Structure of C++ Program. Tokens, Keywords, Identifiers and Constants, Basic Data Types, User Defined Data Types, Derived Data Types, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators.

UNIT II   FUNCTIONS, CLASSES AND OBJECTS   12 Hrs

Introduction of Classes, Specifying a Class, Defining a Member Functions, A C++ Program with Class Access Specifiers, Inline functions, Nesting of Member Functions, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Default Arguments, Const Arguments, Function Overloading, Friend Functions.

UNIT III   CONSTRUCTORS AND DESTRUCTORS   12 Hrs

Introduction, Constructors, Default constructors, Copy Constructors, Dynamic Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic initialization of Objects, Destructors.

UNIT IV   INHERITANCE   12 Hrs

Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi Level Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Abstract Classes, Constructors in Derived Classes, Containership, Operator overloading, Rules for Operator overloading, overloading of binary and unary operators .

UNIT V   POINTERS, VIRTUAL FUNCTIONS AND POLYMORPHISM   12 Hrs

Introduction to Memory Management, new Operator and delete Operator, Pointer to Objects, this Pointer, Pointers to Derived Classes, Polymorphism, Compile time polymorphism, Run time polymorphism, Virtual Functions, Pure Virtual Functions, Virtual Base Classes, Virtual Destructors.

Total Hours: 60

TEXT BOOK:
   1.   E.Balagurusamy, "Object Oriented Programming in C++", 6th ed.,Tata McGraw-Hill, 2013

REFERENCE BOOKS:

1. *K.R.Venugopal, "Mastering C++", published by Tata McGraw- Hill. -2013,Second Edition.*
2. *Rohit Khurana,"Object Oriented Programming With C++",Vikas Publishing House- 2014, Second Edition.*
3. *Robert Lafore, "Object-Oriented Programming in C++", Sams Publishing-2002, Fourth Edition*

Subject Code: **BEC18I03**	Subject Name : **INFORMATION THEORY AND CODING**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Derive equations for entropy & mutual information
- Derive source coding & channel coding for shannon's.
- Explain various codes like linear block codes, Cyclic codes & Convolution Codes.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the basic concepts of information theory, source coding, channel coding and channel capacity, and relation among them
CO2	Understand the encoding concepts of various codes
CO3	Implement the encoder and decoder of block code or convolutional code

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	H	M	M	L	M	L	L	L	M	L	L	L
CO2	H	H	H	L	L	M	L	L	M	M	L	M
CO3	H	M	H	L	M	L	L	L	H	M	L	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	H	L	L
CO2	H	H	L	M	M	L
CO3	H	H	L	L	M	L

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BEC18I03	INFORMATION THEORY AND CODING	Ty	3	1/0	0/0	4

OBJECTIVES:
- Derive equations for entropy & mutual information
- Derive source coding & channel coding for shannon's.
- Explain various codes like linear block codes, Cyclic codes & Convolution Codes.

UNIT I   INTRODUCTION TO INFORMATION THEORY   12 Hrs

Definition of information -Information Measure and Entropy –properties of Entropy- Differential Entropy- Mutual Information-Information source- Markov source.

UNIT II   SOURCE CODING   12 Hrs

Introduction to Lossless coding-kraft McMillan Equality-shannon's source coding theorm -shannon fano coding- Huffman coding- Arithmetic coding – Lempel ziv coding.

UNIT III   CHANNEL CAPACITY AND CODING   12 Hrs

Introduction to channel capacity- channel capacity of a Binary Symmetric Channel- channel capacity of a Binary Erasure Channel- shannon's channel coding theorem – bandwidth - signal to noise trade off- channel capacity theorem.

UNIT IV   LINEAR BLOCK AND CYCLIC CODES   12 Hrs

Binary block code- Linear block code- Systematic LBC- Encoder for LBC-Syndrome Decoding of LBC – Hamming Codes - cyclic codes- Systematic cyclic codes - generator polynomial of cyclic code- parity check polynomial of cyclic codes- encoder for cyclic codes- decoder for cyclic code.

UNIT V   CONVOLUTION CODES   12 Hrs

Time domain and frequency domain- code tree, trellis and state diagram- decoding of convolution codes- viterbi decoding algorithm- trellis coded modulation- encoder for TCM- decoder for TCM

Total Hours: 60

TEXT BOOKS:
1. J.S.Chitode (2009) "*Information Theory and Coding*",Technical publications
2. R. Avudaiammal (2010) "*Information Coding Techniques*", Tata McGraw Hill Education pvt Ltd

REFERENCE BOOKS :
1. *Ranjan Bose (2008) "Information theory, coding and cryptography", Tata McGraw Hill Publishing Company Limited*
2. *Roberto Togneri and Christopher J.S. desilva (2003) "Fundamentals of Information Theory and Coding Design", Chapman and Hall/CRC*

Subject Code: **BEC18I01**	Subject Name : **DIGITAL SYSTEMS**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BES18001	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To introduce number systems and codes and its conversions
- To introduce Boolean algebra and its applications in digital systems
- To introduce the design of various combinational digital circuits using logic gates
- To bring out the analysis for synchronous and asynchronous Sequential circuits

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquired knowledge about number systems and its conversions
CO2	Acquired knowledge about boolean algebra
CO3	Ability to identify, analyze & design combinational circuits
CO4	Ability to identify & analyze synchronous & asynchronous circuits

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	M	L	L	L	L	L	L	M	L	L
CO2	H	M	L	L	L	L	L	L	L	L	L	L
CO3	M	M	H	L	L	M	L	L	M	M	L	L
CO4	M	M	H	L	L	M	L	L	M	M	L	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	L	H	L	L	M	L
CO2	L	H	L	L	M	L
CO3	H	M	L	L	M	M
CO4	H	M	L	L	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✔										

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BEC18I01	**DIGITAL SYSTEMS**	Ty	3	0/0	0/0	3

OBJECTIVES:
- To introduce number systems and codes and its conversions
- To introduce Boolean algebra and its applications in digital systems
- To introduce the design of various combinational digital circuits using logic gates
- To bring out the analysis for synchronous and asynchronous Sequential circuits

UNIT I   NUMBER SYSTEMS   9 Hrs
Review of Decimal, Binary, Octal And Hexadecimal Number Systems –Number Conversions – Signed Magnitude form – 1's and 2's Complement   - Binary weighted codes- Binary arithmetic – codes – BCD code, Gray code, Excess-3 Code.

UNIT II   BOOLEAN ALGEBRA   9 Hrs
Binary logic Functions- Boolean laws – De Morgan's Theorems, Sum Of Products –Product Of Sums – karnaugh map- Quine McCluskey Method.

UNIT III   COMBINATIONAL LOGIC   9 Hrs
Logic gates – AND, OR, NOT, NOR, NAND and EX-OR Gates– Half adder –Full adder- Half subtractor– Full subtractor - Multiplexer – Demultiplexer- Encoder – Decoder – Code converters - PAL- PLA.

UNIT IV   SYNCHRONOUS SEQUENTIAL LOGIC   9 Hrs
Latches-R-S- Flip Flop, S-R Flip Flop, D Flip Flop, JK Flip Flop, T Flip-Flop - Master slave Flip-Flop - Counters –Up Down counters- Binary counters-Ring counter- Shift Registers.

UNIT-V   ASYNCHRONOUS SEQUENTIAL LOGIC   9 Hrs
Asynchronous counters –Decade counters - State diagram - State Table – State Reduction – State Assignment- Excitation Table-Analysis of Asynchronous sequential circuits - Design of ASynchronous Sequential Circuits.

Total Hours: 45

TEXT BOOKS:
1. Charles H. Roth & Larry L.Kinney, "*Fundamentals of Logic Design*", Cengage Learning, 7th Edition.
2. M. Morris Mano & Michael D.Ciletti (2008) *Digital Design*. Pearson Education
3. Thomas.L.Floyd (2013) "*Digital Fundamentals''*, 10th Edition Pearson Education

REFERENCE BOOKS:
1. *Ronald J. Neal S. Gregory L (2009), "Digital Systems", 10th Edition, Pearson Prentice Hall.*
2. *R P Jain, (2010), "Modern Digital Electronics", 4th Edition, Tata Mcgraw Hill Ed. Pvt. Ltd.*

Subject Code: **BHS20ET5**	Subject Name: **UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY**	L	T/SLr	P/R	C
	Prerequisite: None, UHV1 (Desirable)	2	1/0	0/0	3

L:LectureT :Tutorial SLr: Supervised Learning P:Project R:ResearchC:CreditsT/L/ETL: Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

Human Values Courses: During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

1. Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

COURSEOUTCOMES(Cos) :(3–5) The students will be able to

CO1	Relate self and surroundings and identify responsibility in life
CO2	Associate human relationship and nature to handle problems and provide sustainable solutions
CO3	Develop critical ability and engage in reflective and independent Thinking
CO4	Show commitment towards understanding of values
CO5	Apply Human values in day to day setting in real life

Mapping of Course Outcomes with Program Outcomes(POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			1	1		2	1		1	1		2
CO2			2	2	1	2	3	1		2		2
CO3			1	1	1	2			1	2		3
CO4			2		1	1	1	3	1	1		3
CO5			1			2	1	2	1	1		3

Cos/PSOs	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				

3/2/1indicatesstrengthofcorrelation3 –High,2–Medium,1– Low

Category	BasicSciences	EnggSciences	Humaniti es &SocialSciences	Program	Program Electives	OpenElectives	Practical /Project	Internships /	SoftSkills
			√						

BHS20ET5 Universal Human Values 2: Understanding Harmony   2 1/0 0 /03

UNIT I

Introduction - Need, Basic Guidelines, Content and Process for ValueEducation

Purposeandmotivationforthecourse,recapitulationfromUniversal   HumanValues-I - Self-Exploration–what   is   it?   -   Its   content   and   process;   'Natural Acceptance'andExperientialValidation-astheprocessforself-exploration.   - ContinuousHappinessandProsperity-AlookatbasicHuman Aspirations - Right understanding, Relationship   and   Physical   Facility-   the   basic requirementsforfulfilmentofaspirationsofeveryhumanbeingwiththeir   correctpriority   - UnderstandingHappinessandProsperitycorrectly-Acriticalappraisalof   the   currentscenario   - Methodtofulfiltheabovehumanaspirations:understandingandliving in harmony atvariouslevels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance forliving with responsibility (living in relationship, harmony and co-existence) rather than asarbitrariness in choice based on liking-disliking.

UNIT II

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. - Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). - Understanding the characteristics and activities of 'I' and harmony in 'I' - Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physicalneeds, meaning of Prosperity in detail - Programs to ensureSanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available tome. Identifying from one's own life.

Differentiate between prosperity and accumulation. Discussprogram for ensuring health vs dealing with disease

UNIT III

Understanding Harmony in the Family and Society- Harmony in Human-HumanRelationship

Understanding values in human-human relationship; meaning of Justice (nine universal values inrelationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect asthe foundational values of relationship - Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the othersalient values in relationship - Understanding the harmony in the society (society being an extension of family): Resolution,Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals - Visualizing a universal harmonious order in society- Undivided Society, Universal Order- fromfamily to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family,real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal valuein relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT IV

Understanding Harmony in the Nature and Existence - Whole existence asCoexistence

Understanding the harmony in the Nature - Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulationin nature - Understanding Existence as Co-existence of mutually interacting units in all-pervasive space - Holistic perception of harmony at all levels of existence - Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" canbe used), pollution, depletion of resources and role of technology etc.

UNIT V

B.Tech – Information Technology (Full Time) – 2018 Regulation After CDC of Universal Human Values

Implications of the above Holistic Understanding of Harmony on ProfessionalEthics

Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics: a. Ability to utilize the professional competence foraugmenting universal human order b. Ability to identify the scope and characteristics of peoplefriendlyand eco-friendly production systems, c. Ability to identify and develop appropriatetechnologies and management patterns for above production systems. - Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order: ((a) At the level ofindividual: as socially and ecologically responsible engineers, technologists and managers, (b)Atthe level of society: as mutually enriching institutions and organizations - Sum up

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g.Todiscuss the conduct as an engineer or scientist etc.

Text Book

1. *Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010*

Reference Books

1. *Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.*
2. *Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.*
3. *The Story of Stuff (Book).*
4. *The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.*
5. *Small is Beautiful - E. F Schumacher.*
6. *Slow is Beautiful - Cecile Andrews*
7. *Economy of Permanence - J C Kumarappa*
8. *Bharat Mein Angreji Raj - PanditSunderlal*
9. *Rediscovering India - by Dharampal*
10. *Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi*
11. *India Wins Freedom - Maulana Abdul Kalam Azad*
12. *Vivekananda - Romain Rolland (English)*
13. *Gandhi - Romain Rolland (English)*

Subject Code: **BIT18L01**	Subject Name : **DATA STRUCTURES AND ALGORITHMS LAB**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BES17ET2	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To strengthen their problem solving ability by applying the characteristics of an object-oriented approach.
- To introduce object oriented concepts in C++ and Java.
- To analyze Space and Time Complexity.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Explain what constitutes an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches
CO2	Apply an object-oriented approach to developing applications of varying complexities
CO3	Describe the basic operations on arrays, lists, stacks and queue data structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	L	M	L	M	L	L	M	M	M	M
CO2	H	H	L	M	L	M	H	L	M	L	H	M
CO3	H	M	L	M	L	M	L	L	M	M	M	M

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		H		L		L		M	L	H	M
CO2	H		L		M		L		H	L	L	M
CO3	M		M		L		H		L	M	H	L

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

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2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18L01	**DATA STRUCTURES AND ALGORITHMS LAB**	Lb	0	0/0	3/0	1

OBJECTIVES:

- To strengthen their problem solving ability by applying the characteristics of an object-oriented approach.
- To introduce object oriented concepts in C++ and Java.
- To analyze Space and Time Complexity.

EXERCISES:

1) Operation on arrays – insertion and deletion
2) Linked lists-creation, insertion, deletion of single, double and circular lists.
3) Stack- operations using arrays and linked lists.
4) Infix to postfix conversion
5) Evaluation to postfix expression.
6) Queue- operations using arrays and linked lists.
7) Dequeue, circular-operations
8) Binary tree traversals- In order, pre order, post order using recursion
9) Binary tree traversals- In order, pre order, post order using non recursion
10) Linear and binary search
11) Sorting – Selection Sort, Quick sort, Heap Sort and Merge Sort.
12) Addition, multiplication of sparse matrices
13) Polynomial addition and multiplication
14) Depth first search of a graph
15) Analyze Space and Time Complexity for Sorting and Searching.

Subject Code: **BCS18L02**	Subject Name : **OBJECT ORIENTED PROGRAMMING WITH C++ LAB**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BES18ET2	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To develop skills to design and analyze simple linear and non linear data structures
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- 3. To Gain knowledge in practical applications of data structures

COURSE OUTCOMES (COs) : (3- 5)

CO1	Be able to design and analyze the time and space efficiency of the data structure
CO2	Be capable to identity the appropriate data structure for given problem
CO3	Have practical knowledge on the application of data structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H	H	M	H	H	H	H	H	H
CO2	H	M	H	H		H	M	H	H	H	M	H
CO3	M	H	H	H	H	L	M	H	H	H	H	H

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		H		H		H		H		H	
CO2	H		M		H		M		H		H	
CO3	H		H		M		H		H		M	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L02	**OBJECT ORIENTED PROGRAMMING WITH C++ LAB**	Lb	0	0/0	3/0	1

OBJECTIVES:
- To develop skills to design and analyze simple linear and non linear data structures
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- 3. To Gain knowledge in practical applications of data structures

1. Simple C++ Programs to Implement Various Control Structures.
    a. If statement
    b. Switch case statement and do while loop
    c. For loop
    d. While loop
2. Programs to Understand Structure & Unions.
    a. Structure
    b. Union
3. Programs to Understand Pointer Arithmetic.
4. Functions & Recursion.
    a. Function
    b. Recursion
5. Inline Functions.
6. Programs to Understand Different Function Call Mechanism.
    a. Call by reference & Call by Value
8. Programs to Understand Storage Specifiers.
8. Constructors & Destructors.
9. Use of "this" Pointer, using class
10. Programs to Implement Inheritance and Function Overriding.
    a. Multiple inheritances –Access Specifiers
    b. Hierarchical inheritance – Function Overriding /Virtual Function
11. Programs to Overload Unary & Binary Operators as Member Function & Non Member Function.
    a. Unary operator as member function
    b. Binary operator as non member function
12. Programs to Understand Friend Function & Friend Class.
    a. Friend Function
    b. Friend class
13. Programs on Class Template

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Subject Code: BEC18IL1	Subject Name : DIGITAL SYSTEMS LAB	Ty/Lb/ETL	L	T/S.Lr	P/R	C
	Prerequisite: BES18001	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To introduce number systems and codes and its conversions
- To introduce Boolean algebra and its applications in digital systems
- To introduce the design of various combinational digital circuits using logic gates
- To bring out the analysis for synchronous and asynchronous Sequential circuits

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquired knowledge about number systems and its conversions
CO2	Acquired knowledge about boolean algebra
CO3	Ability to identify, analyze & design combinational circuits
CO4	Ability to identify & analyze synchronous & asynchronous circuits

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	M	L	L	L	L	L	L	M	L	L
CO2	H	M	L	L	L	L	L	L	L	L	L	L
CO3	M	M	H	L	L	M	L	L	M	M	L	L
CO4	M	M	H	L	L	M	L	L	M	M	L	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	L	H	L	L	M	L
CO2	L	H	L	L	M	L
CO3	H	M	L	L	M	M
CO4	H	M	L	L	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
							✔					

Subject Code	Subject Name	Ty/Lb/ETL	L	T/S.Lr	P/R	C
BEC18IL1	**DIGITAL SYSTEMS LAB**	Lb	0	0/0	3/0	1

OBJECTIVES:

- To introduce number systems and codes and its conversions
- To introduce Boolean algebra and its applications in digital systems
- To introduce the design of various combinational digital circuits using logic gates

To bring out the analysis for synchronous and asynchronous Sequential circuits

1. Verification of Truth tables of Logic Gates
2. Implementation of Boolean function
3. Implementation of Half and full Adders
4. Implementation of Half and full Subtractors
5. Implementation of Multiplexers
6. Implementation of Demultiplexers
7. Implementation of Encoder
8. Implementation of Decoders
9. Verification of Flip – Flops
10. Implementation of Shift Registers
11. Implementation of Counters
12. Study of A to D Converters

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2018 Regulation
SEMESTER – IV

Subject Code : BMA18016	Subject Name : STATISTICS FOR COMPUTER ENGINEERS	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite : None	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :
- To understand the Basic concepts in Statistics
- To understand the Basic concepts in Probability
- To understand the Basic concepts in Correlation
- To understand the Basic concepts in Probability distributions
- To understand the Basic concepts in Sampling theory

COURSE OUTCOMES (COs) :
Students completing the course were able to

CO1	Find the summation of the given series.
CO2	To determine the functions of permutation and combination.
CO3	To understand the concept of corelation operations.
CO4	Apply knowledge and concepts in finding the derivative of given function and to find the maxima / minima of the given function using lattices.
CO5	Evaluate the partial / total differentiation and maxima / minima of a function of several variables.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H			M	M			H	H		H
CO2	H	H			H	L						H
CO3	H	H			M				M	H		L
CO4	H	H			L				M	H		M
CO5	H	H				M			M	M		H

H/M/L indicates strength of correlation   H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
	√								

B.Tech – Information Technology (Full Time) – 2018 Regulation After CDC of Universal Human Values

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DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ET	L	T/ S.Lr	P/R	C
BMA18016	STATISTICS FOR COMPUTER ENGINEERS	Ty	3	1/0	0/0	4

(Common to III yr. / V Sem. B.Tech (Full Time), I yr. / II Sem. B.Tech (Part Time) – CSE,IT)

OBJECTIVES:
- To understand the Basic concepts in Statistics
- To understand the Basic concepts in Probability
- To understand the Basic concepts in Correlation
- To understand the Basic concepts in Probability distributions
- To understand the Basic concepts in Sampling theory

UNIT I   BASICS OF STATISTICS   12 Hrs
Variables – Uni-variate Data – Frequency Distribution – Measures of Central Tendency – Mean –Median – Mode – Quartiles – Measures of Dispersion – The Range – Quartile Deviation –Standard Deviation – Relative Measures of Dispersion – Coefficient of Variation – Quartile Coefficient of Variation.

UNIT II   PROBABILITY AND RANDOM VARIABLE   12 Hrs
Axioms of Probability – Conditional probability – Total probability – Baye's Theorem – Random variable – Probability mass function – Probability density function – Properties – Moments (Definition and simple problems).

UNIT III   CORRELATION & REGRESSION   12 Hrs
Measures of Skewness & Kurtosis – Bi-variate data – Applications of Correlation: Karl Pearson's Coefficient of Correlation – Rank Correlation: Spearman's Rank Correlation – Linear Regression.

UNIT IV   STANDARD DISTRIBUTIONS   12 Hrs
Binomial – Poisson – Geometric –Uniform – Exponential –Normal distributions.

UNIT V   TESTING OF HYPOTHESIS   12 Hrs
Tests of Significance – Large Sample Tests – Mean – Proportions – Small Sample Tests – t, F, Chi-square Tests: Independence of Attributes, Goodness of Fit.

Total no. of hrs: 60

TEXT BOOKS:
1. Veerarajan T., *Probability, Statistics and, Random Processes*, Tata McGraw Hill Publishing Co., (2008).
2. Gupta S.C., Kapoor V.K., *Fundamentals of Mathematical Statistics*, S.Chand & Co., (2007).

REFERENCE BOOKS:
1. *Singaravelu, Probability and Random Processes, Meenakshi Agency, (2017).*
2. *Richard Johnson A., Miller & Freund's Probability and statistics for Engineers (9[th]ed), Prentice Hall of India, (2016).*

Subject Code: **BCS18004**	Subject Name : **DATABASE MANAGEMENT SYSTEMS**	Ty/ Lb/ ETL	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BCS18001	Ty	3	0/1	0/0	4

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
- To develop an understanding of essential DBMS concepts such as: database security, integrity, and concurrency.

COURSE OUTCOMES (COs) : (3- 5)

CO1	• Understand the most fundamental DBMS concepts and techniques
CO2	• Learn techniques required for building, maintaining, and querying databases.
CO3	• Design Databases for applications

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	M	H	M	M	M	M	M	H
CO2	M	H	M	M	H	M	M	M	H	L	L	M
CO3	H	M	H	H	M	M	L	L	M	L	M	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	H	H
CO2	M	M	H	L	M	M
CO3	M	H	M	M	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
				✔								

DEPARTMENT OF INFORMATION TECHNOLOGY
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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18004	**DATABASE MANAGEMENT SYSTEMS**	Ty	3	0/1	0/0	4

OBJECTIVES:
- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
- To develop an understanding of essential DBMS concepts such as: database security, integrity, and concurrency.

UNIT I   FUNDAMENTALS OF DATABASE   12 Hrs
Introduction - Purpose of database systems – Data Abstraction -Data models – Instances and schemas – Data Independence – DDL – DML – Database user – ER model – Entity sets- keys – ER diagram – relational model – structure – relational algebra- relational calculus- views

UNIT II   SQL   12Hrs
SQL - QBE - level – Basic Structure – various operations – relational database design – problems in the relational database design – normalization – normalization using functional – Multivalued join dependence

UNIT III   FILE STRUCTURE, INDEXING & HASHING   12 Hrs
File and system structure – overall system structure – file transaction – data dictionary – indexing and hashing basic concepts and B+ tree Indices - static and dynamic hash functions

UNIT IV   QUERY PROCESSING AND TRANSACTIONS   12 Hrs
Overview - Measures of Query Cost - Selection Operation – Sorting - Join Operation- Transaction Concept - A Simple Transaction Model - Storage Structure – Serializability

UNIT V   CONCURRENCY CONTROL AND RECOVERY SYSTEM   12 Hrs
Lock-Based Protocols - Deadlock Handling - Timestamp-Based Protocols - Validation-Based Protocols - Failures Classification – Storage - Recovery and Atomicity - Recovery Algorithm - Buffer Management

Total Hours: 60

TEXT BOOKS:
1. Abraham, Silberschatz. Henry, F. K.. Sudharshan, S. (2013) *Database System Concepts* (6[th]ed.) Tata McGraw Hill, New Delhi

REFERENCE BOOKS:
1. *Ramez, E. Shamkant, B. Navathe (2008) Fundamentals of database systems (5th ed.), Pearson Education*
2. *Date, C. J, (2012) An Introduction to Database Systems (8th ed.), Pearson Education*

Subject Code: **BIT18002**	Subject Name : **SYSTEM SOFTWARE AND OPERATING SYSTEM**	Ty/ Lb/ ET L	L	T/ S.L r	P/R	C
	Prerequisite: NIL	Ty	3	0/1	0/0	4

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To view some of the major tasks of the system software of a computer system such as Assemblers, Compilers, Loaders and Linkers.
- To study and apply concepts relating to operating systems, such as System calls, Inter process Communication and process management.
- To study and apply Deadlocks, Memory management, Processor and Disk scheduling,Storage management and applications on Unix.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understanding design issues associated with system software and operating systems
CO2	To know various process management concepts including scheduling, synchronization
C03	To familiar with Multithreading, Memory management and Dead locks
C04	Understanding issues related to file system interface and implementation, disk management and I/O Management.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	M	L	L	L	L	L	L	L	L
CO2	H	H	H	M	M	M	H	L	L	M	M	M
C03	H	M	M	M	L	L	M	M	L	L	L	M
C04	M	M	L	L	H	M	M	L	L	L	M	M

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		H		M		M		L	L	L	L
CO2	M		M		L		L		H	M	M	M
C03	L		L		M		M		M	L	M	M
C04	H		M		M		M		L	H	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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2018 Regulation

Subject Code	Subject Name	Ty/Lb/ETL	L	T/S.Lr	P/R	C
BIT18002	SYSTEM SOFTWARE AND OPERATING SYSTEM	Ty	3	0/1	0/0	4

OBJECTIVES:
- To view some of the major tasks of the system software of a computer system such as Assemblers, Compilers, Loaders and Linkers.
- To study and apply concepts relating to operating systems, such as System calls, Inter process Communication and process management.
- To study and apply Deadlocks, Memory management, Processor and Disk scheduling,Storage management and applications on Unix.

UNIT I   ASSEMBLERS COMPILERS LOADERS AND LINKERS   12 Hrs
Assemblers : Functions – Features – Machine dependent – Machine independent - Design options –One Pass – Multipass – Compilers: Function -Phases of a Compiler –Loader: Functions – Features – Relocation – Program Linking – Linking Loader Implementation Dynamic linking –Bootstrap loaders.

UNIT II   OS CONCEPTS AND PROCESS MANAGEMENT   12 Hrs
OS CONCEPTS Introduction- Operating System Structure- Operating System Operations-Operating System Services- System Calls-Process concept-Process Scheduling-Operation on Process-Cooperating Processes- Inter Process Communication-Threads-Overview-Multithreading Models.-CPU Scheduling-Scheduling Criteria-Scheduling Algorithms.

UNIT III   SYNCHRONIZATION AND DEADLOCKS   12 Hrs
Process Synchronization-The Critical Section Problem-Synchronization Hardware-Semaphores-Classical Problems of Synchronization-Deadlocks-System Model-Deadlock Characterization-Methods of Handling Deadlocks- Deadlock Prevention-Deadlock Avoidance-Deadlock Detection-Recovery from Deadlock

UNIT IV   MEMORY MANAGEMENT I/O MANAGEMENT   12 Hrs
Background-Swapping-Contiguous Memory Allocation - Address Translation - Paging - Segmentation - Segmentation with Paging - Paging Algorithms- Thrashing-Virtual Memory management- File Access methods- File system structure -Disk Scheduling

UNIT V   APPLICATION   12 Hrs
Case study on UNIX Operating System – Design principles – Process management –Scheduling –Memory Management - Inter process Communication.

Total Hours: 60

TEXT BOOKS:
1. Beck L. (2008) *System Software, An Introduction to System Programming* (3rd ed.), Pearson
2. Silberschatz, Galvin, Gagne (2012) Operating System Concepts, (9th ed.), John Wiley & Sons (Asia) Pt. Ltd, Singapore,.

REFERENCE BOOKS:
1. *Andrew S. Tanenbaum, Albert S, Wood Hull(2015) Modern Operating System, Pearson publication*
2. *D.M.Dhamdhere (2012) Operating SystemsConcepts, (3rd ed.), Tata McGraw-Hill Publishing Company Ltd.*
3. *William Stallings (2015) Operating Systems (8th ed.) Prentice Hall of India*

Subject Code: **BEC18I02**	Subject Name : **MICROPROCESSORS AND MICROCONTROLLERS**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BES18I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To study the basic architectures and operational features of the processors and controllers.
- To learn the assembly language programming of 8086.
- To design and understand the multiprocessor configurations.
- To understand the interfacing concepts of the peripheral devices with processors.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Ability to understand the architecture of 8086 microprocessor
CO2	Ability to understand the architecture of 8051 microcontroller
CO3	Ability to understand the interfacing of different peripheral devices with the microprocessors
CO4	Understand the applications of microprocessors & microcontrollers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	L	L	M	L	L	M	L	L	M
CO2	H	M	L	L	L	M	L	L	M	L	L	M
CO3	H	M	L	L	M	L	L	L	L	L	L	M
CO4	H	M	L	L	M	L	L	L	L	L	L	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	L	M	M	L
CO2	H	L	L	M	M	L
CO3	H	L	L	M	M	L
CO4	H	M	M	L	L	L

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✔										

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2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BEC18I02	MICROPROCESSORS AND MICROCONTROLLERS	Ty	3	0/0	0/0	3

OBJECTIVES:
- To study the basic architectures and operational features of the processors and controllers.
- To learn the assembly language programming of 8086.
- To design and understand the multiprocessor configurations.
- To understand the interfacing concepts of the peripheral devices with processors.

UNIT I   16 BIT MICROPROCESSOR   9 Hrs
Evolution of processors – 8086 Architecture – Functional Diagram – Register organization – Memory Addresses – Minimum mode – Maximum mode – Interrupts of 8086

UNIT II   INSTRUCTION SET AND ALP   9 Hrs
Instruction Formats – Addressing modes – Instruction set – Simple programs involving logical, branch and call instructions – sorting – string manipulations

UNIT III   INTERFACING   9 Hrs
Memory Interfacing – I/O Interfacing – Programmable Peripheral Interface 8255 – USART – DMA controller – Programmable Interval Timer 8253

UNIT IV   MICROCONTROLLER   9 Hrs
Introduction – 8051 Architecture – I/O Ports – Memory Organization – Addressing modes – Interrupts

UNIT V   APPLICATIONS   9 Hrs
Instruction set of 8051 – Applications – Simple programs – Interfacing with ADC- Interfacing with DAC-Stepper Motor –Traffic Light Controller

Total Hours: 45

TEXT BOOKS:
1. Ray A.K. & Bhurchandi K.M. (2013) *Advanced Microprocessors and Peripherals,* Tata McGraw Hill Education pvt Ltd
2. Douglas v Hall. (2006) *Microprocessors and Interfacing* (2nd ed.), Tata McGraw Hill Publishing company Limited

REFERENCE BOOKS:
1. *Badri Ram. (2006) Advanced Microprocessors and Interfacing, Tata McGraaw Hill Publishing company limited*
2. *Kenneth J. Ayala (2008) "The 8051 Micro Controller", 3rd Edition, Thomas Delmar Learning.*

Subject Code: **BHS18NC1**	Subject Name **THEINDIAN CONSTITUTION**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Ty	2	0/0	0/0	NC

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:
- To provide an overview of the history of the making of Indian Constitution
- To understand the preamble and the basic structures of the Constitution.
- To Know the fundamental rights, duties and the directive principles of state policy
- To understand the functionality of the legislature ,the executive and the judiciary

COURSE OUTCOMES (COs) : After studying this course the student would be able to

CO1	To provide an overview of the history of the making of Indian Constitution
CO2	To understand the preamble and the basic structures of the Constitution.
CO3	To Know the fundamental rights, duties and the directive principles of state policy

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						H	L	L	L	L		
CO2						H	L	L	L	L		
CO2						H	L	L	M	L		

COs / PSOs	PSO1	PSO2	PSO3
CO1	L	L	M
CO2	L	L	M
CO3	L	L	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engg Sciences	Humanities &Social Sciences	Program core	Program Electives	Open Electives	Practical/ Project	Internships / Technical Skills	Soft Skills			
			✓									

Subject Code	Subject Name	Ty/Lb/ETL	L	T/S.Lr	P/R	C
BHS18NC1	**THEINDIAN CONSTITUTION**	Ty	2	0/0	0/0	NC

OBJECTIVES:
- To provide an overview of the history of the making of Indian Constitution
- To understand the preamble and the basic structures of the Constitution.
- To Know the fundamental rights, duties and the directive principles of state policy
- To understand the functionality of the legislature ,the executive and the judiciary

UNIT I   **3Hrs**

The History of the Making of Indian Constitution, Preamble and the Basic Structures

UNIT II   **3Hrs**

Fundamental Rights and Duties, Directive Principles of State Policy

UNIT III   **3Hrs**

Legislature, Executive and Judiciary

UNIT IV   **3Hrs**

Emergency Powers

UNIT V   **3Hrs**

Special Provisions for Jammu and Kashmir, Nagaland and Other Regions, Amendments

                                                                        Total Hours: 15 Hrs

TEXT BOOKS:

1. D D Basu, Introductiontothe Constitutionof India,20th Edn.,LexisnexisButterworths, 2012.

REFERENCE BOOKS:

1. *Rajeev Bhargava (ed), Ethics and Politics of the Indian Constitution, Oxford University Press, NewDelhi, 2008.*
2. *GranvilleAustin,TheIndianConstitution:CornerstoneofaNation,OxfordUniversityPress, Oxford, 1966.*
3. *Zoya Hassan, E. Sridharan andR. Sudarshan (eds), India's Living Constitution: Ideas, Practices, Controversies,Permanent Black, NewDelhi, 2002.*
4. *SubhashC.Kashyap,OurConstitution,NationalBookTrust, NewDelhi, 2011.*

Subject Code: **BHS18NC2**	Subject Name : **THE INDIAN TRADITIONAL KNOWLEDGE**	Ty/ Lb/ ETL	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: NIL	Ty	2	0/0	0/0	NC

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:
- To understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System
- To understand the Traditional Medicine, Traditional Production and Construction Technology
- To Know the History of Physics and Chemistry, Traditional Art and Architecture and Vastu Shashtra, Astronomy and Astrology
- To understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

COURSE OUTCOMES (COs) : After studying this course the student would be able to

CO1	To understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System
CO2	To understand the Traditional Medicine, Traditional Production and Construction Technology
CO3	To understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		H	H	L		M				M		L
CO2		H	H	L		M				M		L
CO2		H	H	L		M				M		L

COs / PSOs	PSO1		PSO2	PSO3								
CO1	L		L	M								
CO2	L		L	M								
CO3	L		L	M								

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engg Sciences	Humanities &Social	Program core	Program Electives	Open Electives	Practical/ Project	Internships / Technical Skills	Soft Skills			
			✓									

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BHS18NC2	THE INDIAN TRADITIONAL KNOWLEDGE	Ty	2	0/0	0/0	NC

OBJECTIVES:

- To understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System
- To understand the Traditional Medicine, Traditional Production and Construction Technology
- To Know the History of Physics and Chemistry, Traditional Art and Architecture and Vastu Shashtra, Astronomy and Astrology
- To understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

UNIT I   3Hrs

Historical Background: TKS During the Pre- colonial and Colonial Period, Indian Traditional

Knowledge System

UNIT II   3Hrs

Traditional Medicine, Traditional Production and Construction Technology

UNIT III   3Hrs

History of Physics and Chemistry, Traditional Art and Architecture and Vastu Shashtra, Astronomy and Astrology

UNIT IV   3Hrs

Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

UNIT V   3Hrs

TKS and the Contemporary World, TKS and the Indian Union, TKS and IT Revolution

Total Hours: 15 Hrs

TEXT BOOKS:

1. Amit Jha (2009) , Traditional knowledge system in india, 1st Edition, Delhi University (North Campus)
2. Dr.A.K.Ghosh (2011), Traditional Knowledge of Household Products

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Subject Code: **BCS18ET1**	Subject Name : **JAVA PROGRAMMING**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BCS18002	ETL	1	0/1	3/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To design, create, build, and debug Java applications and applets.
- To write Java programs using object-oriented programming techniques including classes,objects, methods, instance variables, composition, inheritance, and polymorphism
- To write programs using graphical user interface (GUI) components and Java's Event Handling Model

COURSE OUTCOMES (COs) : (3- 5)

CO1	To design, create, build, and debug Java applications and applets.
CO2	To write Java programs using object-oriented programming techniques including classes,objects, methods, instance variables, composition, inheritance, and polymorphism.
CO3	To write programs using graphical user interface (GUI) components and Java's Event Handling Model.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	L	L	H	M	H	H	H	H
CO2	H	H	H	H	L	L	H	M	H	H	H	H
CO3	H	H	H	H	H	H	H	M	H	H	L	H

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		H		L		H		M		H	
CO2	H		H		L		H		M		H	
CO3	H		H		L		H		M		H	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18ET1	JAVA PROGRAMMING	ETL	1	0/1	3/0	3

OBJECTIVES :
- To design, create, build, and debug Java applications and applets.
- To write Java programs using object-oriented programming techniques including classes,objects, methods, instance variables, composition, inheritance, and polymorphism
- To write programs using graphical user interface (GUI) components and Java's Event Handling Model

UNIT I   OVERVIEW OF JAVA LANGUAGE   9 Hrs
Introduction to Java,Features of Java,Comparison with C and C++, Java and World Wide Web, Java Environment, Java Development kit (JDK),Java Runtime Environment(JRE), Application Programming Interface (API), Java Virtual Machine (JVM),Primitive Datatypes, Declarations, Ranges,Variable Names Conventions,Numeric Literals, Character Literals,String Literals,Arrays(One dimensional, two-dimensional), Enumerated Data Types

UNIT II   CLASSES, OBJECTS AND METHODS   9 Hrs
Classes and Objects,Defining a class;Defining instance variables and methods,Creating objects out of a class,Method calls via object references,Abstraction,Packages,Interfaces and Abstract classes,Abstract and non-abstract methods,Inheritance,extends and implements keywords in Java,Super class and Sub class,this keyword, super keyword in Java for inheritance,Concrete classes in Java,Polymorphism,Compile time polymorphism - Overloading of methods,Run time polymorphism - Overriding of methods,Method Overriding rules and method overloading rules,Encapsulation.

UNIT III   EXCEPTION AND MULTITHREADED PROGRAMMING   9 Hrs
Exception handling, Need for exceptions, API heirarchy for Exceptions, Types of Exceptions, Keywords in Exception API: try, catch, finally, throw, throws, -Introduction to Threads – Creating Threads, Extending the Thread Class, Implementing the runnable interface, life cycle of a thread, priority of a thread, Multithreading ,Synchronization, Dead Lock.

UNIT IV   STREAMS AND OBJECT SERIALIZATION   9 Hrs
Overview of Streams,Bytes vs. Characters,Overview of the entire Java IO API,Reading a file; writing to a file usinf various APIs,Reading User input from console, PrintWriter Class, Object Serialization, Serializable Interface, Serialization API, ObjectInputStream and ObjectOutput, Transient Fields, readObject and writeObject.

UNIT V   GRAPHICS PROGRAMMING   9 Hrs
Introduction, Abstract Window Toolkit (AWT),Applets-Life Cycle- Basics of event handling – event handlers – adapter classes – actions – mouse events –AWT event hierarchy – introduction to Swing – buttons–Layout Management–Swing Components.

Total Hours: 45

TEXT BOOKS:
1. Herbert Schildt, "The Complete Reference JAVA 2", Tata McGraw Hill publications, 7th Ed., 2007.
2. Balagurusamy, "Programming with JAVA A primer 3rd Edition", Tata McGraw-Hill, 2007

REFERENCE BOOKS:
1. Y.Daniel Liang, "An Introduction to JAVA Programming", Pearson, 2015
2. Kathy Sierra, Bert Bates," Head First Java", Oreilly Publication, 2nd Edition, 2005

Subject Code:	Subject Name :	Ty/Lb/ETL	L	T/S.Lr	P/R	C
BCS18L03	**DATABASE MANAGEMENT SYSTEMS LAB**					
	Prerequisite: BCS18L01	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To create a database and query it using SQL, design forms and generate reports.
- Understand the significance of integrity constraints, referential integrity constraints, triggers, assertions.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand, analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.
CO2	Design different views of tables for different users and to apply embedded and nested queries.
CO3	Design and implement a database for a given problem according to well known design principles that balance data retrieval performance with data consistency.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	M	M	M	M	L	H	M	H	M
CO2	M	M	M	H	M	H	M	H	M	M	M	H
CO3	M	L	H	M	M	L	M	M	M	H	L	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	M	H	M	M	M
CO2	M	H	M	M	L	H
CO3	H	M	H	M	M	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L03	DATABASE MANAGEMENT SYSTEMS LAB	Lb	0	0/0	3/0	1

OBJECTIVES:
- To create a database and query it using SQL, design forms and generate reports.
- Understand the significance of integrity constraints, referential integrity constraints, triggers, assertions..

I. Program to learn DDL and DML commands
1. Execution of data description language commands
2. Execution of data manipulation language commands
3. Execution of data control language commands
4. Execution of transaction control language commands
5. Insert command
6. Select, from and where clause
7. Set operation [union, intersection, except]
8. String operations
9. Nested queries
10. Join operation
11. Modification of the database

II. PL / SQL programs
1. Control statements (for loop)
2. Control statements (while loop)
3. Control statements (for reverse loop)
4. Control statements (loop end loop)
5. Sum of even numbers
6. Sum of odd numbers
7. Series generation
8. Implementation of sub-program
9. Implementation of cursor using pl/sql
10. Control statement (if-else end if)

Subject Code: BIT18L02	Subject Name : **SYSTEM SOFTWARE & OPERATING SYSTEM LAB**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Basic Unix Commands.
- Programs on process creation and Synchronization, and Scheduling.
- Inter process communication including shared memory, pipes and messages

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understanding of Symbol table, Assembler, Loader and Linker
CO2	Demonstrate understanding of how to starting a new process, waiting for a Process, Scheduling algorithms, System calls.
C03	Demonstrate understanding of how to send signals
C04	Demonstrate understanding of how to synchronize processes
C05	Demonstrate understanding of Inter-process communication and page Replacement algorithms.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	M	L	M	M	H	M	L	L	L
CO2	M	M	M	H	L	L	L	M	M	M	M	M
C03	H	H	M	M	L	L	M	M	M	M	M	M
C04	M	M	M	H	H	L	L	L	L	M	L	L
C05	H	M	M	L	L	L	M	M	L	H	M	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	L	H	M
CO2	M	M	H	L	M	M
C03	H	H	M	M	M	M
C04	M	M	H	H	L	M
C05	H	M	M	L	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18L02	**SYSTEM SOFTWARE AND OPERATING SYSTEM LAB**	Lb	0	0/0	3/0	1

OBJECTIVES:

- Basic Unix Commands.
- Programs on process creation and Synchronization, and Scheduling.
- Inter process communication including shared memory, pipes and messages

SYSTEM SOFTWARE

1) Implementation of a Symbol Table
2) Implement Pass 1 of Two pass Assembler
3) Implement Pass 2 of Two pass Assembler
4) Implementation of Absolute Loader
5) Implementation of Relocation Loader

OPERATING SYSTEMS

1) Basic Unix commands
2) Shell Programming
3) System Calls using Fork, Exec
4) Inter Process Communication (IPC).
5) Implementation of Scheduling Algorithms
6) Dining Philosophers Problem
7) Bankers Algorithm
8) Implementation of File Allocation Strategies
9) Simulate Page Replacement Algorithms

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Subject Code: BEC18IL2	Subject Name : MICROPROCESSORS AND MICROCONTROLLERS LAB	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BEC18IL1	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To learn the assembly language programming of 8086.
- To learn the assembly language programming of 8051.
- To understand the interfacing concepts of the peripheral devices with processors

COURSE OUTCOMES (COs) : (3- 5)

CO1	Ability to understand the Programming of 8086 microprocessor
CO2	Ability to understand the Programming of 8051 microcontroller
CO3	Understand the applications of microprocessors & microcontrollers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	L	M	L	L	L	L	L	L	M
CO2	H	M	L	L	M	L	L	L	L	L	L	M
CO3	H	M	L	L	M	L	L	L	L	L	L	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	L	L	M
CO2	H	M	L	L	L	M
CO3	H	M	L	L	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BEC18IL2	**MICROPROCESSORS AND MICROCONTROLLERS LAB**	Lb	0	0/0	3/0	1

OBJECTIVES:
- To learn the assembly language programming of 8086.
- To learn the assembly language programming of 8051.
- To understand the interfacing concepts of the peripheral devices with processors

8086 Microprocessor:
1. Arithmetic operations
2. Block Movement of Data
3. Square and square root
4. Searching and sorting

8051 Microcontroller:
1. Arithmetic operations
2. Block Movement of Data
3. Square and square root
4. Searching and sorting

Interfacing:
1. Traffic light Controller
2. Stepper Motor Controller
3. Waveform Generation
4. Matrix Display

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18TS1	**TECHNICAL SKILL I (EVALUATION)**	Lb	0	0/0	3/0	1

OBJECTIVES:
- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology.

From the list of skill development courses declared by the department, the students are expected to acquire the skill and get certified. This will be evaluated at the end of the semester by the faculty.

Subject Code: **BEN18SK1**	Subject Name : **SOFT SKILL I**		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL		ETL	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To create awareness in students, various top companies helping them improve their skill set matrix, leading to develop a positive frame of mind.
- To help students be aware of various techniques of candidate recruitment and help them prepare CV's and resume.
- To help student how to face various types of interview, preparing for HR, technical interviews.
- To help students improve their verbal reading, narration and presentation skills by performs various mock sessions.

COURSE OUTCOMES (COs) : (3- 5)
Students will be able to

CO1	Be aware of various top companies leading to improvement in skills amongst them.
CO2	Be aware of various candidate recruitment techniques like group discussion, interviews and be able to prepare CV's and resumes.
CO3	Prepare for different types of interviews and be prepared for HR and technical interviews.
CO4	Improve their verbal, written and other skills by performing mock sessions.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	L	L	M	M	H	M	H	M	H
CO2	L	L	L	L	L	M	M	H	M	H	M	H
CO3	L	L	L	L	L	M	M	H	M	H	M	H
CO4	L	L	L	L	L	M	M	H	M	H	M	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	L	L	H
CO2	L	L	H
CO3	L	L	H
CO4	L	L	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
			✓						✓			

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2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BEN18SK1	SOFT SKILL I	ETL	0	0/0	3/0	1

OBJECTIVES:
- To create awareness in students, various top companies helping them improve their skill set matrix, leading to develop a positive frame of mind.
- To help students be aware of various techniques of candidate recruitment and help them prepare CV's and resume.
- To help student how to face various types of interview, preparing for HR, technical interviews.
- To help students improve their verbal reading, narration and presentation skills by performs various mock sessions.

UNIT I   **6 Hrs**

Creation of awareness of top companies / improving skill set matrix / Development of positive frame of mind / Creation of self-awareness.

UNIT II   **6 Hrs**

Group discussions / Do's and don'ts – handling group discussions / what evaluators look for interpersonal relationships / Preparation of Curriculum Vitae / Resume.

UNIT III   **6 Hrs**

Interview – awareness of facing questions – Do's and don'ts of personal interview / group interview, enabling students to prepare for different proce3dures such as HR interviews and Technical Interviews / self-introductions.

UNIT IV   **6 Hrs**

Verbal aptitude, Reading comprehension / narration / presentation / Mock Interviews.

UNIT V   **6 Hrs**

Practical session on Group Discussion and written tests on vocabulary and reading comprehension

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Hours: 30

Subject Code: **BCS18009**	Subject Name : **OBJECT ORIENTED SOFTWARE ENGINEERING**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18002	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Understand the phases in a software development
- Understand fundamental concepts of requirements engineering and Analysis Modelling.
- Understand the different approach for Object Oriented Design
- Learn various testing and maintenance measures

COURSE OUTCOMES (COs) : (3- 5)

CO1	Identify the key activities in managing a software Development.
CO2	Compare different process models.
CO3	Concepts of requirements engineering and Analysis Modeling.
CO4	Apply systematic procedure for software design and deployment.
CO5	Compare and contrast the various testing and maintenance

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H	M	L	L	H	H	H	M	H
CO2	H	H	H	H	H	M	M	H	H	M	L	M
CO3	H	H	H	M	M	M	M	M	H	M	L	M
CO4	H	H	H	H	H	M	M	H	H	H	M	H
CO5	H	H	H	H	H	M	M	H	H	H	M	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	M	M	M	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	M	H	M	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18009	**OBJECT ORIENTED SOFTWARE ENGINEERING**	Ty	3	1/0	0/0	4

OBJECTIVES:
- Understand the phases in a software development
- Understand fundamental concepts of requirements engineering and Analysis Modelling.
- Understand the different approach for Object Oriented Design
- Learn various testing and maintenance measures

UNIT I   SOFTWARE DEVELOPMENT LIFE CYCLE   12 Hrs

Introduction -Software process models: The waterfall model, Incremental development, Reuse-oriented software engineering – OOSD Life cycle: Process activities Software specification – Software design and implementation – Software validation – Software evolution- Process iteration: Prototyping, Incremental delivery, Boehm's spiral model - Agile methodology - OMT – Booch Methodology – Jacobson methodology – patterns – unified approach

UNIT II   OBJECT ORIENTED SOFTWARE REQUIREMENTS AND ANALYSIS   12 Hrs

Requirements engineering: Functional and non-functional requirements – The software requirements document – System Modeling: Context models – Interaction models - Structural models - Behavioral models - **UML**: Static and Dynamic Models–Introduction to UML -Use case Diagram – Class diagrams – Dynamic modeling-Packages and Model Organization-UML Extensibility - Use case model – Creation of Classes: Noun Phrase Approach – Identifying Object Relationships, Attributes and Methods

UNIT III   OBJECT ORIENTED SOFTWARE DESIGN   15 Hrs

Architectural design: Architectural design decisions - Architectural views - Architectural patterns - Application architectures - Design and implementation: Object-oriented design using the UML - OO Design Axioms – Corollaries-Design Patterns- Designing Classes: Class Visibility – refining Attributes – Designing Methods – Access layer: Object Store and Persistence- OODBMS – Table Class mapping – Designing Access layer classes - View layer: Designing Interface Objects

UNIT IV   TESTING   9 Hrs

Software testing: Development testing - Test-driven development - Release testing - User testing - Quality Assurance Test – Testing strategies – Impact of OO Testing – Test Cases – Test Plan – Continuous Testing - Myers's Debugging principles.

UNIT V   SOFTWARE QUALITY & MANAGEMENT   12 Hrs

Project management: Risk management- Managing people – Teamwork - Project planning: Software pricing - Plan-driven development - Project scheduling - Agile planning - Estimation techniques Quality management: Software quality - Software standards - Reviews and inspections - Software measurement and metrics - Configuration management: Change management - Version management - System building - Release management

Total Hours: 60

TEXT BOOK:
1. Yogesh Singh, Ruchika Malhotra (2012), *Object – Oriented Software Engineering* PHI Learning Private Limited.

REFERENCE BOOKS:
1. *Ian Sommerville (2008) Software Engineering (9thed.) Pearson Education Asia*
2. *Ali Bahrami (2008) Object Oriented System Development McGraw Hill international*
3. *Roger S. Pressman (2010) Software Engineering: A Practitioner Approach (8thed.) McGraw hill Publications*
4. *Grady Booch (2009) Object oriented Analysis & design ,Pearson Education India*

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Subject Code: **BCS18007**	Subject Name : **COMPUTER NETWORKS**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Ty	3	1/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- The students will be have knowledge of the networks functions
- To understand how communication takes place in various mediums
- To learn about the protocols for data communication in the network layers
- To study about the various network algorithms for smooth data communication

COURSE OUTCOMES (COs) : (3- 5)

CO1	Have knowledge on functions of Network Devices & OSI Layers for Communication
CO2	Knowledge on IP addresses and protocols.
CO3	Have knowledge on how to avoid the error and congestion on network using algorithms

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	H	M	L	L	H	M	H	H
CO2	H	H	H	M	H	H	M	L	H	M	H	H
CO3	H	H	H	H	H	M	M	L	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	H	H	M
CO2	H	H	L	H	H	M
CO3	H	H	L	H	H	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✔										

2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18007	COMPUTER NETWORKS	Ty	3	1/0	0/0	3

OBJECTIVES:

The students will be able to:

- The students will be have knowledge of the networks functions
- To understand how communication takes place in various mediums
- To learn about the protocols for data communication in the network layers
- To study about the various network algorithms for smooth data communication

UNIT I   INTRODUCTION   9 Hrs

Introduction to computer networks and uses - Network: devices, topology, types - Reference model - The physical layer - The theoretical basis for data communication - Transmission media: Guided and unguided- Public Switched Telephone Network.

UNIT II   DATA LINK LAYER   9 Hrs

Data link layer design issues - Error detection and correction - Sliding window protocols- HDLC –Channel access on links: SDMA – TDMA - FDMA – CDMA - ETHERNET - 802.11, 802.16 - Bridges and Switches-Bluetooth

UNIT III   NETWORK LAYER   9 Hrs

Network layer design issues - Circuit switching – Packet switching – Virtual circuit switching-Routing algorithms – Congestion control algorithms - Internetworking- Network layer in Internet -IPV6

UNIT IV   TRANSPORT LAYER   9 Hrs

Transport layer design issues - Transport protocols - Simple transport protocol - Internet transport protocols UDP, TCP - Flow Control – Congestion control - Congestion avoidance

UNIT V   APPLICATION LAYER   9 Hrs

Domain name system - Electronic mail – Introduction to World Wide Web: HTTP, SNMP, Telnet, FTP, RTP.

Total Hours: 45

TEXT BOOKS:

1. Peterson Davie (2012) Computer Networks - A System Approach (2nd ed.), Morgan Kauffman Harcourt Publishers.
2. James F. Kurose, Keith W. Ross Computer Networking: A Top-Down Approach / Edition 6, Pearson publication, 2012.

REFERENCE BOOKS:

1. *Andrew S. Tanenbaum. David J. Wetherall ,"Computer Networks "5th Edition PHI, 2011*
2. *William Stallings," Data and computer communications", PHI, 2001*
3. *Douglas E. comer," Internetworking with TCP/IP-Volume-I", PHI, 5th edition 2006*
4. *Godbole, "Data communication and networking", TMH, 2004.*
5. *Forouzan B. A., "Data Communications and networking", TMH, 2003.*

Subject Code **BCS18ET2**	Subject Name : **COMPUTER GRAPHICS**		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BES18ET2		ETL	1	0/1	3/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- Understand the output primitives, two dimensional graphics and their transformations.
- Understand the three dimensional graphics and their transformations.
- Understand illumination and color models
- Learn to create animations

COURSE OUTCOMES (COs) : (3- 5)

CO1	Transform geometrical structures, perform clipping on geometrical objects
CO2	Analyze a 3D structure
CO3	Create and evaluate graphic projects

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	M	M	M	L	M	M	L	L	L
CO2	H	M	H	L	H	M	L	M	M	L	L	L
CO3	H	M	H	M	H	M	L	M	M	L	L	L

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		H		L		L		L		L	
CO2	H		H		L		L		L		L	
CO3	H		H		L		M		L		M	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18ET2	**COMPUTER GRAPHICS**	ETL	1	0/1	3/0	3

OBJECTIVES:

- Understand the output primitives, two dimensional graphics and their transformations.
- Understand the three dimensional graphics and their transformations.
- Understand illumination and color models
- Learn to create animations

UNIT I   OUTPUT PRIMITIVES   9 Hrs

Output primitives-Line drawing algorithms-Loading the frame buffer-Line function-Circle generation algorithms –Ellipse generation algorithms- Attributes of output primitives-Numerical problem solving and programs on line, circle and ellipse drawing algorithms

UNIT II   TWO DIMENSIONAL TRANSFORMATION & VIEWING   9 Hrs

Two dimensional transformations- Matrix representations and homogeneous coordinates - Composite transformations – two dimensional viewing -Window to view port transformation - Clipping operations - Point clipping - Line clipping (Cohen - Sutherland line Clipping) - Polygon clipping(Sutherland - Hodgeman algorithm) –Numerical problem solving and programming on two dimensional transformation ,viewing and clipping

UNIT III   THREE DIMENSIONAL GRAPHICS   9 Hrs

Three dimensional concepts - Three dimensional object representation -Three Dimensional Transformations - Visible surface detection methods (Back Face Detection - Depth Buffer Method - Scan Line Method) - Numerical problem solving and programming on three dimensional transformations

UNIT IV   POLYGONRENDERING METHODS AND COLOUR MODELS   9 Hrs

Constant-Intensity Shading – Gouraud Shading- Phong Shading- chromaticity diagram - RGB colour model - YIQ colour model - CMY colour model - Colour selection

UNIT V ANIMATION GRAPHICS   9 Hrs

Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing - create Interactive animation for gamming

Total Hours: 45

TEXT BOOKS:
1. Donald, D. Hearn. Pauline, Baker, M. Warren, Carithers. (2010) *Computer graphics with Open GL*, (4[th]ed.)
2. Computer Graphics (Special Indian Edition) (Schaum's Outline Series)   2nd Edition, 2006 (English, Paperback, Xiang, Plastock, Avadhani), McGraw Hill Education (India) Private Limited

REFERENCE BOOKS:
1. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley ,"Computer Graphics: Principles and Practice", 3rd Edition, Addison-Wesley Professional,2013.
2. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.

Subject Code:	Subject Name :		Ty/	L	T/	P/R	C

BCS18L08	OBJECT ORIENTED SOFTWARE ENGINEERING LAB	Lb/ ETL		S.Lr		
	Prerequisite: BCS18L02	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Identify Use Cases and develop the Use Case model.
- Identify the business activities and develop an UML Activity diagram.
- Identity the conceptual classes and develop a domain model with UML Class diagram.
- Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
- Draw the State Chart diagram.
- Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
- Implement the Technical services layer.   * Implement the Domain objects layer.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Show the importance of systems analysis and design in solving complex problems.
CO2	Show how the object-oriented approach differs from the traditional approach to systems analysis and design.
CO3	Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation. ·
CO4	Recognize the difference between various object relationships: inheritance, association, whole-part, and dependency relationships. ·
CO5	Show the role and function of each UML model in developing object-oriented software.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	L	L	H	H	H	M	H
CO2	H	H	H	H	H	L	L	H	H	M	L	H
CO3	H	H	H	H	H	L	L	H	H	M	L	H
CO4	H	H	H	H	H	L	L	H	H	H	M	H
CO5	H	H	H	H	H	L	L	H	H	H	M	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	M	H	M	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

DEPARTMENT OF INFORMATION TECHNOLOGY

2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L08	**OBJECT ORIENTED SOFTWARE ENGINEERING LAB**	Lb	0	0/0	3/0	1

OBJECTIVES:
- Identify Use Cases and develop the Use Case model.
- Identify the business activities and develop an UML Activity diagram.
- Identity the conceptual classes and develop a domain model with UML Class diagram.
- Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
- Draw the State Chart diagram.
- Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
- Implement the Technical services layer.   * Implement the Domain objects layer.

EXERCISES

1. Study of case tools such as rational rose or equivalent tools
2. Railway reservation system
3. Student Mark Analysis system
4. Payroll processing application
5. Inventory system
6. Automating the Banking process
7. Course Registration System
8. Library management system
9. Passport Automation System

SOFTWARE REQUIRED:

Languages: C/C++/JDK 1.3, JSDK, WEB BROWSER & UML
Any Front End Tools (Like VB, VC++, Developer 2000)
Any Back End Tools (Like Oracle, MS-Access, SQL, DB2)
Modelling and Design : Rational Rose

Subject Code: BCS18L05	Subject Name : NETWORK PROGRAMMING LAB		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: **:** **BCS18ET2**		Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Hands on Experience to design an application using TCP and UDP sockets.
- Hands on Experience to design an interface to transfer a file between two ends using FTP
- Hands on Experience to develop a RMI application for specific operation
- To have a knowledge to work with Network Simulators

COURSE OUTCOMES (COs) : (3- 5)

CO1	Ability to design a Socket Programing using TCP and UDP
CO2	To design Client /Server Application Program
CO3	Ability to create a Server based application using RMI and RPC concepts.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M	L	L	H	M	H	H
CO2	H	H	H	M	H	H	L	L	H	M	H	H
CO3	H	H	H	H	M	M	M	L	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	H	H	M
CO2	H	H	L	H	H	M
CO3	H	H	L	H	H	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L05	**NETWORK PROGRAMMING LAB**	Lb	0	0/0	3/0	1

OBJECTIVES:

- Hands on Experience to design an application using TCP and UDP sockets.
- Hands on Experience to design an interface to transfer a file between two ends using FTP
- Hands on Experience to develop a RMI application for specific operation
- To have a knowledge to work with Network Simulators

1. Networking Commands with options. (Case Study).
2. Socket program to extent communication between two deferent ends using TCP.
3. Socket program to extent communication between two deferent ends using UDP
4. Create a Socket (TCP) between two computers and enable file transfer between them.
5. Implementation of RPC in server-client model
6. Implementation of ARP/RARP.
7. HTTP Socket program to download a web page.
8. File transfer in Client-Server architecture using following methods
a) Using RS232C b) Using TCP/IP
9. To implement RMI (Remote Method Invocation)
10. Write a network program to broadcast/ multicast a message to a group in the same network.
11. Demonstration of Network Simulators.

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18TS2	TECHNICAL SKILL II (EVALUATION)	Lb	0	0/0	3/0	1

OBJECTIVES:
- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology.

From the list of skill development courses declared by the department, the students are expected to acquire the skill and get certified. This will be evaluated at the end of the semester by the faculty.

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DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation
SEMESTER – VI

Subject Code: **BCS18010**	Subject Name : **DATA WAREHOUSING AND DATA MINING**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18004	Ty	3	0/0	0/3	4

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Provide an overview of the methodologies and approaches to data mining
- Gain insight into the challenges and limitations of data mining techniques and data warehousing
- Applying data mining solutions using common data mining tools

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the difference between Data Warehousing and general databases
CO2	Understand the different steps followed in Data mining and pre-processing techniques using tools
CO3	Able to apply Association Rule mining and Clustering approaches
CO4	Familiarize with multi-dimensional data cubes and related analysis

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	H	H	L	L	L	M	M	L	L	L	H	L
CO2	H	H	M	H	H	M	M	M	M	M	H	L
CO3	H	H	H	H	H	M	M	L	M	M	H	L
CO4	H	H	H	H	H	M	M	M	H	H	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PS06
CO1	H	H	L	L	H	H
CO2	H	H	L	H	H	H
CO3	H	H	L	H	H	M
CO4	H	H	M	M	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18010	**DATA WAREHOUSING AND DATA MINING**	Ty	3	0/0	0/3	4

OBJECTIVES:
- Provide an overview of the methodologies and approaches to data mining
- Gain insight into the challenges and limitations of data mining techniques and data warehousing
- Applying data mining solutions using common data mining tools

UNIT I   DATA WAREHOUSING   12 Hrs

Introduction to Data Warehousing- Advantages- What makes Data Warehousing a reality- Data warehousing Components-Building a Data Warehouse-mapping Data Warehouse to a Multiprocessor-Architecture-DBMS Schemas for Design Support

UNIT II   ETL AND BUSINESS TOOLS   12 Hrs

Data Extraction-Cleaning and Transformation tools- Meta data. Reporting and Query tools and Application-OLAP Patterns and Models- Statistics

UNIT III   DATA MINING   12 Hrs

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.- Data Cleaning –Missing Values-Noisy Data-Inconsistent Data-Data Integration and Transformation-Data Reduction -Dimensionality Reduction – Evaluation criteria of Various Mining Techniques

UNIT IV   ASSOCIATION RULE MINING AND CLASSIFICATION   12 Hrs

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Constraint Based Association Mining – Classification and Prediction - Decision Tree Induction - Entropy and Classification Algorithms -Bayesian Classification – Rule Based Classification

UNIT V   CLUSTERING TECHNIQUES   12 Hrs

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods - Kmeans – Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis –Genetic Algorithm For Mining - Data Mining Applications

Total Hours: 60

TEXT BOOKS:
1. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.

REFERENCE BOOKS:
1. *Arun K Pujari (2017) Data Mining Techniques 4th edition, Universities Press (India) Ltd.*
2. *Sam Anahory, Dennis Murry (2004) Data Warehousing in the real world, Pearson Education*
3. *Margaret H. Dunham (2006) Data Mining: Introductory and Advanced Topics, Pearson*

Subject Code: **BIT18003**	Subject Name : **WEB TECHNOLOGY AND WEB SERVICES**	Ty/ Lb/ ETL	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- The students will have knowledge about the HTML5 and CSS3
- To learn the concepts of XML and SOAP.
- To study about the JSP and understand to develop basic level application and advance application on web pages.
- To study about the concept of Web services .

COURSE OUTCOMES (COs) : (3- 5)

CO1	Able to design the web page using HTML5 and CSS3
CO2	Learn the fundamentals of XML , JSP and implement in the web service
CO3	Understand the concept of Web service including SOAP, UDDI and WSDL

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	L	H	M	L	L	H	M	H	H
CO2	H	H	H	M	H	H	M	L	H	M	H	H
CO3	H	H	H	H	H	M	M	L	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	H	H	H
CO2	H	H	L	H	H	H
CO3	H	H	L	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18003	**WEB TECHNOLOGY AND WEB SERVICES**	Ty	3	0/0	0/0	3

OBJECTIVES:
- The students will have knowledge about the HTML5 and CSS3
- To learn the concepts of XML and SOAP.
- To study about the JSP and understand to develop basic level application and advance application on web pages.
- To study about the concept of Web services .

UNIT I   HTML 5 & CSS 3   9 Hrs
HTML – forms – frames – tables – web page design – Dynamic HTML – introduction – cascading style sheets – object model and collections –event model – filters and transition – data binding – data control – ActiveX control – handling of multimedia data

Unit II   XML   9 Hrs
Role of XML - XML and The Web - XML Language Basics - Revolutions of XML - Service Oriented Architecture (SOA). XML - Name Spaces - Structuring With Schemas and DTD - Presentation Techniques - Transformation - XML Infrastructure.

Unit III   SOAP   9 Hrs
Overview of SOAP - HTTP - XML-RPC - SOAP: Protocol - Message Structure - Intermediaries - Actors - Design Patterns and Faults - SOAP With Attachments. Introduction to SGML - COM – DCOM – CORBA.

UNIT IV   SERVER SIDE PROGRAMMING   9 Hrs
Introduction to Servlets and Java Server Page (JSP), Servlets lifecycle, Servlet Classes and Sessions. JSP Application Design, JSP objects, sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP.

Unit V   WEB SERVICES   9 Hrs
Overview - Architecture - Technologies - UDDI - WSDL - ebXML - SOAP and Web Services in E-Com, Rest full in Web service.

Total Hours: 45

TEXT BOOKS:
1. Richard Clark, Oli Studholme, Christopher Murphy and Divya Manian,"Beginning HTML5 and CSS 3" @ Apress , 2012.
2. Frank. P. Coyle, "XML, Web Services and The Data Revolution", Pearson Education, 2002.
3. Phil Hanna, "JSP: The Complete Reference", McGraw-Hill, 2001

REFERENCE BOOKS:
1. *Laura Lemay, Rafe Coburn, Jennifer Kyrnin, "Mastering HTML, CSS & JavaScript Web Publishing", Pearson Education.2015*
   Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", Pearson Education, 2004.

Subject Code: **BCS18ET3**	Subject Name : **PHP / MYSQL**			Ty/ Lb/ ETL	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BCS18L03			ETL	1	0/1	3/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
- The students will learn the technology about scripting languages basics.
- To learn install PHP and work on that.
- To learn the basic and advance concepts of PHP language.
- To understand install the MySQL and work with MySQL database in admin level and client to store and retrieve the data in application with PHP.
- To learn design basic and advance applications using PHP and MySQL.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Learn the fundamentals of HTML, CSS and PHP
CO2	Learn the fundamentals database concept and MySQL
CO3	Able to develop the Application using PHP and MySQL

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	L	H	M	L	L	H	H	H	H
CO2	H	H	H	M	H	H	M	L	H	M	H	H
CO3	H	H	H	H	H	M	M	L	H	M	H	H

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		H		L		H		H		H	
CO2	H		H		L		H		H		H	
CO3	H		H		L		H		H		H	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18ET3	PHP / MYSQL	ETL	1	0/1	3/0	3

OBJECTIVES:
- The students will learn the technology about scripting languages basics.
- To learn install PHP and work on that.
- To learn the basic and advance concepts of PHP language.
- To understand install the MySQL and work with MySQL database in admin level and client to store and retrieve the data in application with PHP.
- To learn design basic and advance applications using PHP and MySQL.

UNIT I   INTRODUCTION   9 Hrs
Introduction to Web server and Web browser - Introduction to PHP - Lexical structure - Language basics - Function and String - Default parameters - Variable function, Anonymous function Printing functions - Manipulating and searching strings - Regular expressions.

UNIT II   ARRAYS   9 Hrs
Identifying elements of an array - Indexed Vs Associative arrays - Storing data in arrays - Multidimensional arrays - Extracting multiple values - Converting between arrays and variables - Traversing arrays - Sorting - Action on entire arrays - Using arrays.

UNIT III   OBJECTS AND WEB TECHNIQUES   9 Hrs
OOP – Class – Objects – Introspection – Serialization – Inheritance - Interfaces - Encapsulation
HTTP Basics – Variables – Server information – Processing Form, Setting Response headers – maintain state – SSL.

UNIT IV   DATABASES AND GRAPHICS   9 Hrs
Using PHP to access Database – Relational Databases and SQL – MySQLi Object interface – SQLite- Direct file level manipulation – mongoDB. Embedding an image in a page – Basic Graphic concepts – Creating and drawing images.

UNIT V   FILES AND DIRECTORIES   9 Hrs
Filter input – cross-site scripting – Escape output – Session fixation – file uploads – file access – PHP code – Shell commands – Core libraries – Templating systems – Handling output – Error Handling – Performance Tuning.

Total Hours: 45

TEXT BOOKS:
1. **www.spoken-tutorials.org**
2. Kevin Tatroe, Peter MacIntyre, etal " Programming PHP" O REILLY 3rd Edition – 2013
3. Luke Welling, Laura Thomson " PHP and MySQL Web Development" Person Education 5th Edition – 2016.

REFERENCE BOOKS:
1. *Robin Nixon "Learning PHP, MySQL & JavaScript" O REILLY – 5th Edition - 2015.*
2. *Elizabeth Naramore, Jason Gerner, etal "Beginning PHP5, Apache, MySQL web development" Wrox Publishing – 2005.*

Subject Code: **BCS18L11**	Subject Name : **DATA MINING LAB**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18ET3	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Identify and categories the various risks face by an organization;
- Explain the various risk control measures available
- Design a risk management program for a business organization.

COURSE OUTCOMES (COs) : (3- 5)

CO1	demonstrate knowledge of the range of financial and financial related risks facing organizations
CO2	understand the approach to risk management through risk identification, risk measurement and risk management (or mitigation)
CO3	understand operational risk and how to manage it.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	M	M	H	M	L	M	M	M	H	H
CO2	L	H	M	H	H	M	M	L	L	M	M	M
CO3	H	M	L	H	M	L	H	M	L	L	M	M

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		M		M		M		H	M	M	L
CO2	M		M		M		L		M	H	L	L
CO3	H		L		L		M		M	M	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

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2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L11	**DATA MINING LAB**	Lb	0	0/0	3/0	1

OBJECTIVES:
- Identify and categories the various risks face by an organization;
- Explain the various risk control measures available
- Design a risk management program for a business organization.

LIST OF EXPERIMENTS

1. Introduction to the Weka machine learning toolkit
2. Classification Introduction to exploratory data analysis using Rattle an open source Tool(R)
3. Introduction to regression using Rattle an open source Tool. (R)
4. Using the Weka toolkit – Part 1
5. Classification using the Weka toolkit – Part 2
6. Performing data preprocessing for data mining in Weka
7. Performing clustering in Weka
8. Association rule analysis in Weka
9. Data mining case study using the CRISP-DM standard
10. Data mining case study using the CRISP-DM standard

Subject Code: **BIT18L03**	Subject Name : **WEB TECHNOLOGY AND WEB SERVICES LAB**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite:BIT18IL01	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
- To learn about to develop an own web site.
- To have knowledge to design webpage using CSS.
- To have knowledge to design a dynamic web site using XML and XSLT.
- To learn and develop to design mail communication.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Ability to design a basic website using HTML and CSS
CO2	To design user interactive web pages using forms
CO3	To develop RMI and RPC application.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	L	H	M	L	L	H	M	H	H
CO2	H	H	H	M	H	H	M	L	H	M	H	H
CO3	H	M	H	M	H	M	M	L	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	H	H	H
CO2	H	H	L	H	H	H
CO3	H	H	L	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18L03	**WEB TECHNOLOGY AND WEB SERVICES LAB**	Lb	0	0/0	3/0	1

OBJECTIVES:
- To learn about to develop an own web site.
- To have knowledge to design webpage using CSS.
- To have knowledge to design a dynamic web site using XML and XSLT.
- To learn and develop to design mail communication.

1. Create a web page with the following using HTML
    i) To embed an image map in a web page
    ii) To fix the hot spots
    iii) Show all the related information when the hot spots are clicked.
2. Create a web page with all types of Cascading style sheets.
3. Client Side Scripts for Validating Web Form Controls using DHTML
4. Write a program in Java to create applets incorporating the following features:
    i. Create a color palette with matrix of buttons Set background and foreground of the control text area by selecting a color from color palette.
    ii. In order to select Foreground or background use check box control as radio buttons
    iii. To set background images
5. Programs using XML – Schema – XSLT/XSL
6. Create a Web form for an online library. This form must be able to accept the Membership Id of the person borrowing a book, the name and ID of the book, and the name of the book's author. On submitting the form, the user (the person borrowing the book) must be thanked and informed of the date when the book is to be returned. You can enhance the look of the page by using various ASP.NET controls.
7. Create a JSP application. Send a simple E-Mail to your friends
8. Consider a case where we have a web Service- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Data base.

Subject Code: **BEN18SK2**	Subject Name : **SOFT SKILL – II**		Ty/ Lb/ ET L	L	T/ S.L r	P/R	C
	Prerequisite: BEN18SK1		ETL	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
- To bring behavioural patterns of students.
- To train them for corporate culture.
- To create self awareness.
- To build confidence.
- To train the students for facing the interviews and develop interpersonal relationship.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Recognize and apply arithmetic knowledge in a variety of contexts.
CO2	Ability to identify and critically evaluate philosophical arguments and defend them from criticism.
CO3	Define data and interpret information from graphs.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	L	L	H	M	H	H
CO2	M	M	M	H	L	H	L	H	H	H	H	L
CO3	H	H	H	H	H	H	M	M	H	H	H	H

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1												
CO2												

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
									✓			

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BEN18SK2	**SOFT SKILL - II**	ETL	0	0/0	3/0	1

OBJECTIVES:
- To bring behavioural patterns of students.
- To train them for corporate culture.
- To create self awareness.
- To build confidence.
- To train the students for facing the interviews and develop interpersonal relationship.

UNIT I   LOGICAL REASONING I

Logical Statements – Arguments – Assumptions – Courses of Action.

UNIT II   LOGICAL REASONING II

Logical conclusions – Deriving conclusions from passages – Theme detection.

UNIT III   ARITHMETICAL REASONING I

Number system – H.C.F & L.C.M – Problem on ages – Percentage – Profit & Loss – Ratio & Proportion – Partnership.

UNIT IV   ARITHMETICAL REASONING II

Time & Work – Time & Distance – Clocks – Permutations & Combinations – Heights & Distances – Odd man out and Series.

UNIT V   DATA INTERPRETATION

Tabulation – Bar graphs – Pie graphs – Line graphs.

REFERENCE BOOK:

1. *R.S.Agarwal, A modern approach to Logical Reasoning, S.Chand & Co., (2017).*

2. *R.S.Agarwal, A modern approach to Verbal and Non verbal Reasoning, S.Chand & Co., (2017).*

3. *R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S.Chand & Co., (2017).*

4. *A.K.Gupta, Logical and Analytical Reasoning, Ramesh Publishing House, (2014).*

5. *B.S.Sijwali, Indu sijwali, A new approach to Reasoning (Verbal and Non verbal), Arihant Publishers, (2014).*

Subject Code: BIT18L04	Subject Name : MINI PROJECT / INPLANT TRAINING / INTERNSHIP	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite : NIL	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The main objective of the Inplant training is to provide a short-term work experience in an Industry/ Company/ Organization

COURSE OUTCOMES (COs) : (3- 5)

CO1	To get an insight of an industry / organization/company pertaining to the domain of study.
CO2	To acquire skills and knowledge for a smooth transition into the career.
CO3	To gain field experience and get linked with the professional network.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	L	L	L	H	H	H	H	H	H	H
CO2	H	M	H	H	M	H	H	H	H	H	H	M
CO3	H	H	H	H	M	H	H	H	H	H	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
								✓				

Subject Code	Subject Name	Ty/ Lb/	L	T/ S.Lr	P/R	C
BIT18L04	**MINI PROJECT /INPLANT TRAINING / INTERNSHIP**	Lb	0	0/0	3/0	1

OBJECTIVE :

- The main objective of the In-plant training is to provide a short-term work experience in an Industry/ Company/ Organization

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18TS3	TECHNICAL SKILL III (EVALUATION)	Lb	0	0/0	3/0	1

OBJECTIVES:

- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology.

From the list of skill development courses declared by the department, the students are expected to acquire the skill and get certified. This will be evaluated at the end of the semester by the faculty.

Subject Code: **BIT18006**	Subject Name : **CLOUD TECHNOLOGY**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS17I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To learn Cloud computing infrastructure and services.
- To acquire knowledge about cloud storage.
- To understand cloud computing security.
- To test web application in cloud platform.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the application of cloud computing
CO2	Recognize the importance cloud security.
CO3	Design the efficient flexible cloud applications

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M	H	M	M	M	H	M	H	H
CO2	H	M	H	M	H	M	M	H	M	H	M	M
CO3	H	H	M	M	H	M	M	M	H	M	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	M	M
CO2	H	M	H	M	H	H
CO3	H	M	H	M	H	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18006	**CLOUD TECHNOLOGY**	Ty	3	0/0	0/0	3

OBJECTIVES:
- To learn Cloud computing infrastructure and services.
- To acquire knowledge about cloud storage.
- To understand cloud computing security.
- To test web application in cloud platform.

UNIT I   CLOUD COMPUTING INTRODUCTION   9Hrs
Characteristics – cloud models – cloud services – cloud based services and applications – virtualization – Load balancing – deployment – replication – monitoring – MapReduce – Identity and Access management.

UNIT II   CLOUD SERVICES AND PLATFORMS   9Hrs
Compute services – storage services – database services – application services – content delivery services – analysis services – Deployment & management services – identity and Access management services – open source private cloud software – Hadoop MapReduce job execution – Hadoop schedulers – Hadoop cluster setup

UNIT III   CLOUD APPLICATION DESIGN & PYTHON   9Hrs
Design consideration for cloud applications – reference architecture for cloud applications – cloud application design methodologies - data storage approaches – Python data types & data structures – control flow – functions – modules – packages – file handling – classes.

UNIT IV   CLOUD APPLICATION DEVELOPMENT   9Hrs
Python for Amazon web services – Google cloud platform – windows Azure – packages of Internet – JSON – XML – HTTPLib and URLLib – Web application framework – Django – design approaches – image processing App – document storage app – MapReduce app.

UNIT V   ADVANCED APPICATIONS   9Hrs
Clustering Big Data – Classification of Big Data – multimedia cloud – Streaming protocols – cloud application benchmarking and tuning – workload characteristics – application performance matrix – design consideration – benchmarking tools- deployment prototyping – CSA cloud security architecture – authentication – authorization – data security – auditing.

Total Hours: 45

TEXT BOOKS:
1. Arshdeep Bahga et al, "Cloud computing a hands-on approach" Universities press - 2014
2. Anthony T.Velte et al, "Cloud Computing A Practical Approach" Tata McGraw-Hill – 2013
3. Zaigham Mahmood et al, "Cloud Computing Concept Technology Architecture" Pearson, 2014.

REFERENCE BOOKS:
1. *Barrie Sosinsky, "Cloud Computing Bible" Wiley India Publication – 2011*
2. *Rishabh Sharma "Cloud Computing Fundamentals, Industry Approach and Trends" Wiley – 2015.*
3. *David Crookes "Cloud Computing in easy steps" McGraw Hill – 2012*

Subject Code: **BCS18012**	Subject Name : **OPEN SOURCE SCRIPTING LANGUAGES**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18ET3	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- The students will have knowledge about the scripting languages
- To learn the JavaScript language and ability to write program on it.
- To learn the PERL language and ability to write program on it.
- To study about the Python language and understand to write basic level program and advance program on networking, web scripting on web pages.
- To study about RUBY language and have knowledge to write programs.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Ability to understood scripting languages concepts and technology for web site design
CO2	Students have knowledge to develop an interactive web site using scripting languages.
CO3	Have the knowledge have to design secured web pages

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	L	H	M	L	L	H	M	H	H
CO2	H	H	H	M	M	H	M	L	H	M	H	H
CO3	H	M	H	M	H	M	M	L	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	H	H	H
CO2	H	H	L	H	H	H
CO3	H	H	L	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18012	OPEN SOURCE SCRIPTING LANGUAGES	Ty	3	0/0	0/0	3

OBJECTIVES:
- The students will have knowledge about the scripting languages
- To learn the JavaScript language and ability to write program on it.
- To learn the PERL language and ability to write program on it.
- To study about the Python language and understand to write basic level program and advance program on networking, web scripting on web pages.
- To study about RUBY language and have knowledge to write programs.

UNIT I   INTRODUCTION TO SCRIPTING LANGUAGES   8 Hrs
Introduction to Scripting: Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages.

UNIT II   JAVASCRIPT   9 Hrs
JavaScript introduction – control structures – functions – arrays – document objects model – Event handling – object oriented in JavaScript - simple web applications

UNIT III   PERL   9 Hrs
PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT IV   PYTHON   10 Hrs
Python: Installing Python,Introduction to Python language, Basic syntax, interactive shell, editing, saving, and running a script. The concept of data types; variables, assignments; immutable variables-operators and expressions - Conditions and Control statements – String handling, files and directories - functions and its types.Simple Graphics and Image Processing, Python with OOP - Exception handling

UNIT V   RUBY   9 Hrs
Introduction to RUBY : Basics, Comments, Variables Strings, Operators, Conditional Statements,Arrays and Hashes, Methods Files,classes, Exception Handling Introduction to Ruby on Rail .

Total Hours: 45

TEXT BOOKS:
1. David Barron, "The World of Scripting Languages" , Wiley Publications,2002
2. Kenneth A. Lambert, Martin Osborne, "Fundamentals ofPython: First Programs", Contributing Author published by Course Technology, Cengage Learning Publications.2010.
3. Michael Fitzgerald, "Learning Ruby", O'Reilly Publications, 2007.

REFERENCE BOOKS:
1. *Richard Clark, Oli Studholme, Christopher Murphy and Divya Manian,"Beginning HTML5 and CSS 3" @ Apress.*
2. *Jennifer Campbell , Paul Gries, Jason Montojo , Greg Wilson , "Practical Programming An Introduction to Computer Science Using Python" , The Pragmatic Bookshelf Raleigh, North Carolina Dallas, Texas , 2009*
3. *Tom Christiansen, brian d foy & Larry Wall, with Jon Orwant, "Programming Perl, Fourth Edition ", O'Reilly, 2012.*

Subject Code:	Subject Name : **MANAGEMENT CONCEPTS AND ORGANIZATIONAL BEHAVIOR**		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BMG18002	Prerequisite: BES18ET3 Basic Knowledge such as Statistical Techniques and Probability Theory		Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   P : Project C: Credits

OBJECTIVES:
- This course is aimed at addressing the contemporary issues, which fall under the broad title of management, and its functions.
- There will also be an attempt to analyze the behavior of individuals within an organization and the issues of working with other group or teams.

COURSE OUTCOMES (COs) :

CO1	Effective leadership skills
CO2	Accommodating with co workers and at Work environment
CO3	Enhanced leadership skills
CO4	Understanding and implementing good policies for the welfare of management and workers

Mapping of Course Outcomes (COs) with Program Outcomes (POs) & Program Specific Outcomes (PSOs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H		M		M		L		M		L	
CO2	M	M				M		H	M	M	L	H
CO3	L		H	H	M		M	H	M	L	M	
CO4	M	L				M			M			M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Management Science		
										✓		

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BMG18002	**MANAGEMENT CONCEPTS AND ORGANIZATIONAL BEHAVIOR**	Ty	3	0/0	0/0	3

OBJECTIVES:
- This course is aimed at addressing the contemporary issues, which fall under the broad title of management, and its functions.
- There will also be an attempt to analyze the behavior of individuals within an organization and the issues of working with other group or teams.

UNIT I   INTRODUCTION TO MANAGEMENT   9 Hrs
Definition of Management – Science or Art or Profession – Manager v_s Entrepreneur vs Leader – Types of Managers – Managerial roles and skills – Evolution of Management – Scientific, Human relations and system approaches

UNIT II   PLANNING AND ORGANIZING   9 Hrs
Nature and purpose of planning – planning process – types of planning – planning premises – Nature and purpose of organizing – Formal and Informal organization – organization chart – organization structure – types - Line and staff authority

UNIT III   DIRECTING AND CONTROLLING   9 Hrs
Leadership – Types and theories of leadership – communication – process of communication – barriers in communication – System and process of controlling – Budgetary and non budgetary control techniques – Direct and preventive control – reporting

UNIT IV   INDIVIDUAL BEHAVIOR   9 Hrs
Diversity - Attitudes and Job satisfaction – Emotions and Moods – personality and values – perception – Decision making – Motivation concepts – Motivation Applications

UNIT V   GROUP BEHAVIOR   9 Hrs
Foundations of Group Behavior – Understanding Teams – power and politics – Conflict and Negotiation – Stress Management

Total Hours: 45

TEXT BOOKS:
1. Harold Koontz and Heinz Weihrich "*Essentials of Management*" Tata McGraw Hill Education 2015
2. Stephen. P. Robbins, Timothy A. Judge and Seema Sanghi "Essentials of *Organizational Behavior"* Pearson 10th Edition 2010

REFERENCE BOOKS:
1. *Tripathi PC & Reddy PN "Priciples of Management" Tata McGraw Hill 2012*
2. *Stephen P. Robbins, David A.De.Cenzo, Mary Coulter "Fundamentals of Management" Pearson Education 2016*

Subject Code: **BIT18ET1**	Subject Name : **MOBILE APPLICATION DEVELOPMENT**	Ty/ Lb/ ET L	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BCS18ET2	ETL	1	0/1	3/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits

Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Describe the limitations and challenges of working in a mobile and wireless environment
- Describe and apply the different types of application models/architectures used to develop mobile software applications.
- Describe the components and structure of a mobile development frameworks

COURSE OUTCOMES (COs) : (3- 5)

CO1	Able to understand the various Mobile Platforms and analyze its architectures
CO2	Able to design and develop various Mobile Applications for Android and Apple
CO3	Able to develop own mobile application

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	H	L	L	M	M	L	M	L	L	H	L	L
CO2	M	H	H	M	H	L	L	M	M	M	M	H
CO3	M	H	H	M	H	L	L	M	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	L	L	H	L	H	M
CO2	M	H	L	M	M	H
CO3	H	H	L	H	M	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Special Elective		
										✔		

Subject Code : BIT18ET1	Subject Name : MOBILE APPLICATION DEVELOPMENT	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
		ETL	1	0/1	3/0	3

OBJECTIVES:
- Describe the limitations and challenges of working in a mobile and wireless environment
- Describe and apply the different types of application models/architectures used to develop mobile software applications.
- Describe the components and structure of a mobile development frameworks

UNIT I   INTRODUCTION   9 Hrs
Introduction to Mobile Platforms – Exploring Android Platform – Android Studio, Java, XML – Exploring Apple IPhone Platform – XCode, Objective C, Swift – Options for development

UNIT II   USER INTERFACE (UI) DEVELOPMENT FOR MOBILE APPS   9 Hrs
UI Elements – User Interface Frameworks – Layouts – Gesture based interfaces – Applying Styles & Themes – Adding Settings

UNIT III   GOOGLE ANDRIOD PLATFORM   9 Hrs
Google Application Architecture – Basic Building Blocks - The Android Emulator – Event based programming – SQLite Database Access – ADB – Location based Services

UNIT IV   APPLE IPHONE PLATFORM   9 Hrs
UI Kit for Interfaces - Event Handling and Graphics Services – SQLite Database Access – Application Debugging – Location Handling

UNIT V   IMPLEMENTING SOFTWARE AS A SERVICE   9 Hrs
Service Oriented Computing Examples – Google Maps – Enabling Map based services in Application – Amazon Web Services – Exploring AWS S3 & AWS IoT APIs

Total No. of Hrs: 45

TEXT BOOKS:
1. Ed Burnette (2015) Hello, Android: Introducing Google's Mobile Development Platform, 4th edition, Pragmatic Bookshelf.
2. Marko Gargenta (2011) Learning Android, O'Reilly Media.

REFERENCE BOOKS:
1. *Richard Rodger (2012) Beginning Mobile application development in the cloud, Wrox Publication.*
2. *Jonathan A. Zdziarski (2008), iPhone Open Application Development, 2nd edition, O'Reilly Media Publication.*

Subject Code: **BIT18L05**	Subject Name : **CLOUD APPLICATION DEVELOPMENT LAB**	Ty/ Lb/ ET L	L	T/ S.L r	P/R	C
	Prerequisite: Nil	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To learn and implement various cloud Technology

COURSE OUTCOMES (COs) : (3- 5)

CO1	Create the application of cloud Technology
CO2	Implement security in cloud applications
CO3	Deploy and perform cloud applications

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	H	M	H	M	M	M	H	M	H	H
CO2	H	M	H	H	H	M	H	H	M	H	M	H
CO3	H	H	M	M	H	M	M	M	H	M	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	M	M
CO2	M	M	H	M	H	H
CO3	H	M	H	M	H	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

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Subject Code	Subject Name	Ty/ Lb/	L	T/ S.Lr	P/R	C
BIT18L05	**CLOUD APPLICATION DEVELOPMENT LAB**	Lb	0	0/0	3/0	1

OBJECTIVE:

- To learn and implement various cloud Technology

List of Experiments

1. Creating an application using Hadoop Map/Reduce (Ex: Word Count)
2. Creating an application on Amazon EC2
3. Creating an application on Windows Azure
4. Creating an application on Hadoop
5. Creating an application on Google App Engine
6. Creating an application on Google Apps Business solutions
7. Creating an application on control panel software manager and hypervisor
8. Creating a Warehouse Application in SalesForce.com
9. Case Study: PAAS(Facebook, Google App Engine)
10. Case Study: Amazon Web Services.

COURSE OUTCOME:

Students will be able to
- create the application of cloud Technology
- implement security in cloud applications
- Deploy and perform cloud applications.

Subject Code: **BIT18L06**	Subject Name : **SCRIPTING LANGUAGES LAB**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS17ET3	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits

Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To learn the basic of JavaScript , Perl & Python
- To develop web application using JavaScript &Perl
- To learn and get the server information and visitor page information using Perl
- To learn error and exception handling in Python
- To have knowledge get system information using Python
- To learn and develop web application using Python and MySQL

COURSE OUTCOMES (COs) : (3- 5)

CO1	Able to design web application using JavaScript , Perl & Python
CO2	Design the web sites using database and scripting languages based upon recent technology
CO3	Using Python Scripting languages they will get system details

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	L	H	M	L	L	H	M	H	H
CO2	H	H	H	M	M	H	M	L	H	M	H	H
CO3	H	M	H	M	H	M	M	L	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	H	H	H
CO2	H	H	L	H	H	H
CO3	H	H	L	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

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2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18L06	**SCRIPTING LANGUAGES LAB**	Lb	0	0/0	3/0	1

OBJECTIVES:
- To learn the basic of JavaScript , Perl & Python
- To develop web application using JavaScript &Perl
- To learn and get the server information and visitor page information using Perl
- To learn error and exception handling in Python
- To have knowledge get system information using Python
- To learn and develop web application using Python and MySQL

JavaScript

1. JavaScript program to Perform all Arithmetic Operation
2. JavaScript to search an element in an array of size "n".
3. JavaScript to compute the GCD of 2 numbers using function.
4. JavaScript to illustrate different in-built String Functions.

Perl

1. a) Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, and CGI Revision etc.
   b) Write a Perl program to accept UNIX command from a HTML form and to display the output of the command executed.
2. a) Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.
   b) Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
3. Write a Perl program to display a digital clock which displays the current time of the server.
4. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.

Python

1. Write Simple python program with function and it types
2. Write a python program to read and write operation with a file.
3. Exception handling in python
4. Write a Python script with MySQL to create a customer account balance database in a banking process.
5. Write a program that displays the following system information from /proc files. a). CPU information, b). Memory Usage Information, c). Interrupt information.
6. Write a simple image viewer application using python.

Subject Code: BIT18L07	Subject Name : PROJECT PHASE - I		Ty/Lb/ETL	L	T/S.Lr	P/R	C
	Prerequisite: NIL		Lb	0	0/0	3/3	2

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :   The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue , address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Apply the knowledge and skills acquired in the course of study addressing a specific problem or issue.
CO2	To encourage students to think critically and creatively about societal issues and develop user friendly and reachable solutions
CO3	To refine research skills and demonstrate their proficiency in communication skills.
CO4	To take on the challenges of teamwork, prepare a presentation and demonstrate the innate talents.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M	H	H	L	M	M	H	H
CO2	H	H	H	H	H	H	H	M	M	M	H	H
CO3	H	H	H	H	H	H	H	M	M	H	H	M
CO4	H	M	H	H	H	H	M	H	H	H	H	H

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1												
CO2												

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18L07	**PROJECT PHASE – I**	Lb	0	0/0	3/3	2

OBJECTIVES:

- The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue , address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

B.Tech CSE Project carries 12 credits of which , Phase I carries 2 credit. In Phase I ,Students are expected to

(i) Identify a Problem.
(ii) Have the feasibility explored.
(iii) Freeze the Requirement specification (both user and system).
(iv) Construct the architectural model (as many as required).
(v) Design the solution.
(vi) If possible publish the Feasibilty study as a survey paper

Subject Code: **BHS18FLX**	Subject Name : **FOREIGN LANGUAGE (EVALUATION)**	Ty/ Lb/ ET L	L	T/ S.L r	P/R	C
	Prerequisite: NIL	Lb	0	0/0	3/3	2

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES : To recognize the cultural values, practices, and heritage of the foreign country, communicate effectively in a foreign language and interact in a culturally appropriate manner with native speakers of that language.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Achieve functional proficiency in listening, speaking, reading, and writing.
CO2	Develop an insight into the nature of language itself, the process of language and culture acquisition.
CO3	Decode, analyze, and interpret authentic texts of different genres.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	L	L	H	L	H	M	H	H	L
CO2	M	L	L	L	L	H	L	H	H	H	H	L
CO3	L	L	M	M	L	H	M	H	M	H	H	L

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1												
CO2												

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
			✓									

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SEMESTER – VIII

Subject Code: **BIT18005**	Subject Name : **WIRELESS COMMUNICATION**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BEC17I01	Ty	3	0/0	0/3	4

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To learn Wireless transmission
- To acquire knowledge about mobile network layer
- To test and exploit support of mobility
- To perform wireless telephony applications

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the application of mobile communication
CO2	RecognizetheTelecommunication and satellite systems
CO3	Design the Wireless LAN and Mobile network layer

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	H	H	M	M	M	H	M	H	H
CO2	H	H	M	H	M	M	M	H	H	H	M	H
CO3	H	H	M	H	H	M	H	M	H	M	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	M	M
CO2	M	M	H	M	H	H
CO3	H	H	H	H	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18005	WIRELESS COMMUNICATION	Ty	3	0/0	0/3	4

OBJECTIVES:
- To learn Wireless transmission
- To acquire knowledge about mobile network layer
- To test and exploit support of mobility
- To perform wireless telephony applications

UNIT I   INTRODUCTION & WIRELESS TRANSMISSION   12Hrs
Introduction – Applications – vehicles – emergencies – replacement of wired networks – history of wireless communications – market for mobile communication – simplified reference model – wireless transmission – frequencies for radio transmission – signals – antennas – signal propagation – multiplexing – modulation – spread spectrum – cellular system.

UNIT II   MAC AND TELECOMMUNICATION SYSTEM   12Hrs
Motivation of specialized MAC – SDMA – FDMA – TDMA – Classical Aloha – PRMA packet reservation multiple access – polling – CDMA – comparison – Telecommunication – GSM – Mobile services – protocols - DECT – TETRA – UMTS and IMT2000 – UMTS system architecture – UMTS radio interface – UTRAN – core network – handover.

UNIT III   SATELLITE SYSTEM AND BROADCAST SYSTEMS   12Hrs
Satellite system history – application – basics – GEO – LEO – MEO – Routing - localization - handover – broadcast systems – cyclical repetition of data – digital audio broadcasting – digital video broadcasting – convergence of broadcasting and mobile communications.

UNIT IV   WIRELESS LAN AND MOBILE NETWORK LAYER   12Hrs
Intra red Vs radio transmission – Infrastructure and ad-hoc network – IEEE 802.11 – HIPERLAN – Bluetooth – radio layer – Ling manager protocol - L2CAP – security – SDP – profiles - IEEE 802.15 – mobile IP – IP packet delivery – Agent discovery – registration – tunnelling and encapsulation – optimization – IPv6 – DHCP – mobile ad-hoc networks – ad-hoc routing protocols.

UNIT V   MOBILE TRANSPORT LAYER AND SUPPORT FOR MOBILITY   12Hrs
Traditional TCP – congestion control – classical TCP improvements – TCP over 2.5/3G wireless networks – performance enhancing proxies – Support for mobility – file systems – world wide web – wireless application protocols – WML Script – Hnode – SyncML – architecture of future networks.

Total Hours: 60

TEXT BOOKS:
1. Jochen Schiller Mobile communcications" 2nd Edition – Pearson - 2011
2. Rappaport " Wireless communications principle and practice" 2nd Edition - 2010

REFERENCE BOOKS:
1. *Rajkamal "Mobile computing" – Oxford – 2011*
2. *Prasant kumar pattnaik " Fundamentals of Mobile computing" 2nd Edition – PHI – 2015*

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Subject Code: **BIT18L08**	Subject Name : **PROJECT PHASE - II**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BIT17L10	Lb	0	0/0	12/12	8

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :   The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue , address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Apply the knowledge and skills acquired in the course of study addressing a specific problem or issue.
CO2	To encourage students to think critically and creatively about societal issues and develop user friendly and reachable solutions
CO3	To refine research skills and demonstrate their proficiency in communication skills.
CO4	To take on the challenges of teamwork, prepare a presentation and demonstrate the innate talents.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	CO1	H	CO1	H	CO1	H	CO1	H	CO1	H	CO1
CO2	H	CO2	H	CO2	H	CO2	H	CO2	H	CO2	H	CO2
CO3	H	CO3	H	CO3	H	CO3	H	CO3	H	CO3	H	CO3
CO4	H	CO4	H	CO4	H	CO4	H	CO4	H	CO4	H	CO4

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5
CO1									
CO2									

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					

B.Tech – Information Technology (Full Time) – 2018 Regulation After CDC of Universal Human Values

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Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18L08	PROJECT (PHASE – II)	Lb	0	0/0	12/12	8

OBJCETIVES:

The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue , address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

Students are expected to carry out the following :
- (i) Implement the Design using suitable technologies.
- (ii) Generate the test cases.
- (iii) Demonstrate the solution with suitable user interface.
- (iv) Prepare a project report consolidating the phase-I and II activities.

Subject Code: **BCS18E01**	Subject Name : **IMAGE PROCESSING**	Ty/ Lb/ ET L	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18ET1	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To Lean the image fundamentals and mathematical transforms necessary for image processing.
- To Learn the image enhancement techniques
- To Learn image restoration procedures.
- To Learn the image compression procedures.
- To Learn the image segmentation and representation techniques.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Discuss digital image fundamentals
CO2	Apply image enhancement and restoration techniques
CO3	Use image compression and segmentation techniques
CO4	Represent features of images

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12
CO1	H	L	M	M	M	L	M	L	M	M	M	L
CO2	H	H	H	H	H	L	M	L	M	M	H	M
CO3	H	H	H	H	H	M	M	L	H	M	H	M
CO4	M	M	M	L	M	M	M	M	L	M	M	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	M	M	M	M
CO2	H	H	L	H	H	H
CO3	M	H	M	H	H	H
CO4	M	H	L	M	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E01	**IMAGE PROCESSING**	Ty	3	0/0	0/0	3

OBJECTIVES:
- To Lean the image fundamentals and mathematical transforms necessary for image processing.
- To Learn the image enhancement techniques
- To Learn image restoration procedures.
- To Learn the image compression procedures.
- To Learn the image segmentation and representation techniques

UNIT I   INTRODUCTION   9 Hrs
Digital image representation-Fundamental steps in image processing -Elements of digital image processing systems, Digital Image Fundamentals - :Elements of visual perception-A simple image model -Sampling and quantalization -Some basic relationship between pixels-Imaging geometry -Photographic film.

UNIT II   IMAGE TRANSFORMS   9 Hrs
Introduction to the Fourier transform -The Discrete Fourier transform -Some properties of the
two dimenstional Fourier transform -The fast Fourier transform-Other seperable image transforms-The hotelling transform.

UNIT III   IMAGE ENHANCEMENT   9 Hrs
Background -Enhancement by point Processing -Spatial filtering-Enhancement in the frequency domains - Generations of the spatial masks from frequency Domain specifications- Color image processing -Image Restoration: Degradation Model -diagonalization of Circulant and Block circulant Matrices -Algebraic approach to restoration-Inverse filtering -Least mean square filter -constrained least square restoration-Restoration in spatial domain-Geometric transformation.

UNIT IV   IMAGE COMPRESSION   9 Hrs
Fundamentals -image Compression models -Elements of information Theory - Error-free Compression - Lossy Compression - Image Compression standards, Images Segmentation : Edge linking and boundary detection - Thresholding - Region - Oriented segmentation – The use of motion in segmentation.

UNIT V   REPRESENTATION AND DESCRIPTION   9 Hrs
Representation Schemes - Boundary descriptors - Morphology - Relational descriptors, Recognition and Interpretation: Elements of image Analylsis - Pattern and pattern classes - Decision theoretic methods - Structural Methods - Interpretation.

Total Hours: 45

TEXT BOOKS:
1. RAFAEL C.GONZALEZ and RICHARD E.WOODS. Digital Image Processing - 2009,Prentice Hall.
2. Jayaraman, S. Esakkirajan and T. Veerakumar, Digital Image Processing – Tata McGraw Hill, 2009

REFERENCE BOOKS :
1. *M.A.SID AHMAED, Image Processing Theory, Algorithm and Architecture – McGraw Hill, 1995*
2. *DON PEARSON, Image Processing, McGraw Hill, 1991.*

Subject Code: **BCS18E02**	Subject Name : **GEOGRAPHICAL INFORMATION SYSTEMS**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- The students will be able to design, explore, interpolate and analyze GIS models
- To create a new geo coding technique and apply the learnt GIS modeling for a real time case study.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To design, explore, interpolate and analyze GIS models
CO2	Create a new geo coding technique
CO3	Apply the learnt GIS modeling for a real time case study

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M	H	M	M	M	H	H	H
CO2	H	H	H	M	M	H	M	M	L	M	M	L
CO3	H	H	M	M	M	H	H	H	H	H	M	M

Mapping of Course Outcomes with Program Specific Outcomes (PSOs)

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	M	H	H
CO2	H	H	L	M	H	H
CO3	H	M	M	M	H	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E02	GEOGRAPHICAL INFORMATION SYSTEMS	Ty	3	0/0	0/0	3

OBJECTIVES:

- The students will be able to design, explore, interpolate and analyze GIS models
- To create a new geo coding technique and apply the learnt GIS modeling for a real time case study

UNIT I   BASIC CONCEPTS   **9 Hrs**
Introduction - Coordinate Systems - Vector Data Model - Raster Data Model.

UNIT II   DATA ACQUISTION & MANIPULATION   **9 Hrs**
GIS Data Acquisition - Geometric Transformation - Spatial Data Editing - Attribute Data Input and Management - Data Display and Cartography.

UNIT III   DATA ANALYSIS   **9 Hrs**
Data Exploration - Vector Data Analysis - Raster Data Analysis - Terrain Mapping and Analysis - Viewsheds and Watersheds.

UNIT IV   INTERPOLATION & APPLICATIONS   **9 Hrs**
Spatial Interpolation - Geocoding and Dynamic Segmentation - Path Analysis and Network Applications.

UNIT V   MODELLING   **9 Hrs**
GIS Model and Modelling.

                                                                              Total Hours: 45

TEXT BOOK:
1.   Kang-tsung Chang (2015), *Introduction to Geographic Information Systems*,
(8th ed.), Mcgrawhill ISBN 0078095131, 9780078095139

REFERENCE BOOKS:
1. *Prithvish Nag And Smita Sengupta, Introduction To Geographical Information Systems, Concept Publishing Company, 2007, ISBN 8180694399, 9788180694394*
2. *Paul Longley, Geographical information systems, 2/e, Wiley, 1999,Digitised 2007, ISBN - 0471321826, 9780471321828*

Subject Code: BCS18E03	Subject Name : **DATABASE TUNING**	Ty/Lb/ETL	L	T/S.Lr	P/R	C
	Prerequisite: BCS18004	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- The students will be able to tune the databases for different data base applications
- To develop case studies in data bases, and able to troubleshoot the data bases
- Identify the critical performance tuning steps

COURSE OUTCOMES (COs) : (3- 5)

CO1	Able to Tune the databases for different Data base Applications
CO2	Able to Develop Case Studies in data bases.
CO3	Able to Troubleshoot the data bases

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H	M	H	H	M	H	H	H	M
CO2	H	H	H	H	L	H	M	H	M	H	H	M
CO3	M	H	H	M	H	M	H	H	M	H	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	H	H	M	H
CO2	H	H	H	M	H	M
CO3	H	H	M	H	M	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E03	**DATABASE TUNING**	Ty	3	0/0	0/0	3

OBJECTIVES:
- The students will be able to tune the databases for different data base applications
- To develop case studies in data bases, and able to troubleshoot the data bases
- Identify the critical performance tuning steps

UNIT I   Fundamentals of Tuning   9 Hrs

Review of Relational Databases – Relational Algebra - Locking and Concurrency Control – Correctness Consideration – Lock Tuning – Logging and the Recovery Subsystem – Principles of Recovery – Tuning the Recovery Subsystem – Operating Systems Considerations – Hardware Tuning

UNIT II   Indexing and Hashing   9 Hrs

Types of Queries – Data Structures – B tree – B+ Tree - Hash Structures – Bit Map Indexes – Clustering Indexes – Non Clustering Indexes – Composite Indexes – Hot Tables – Comparison of Indexing and Hashing Techniques

UNIT III   Query Optimization   9 Hrs

Techniques - Tuning Relational Systems – Normalization – Tuning De-normalization – Clustering Two Tables – Aggregate Maintenance – Record Layout – Query Tuning – Triggers – Client Server Mechanisms – Objects, Application Tools and Performance – Tuning the Application Interface – Bulk Loading Data – Accessing Multiple Databases

UNIT IV   Troubleshooting   9 Hrs

Query Plan Explainers – Performance Monitors – Event Monitors – Finding ―Suspicious‖ Queries – Analyzing a Query‗s Access Plan – Profiling a Query Execution – DBMS Subsystems

UNIT V   Case Studies   9 Hrs

Transaction Chopping – Time Series Databases – Understanding Access Plans – Configuration Parameters: ORACLE; SQL SERVER; DB2UDB – DISTRIBUTED DATABASE – IMPLEMENTATION.

TOTAL HOURS: 45

TEXT BOOKS:
1. Dennis Shasha and Philippe Bonnet (2005) Database Tuning, Principles, Experiments, and Troubleshooting Techniques, Elsevier
2. Thomas Connoly and Carlolyn Begg (2009) Database Systems, A Practical Approach to Design, Implementation and Management, (4th ed.) Pearson Education

Subject Code: **BCS18E04**	Subject Name : **COMPONENT BASED TECHNOLOGY**	Ty/ Lb/ ETL	L	T/ S.Lr	P/ R	C
	Prerequisite: BCS18ET2 & BCS18012	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
- Show clear understanding of theoretical concepts of component based development and be able to apply the appropriate techniques of implementation using EJB 3 technology.
- To show the ability to critically discuss the key concepts in component based development and influence of this topic to modern trends in business computing and software engineering.
- Show detailed knowledge of aspects of EJB 3 technology that allow development of applications based on components and service oriented architecture.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Mastering the principles for building software systems from components.
CO2	Familiarity with the technologies and standards for component models and service-oriented computing.
CO3	Familiarity with the Java realization of components including Java Beans, JSP, Servlets, EJB, and Java RMI and how Web services are realized in Java.
CO4	Familiarity with the CORBA realization of components (CCM).

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M	M	L	H	L	H	M
CO2	H	H	M	M	H	L	L	L	H	L	H	H
CO3	H	H	H	H	H	H	M	L	H	L	H	H
CO4	H	M	M	M	M	M	M	L	M	L	M	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	H	H	M
CO2	H	M	M	H	M	H
CO3	H	H	M	H	M	H
CO4	M	M	M	H	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E04	COMPONENT BASED TECHNOLOGY	Ty	3	0/0	0/0	3

OBJECTIVES:
- Show clear understanding of theoretical concepts of component based development and be able to apply the appropriate techniques of implementation using EJB 3 technology.
- To show the ability to critically discuss the key concepts in component based development and influence of this topic to modern trends in business computing and software engineering.
- Show detailed knowledge of aspects of EJB 3 technology that allow development of applications based on components and service oriented architecture.

UNIT I   Distributed Object Technology   9 Hrs
Introduction-Evolution of distributed systems-Evolution of distributed objects- Methods of distribution-Multi-Tier Architecture. **Component Technology:** Component Concepts-Modules- Interfaces-Callbacks – Directory services-Component Architecture-Component Based Software development.

UNIT II   Enterprise Foundations   9 Hrs
Enterprise Architecture Overview-Object Oriented Software Development for the Enterprise- Component based Software development for the Enterprise- Java Enterprise System Architecture with J2EE.**JAVA Based Component Model:** JAVA Beans-Remote Method Invocation(RMI)-RMI-IIOP. **Enterprise Java Beans:** Introduction-EJP Architecture-Types of Enterprise Beans-Life Cycle of Beans-Steps in developing an EJP.

UNIT III   Architecture of Corba   9 Hrs
The History of CORBA- CORBA Architecture-ORB-Portable Object Adapter-Internet inter-ORB Protocol(IIOP)- Dynamic CORBA-OMG IDL-CORBA   Services-CORBA Object Location Service-CORBA Activation Framework-CORBA Messaging Services-CORBA Event Service-CORBA Security Service-CORBA Object Transaction Service. CORBA Component Model-Model Driven Architecture.

UNIT IV   Microsoft Component Technologies   9 Hrs
Evolution of Microsoft Component Technologies-OLE-Active X Controls-DLL Surrogates and Executables-Components with ATL-DCOM Architecture-Interface-COM IDL. **Service Oriented Architecture:** Introduction to Web Services-Introduction to Service oriented architecture-Business Value of SOA-Architectural Elements of SOA- Web Services and Service Oriented Architecture.

UNIT V   Application   9 Hrs
Client Server using –RMI-RMI/IIOP- CORBA-Enterprise Beans. Componentized Application Development using EJP.

Total Hours: 45

TEXT BOOKS:
   1. G. Sudha Sadasivam(2008)- Component Based Technology,Wiley India Pvt.Ltd.

REFERENCE BOOKS:
   1. *Robert Orfali, Dan Harkey and Jeri Edwards (2002)-The Essential Client / Server Survival Guide, Galgotia*
   2. *Publications Pvt. Ltd.*
   3. *Tom Valesky (2002) - Enterprise Java Beans, Pearson Education.*
   4. *Jason Pritchard (2000) ―COM and CORBA Side by Side, Addison Wesley.*
   5. *Joel Murach,Anne Boehm (2012)- C#, Murach.*

Subject Code:	Subject Name :		Ty/	L	T/	P/R	C

B.Tech – Information Technology (Full Time) – 2018 Regulation After CDC of Universal Human Values

BCS18E05		E-COMMERCE		Lb/ ETL		S.Lr			
	Prerequisite: BIT18I02			Ty	3	0/0		0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Understand the nature of e-Commerce
- Recognize the business impact and potential of e-Commerce
- Explain the technologies required to make e-Commerce viable
- Discuss the current drivers and inhibitors facing the business world in adopting and using eCommerce;
- Explain the economic consequences of e-Commerce;
- Discuss the trends in e-Commerce and the use of the Internet.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Analyze the impact of E-commerce on business models and strategy
CO2	Describe the infrastructure for E-commerce
CO3	Assess electronic payment systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	H	H	H	H	H	H	H	M	M	M
CO2	H	H	H	H	H	H	H	H	H	M	M	M
CO3	H	H	H	H	H	H	H	H	H	H	M	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E05	E-COMMERCE	Ty	3	0/0	0/0	3

OBJECTIVES:
- Understand the nature of e-Commerce
- Recognize the business impact and potential of e-Commerce
- Explain the technologies required to make e-Commerce viable
- Discuss the current drivers and inhibitors facing the business world in adopting and using eCommerce;
- Explain the economic consequences of e-Commerce;
- Discuss the trends in e-Commerce and the use of the Internet.

UNIT I   Introduction   9 Hrs
History of E-Commerce -E-Commerce Vs E-Business-Emergence of the Internet- Advantages-Disadvantages-Business model- E –Business Models based on the relationship of Transaction Parties- E –Business Models based on the relationship of Transaction Types- Technologies of World Wide Web-Internet Client Server Applications-Networks and Internets-Software Agents-Internet Standards and Specification-Internet Service Provider-Markup Language and the web-JavaScript-XML-Intranets and Extranets.

UNIT II   E-Marketing   9 Hrs
Identifying Web Presence Goals- The Browsing Behaviour Model-Online Marketing-E-Advertising-Internet Marketing Trends-Targets Markets-E-Branding-Marketing Strategies E-Security: Security on the Internet-E-Business Risk Management Issues-E-Payment Systems: Digital Token based e-payment System-Classification of New Payment System- Electronic Cash-Risk and E-Payment System-Designing E-paymentSystem- Digital Signature.

UNIT III   E-Customer Relationship Management   9 Hrs
CRM-ECRM Solutions- ECRM Toolkit-Typical Business Touch point. E-Supply Chain Management-Supply Chain Management- Supply chain Management for Various Industries- E- Strategy and Knowledge management.

UNIT IV   Mobile Commerce   9 Hrs
Information System for Mobile Commerce-Mobile Payments-Cellular Networks-Different Generations in wireless Communication- Technologies for mobile Commerce-WAP Programming Model. Portals for E-Business: Portals-Requirements of Intelligent Websites.

UNIT V   Applications   9 Hrs
Plan your Business and create a web Site with wordpress.

Total Hours: 45

TEXT BOOK:
1. P.T. Joseph, S.J. (2015),E-Commerce Indian Perspective Fifth Edition, PHI Learning

REFERENCE BOOKS:
1. *Zheng Qin(2009), Introduction to E-Commerce,Springer.*
2. *Mamta Bhusry,E-Commerce, Laxmi Publications PVT Ltd.*

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Subject Code: **BCS18E06**	Subject Name : **ARTIFICIAL INTELLIGENCE**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- The students will be able to solve problems using AI techniques
- To develop new games using AI techniques
- To guide the process of deducing information in a computational manner

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand different types of AI agents
CO2	Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms)
CO3	Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving
CO4	Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information
CO5	Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M	H	M	M	H	H	H	H
CO2	H	H	H	H	M	H	M	M	H	H	H	H
CO3	H	H	H	H	L	H	M	M	H	M	H	H
CO4	H	H	H	H	M	H	M	M	H	H	H	H
CO5	H	H	H	H	M	H	M	M	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	M	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	M	H	H	H
CO5	H	M	H	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E06	ARTIFICIAL INTELLIGENCE	Ty	3	0/0	0/0	3

OBJECTIVES:
- The students will be able to solve problems using AI techniques
- To develop new games using AI techniques
- To guide the process of deducing information in a computational manner

UNIT I   Introduction and Problem Solving   9 Hrs

Introduction– Intelligent agent – Types of agents – Agent Structure – Problem solving agents – Problem Formulation - Uninformed search strategies – Breadth first search – Uniform cost search – Depth first search –Depth limited search – Bidirectional search – Searching with partial Information

UNIT II   Informed Search Methods and Game Playing   9 Hrs

Informed search Strategies – A* Heuristic function – Hill Climbing search – Constraint Satisfaction problem - Optimal decisions in games – Pruning –Alpha-Beta pruning - State-of-the-Art Game Programs

UNIT III   Knowledge and Reasoning   9 Hrs

Knowledge based agent – The Wumpus world environment – First-order logic –Building a Knowledge base – Properties of Good and Bad Knowledge bases – The Grocery Shopping World - Inferences in FOL – Forward and backward chaining algorithm

UNIT IV   Acting Logically   9 Hrs

Planning-Simple planning agent-Planning with state space search-Partial order planning-Practical planning – Practical planners – Planning and Acting – Conditional Planning – Fully Integrated planning and execution

UNIT V   Uncertain Knowledge Reasoning and Robotics   9 Hrs

Acting under Uncertainty - Knowledge Engineering for Uncertain Reasoning - Case study: The Pathfinder system – Robotics Introduction – Goods of Robots – Parts of Robots – Navigation and Motion planning.

Total Hours: 45

TEXT BOOKS:
1. Stuart R. Peter N. (2010) Artificial Intelligence A modern Approach, Prentice Hall
2. Elaine R. Kevin K. (2008) Artificial Intelligence Tata McGraw Hill

REFERENCE BOOKS:
1. *Tim Jones M. (2008) Artificial Intelligence, A System Approach(Computer Science)*
2. *Ben Coppin (2004) Artificial intelligence illuminated, Jones and Bartlett Learning*

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Subject Code: **BCS18E07**	Subject Name : **HUMAN COMPUTER INTERACTION**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Learn the foundations of Human Computer Interaction
- Be familiar with the design technologies for individuals and persons with disabilities
- Manage HCI

COURSE OUTCOMES (COs) : (3- 5)

CO1	To learn the basic terminologies of HCI
CO2	Understand the design technologies for individuals and persons with disabilities
CO3	Understand how to manage the emerging issues in HCI

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H	M	H	H	M	H	H	H	H
CO2	H	H	H	H	H	H	M	M	H	H	H	M
CO3	H	H	H	H	M	M	H	H	H	M	H	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	M	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E07	**HUMAN COMPUTER INTERACTION**	Ty	3	0/0	0/0	3

OBJECTIVES:

- Learn the foundations of Human Computer Interaction
- Be familiar with the design technologies for individuals and persons with disabilities
- Manage HCI

UNIT I   Humans In HCI   9   Hrs

Introduction-implications for HCI-overview of HCI-Mentor models in HCI-emotions in HCI-cognitive architecture –task loading and stress in HCI-theoretical framework and mitigation strategies-motivating ,influencing and persuading users – human error identification in HCI

UNIT II   Computers In HCI   9 Hrs

Input technologies and techniques – sensor and recognition based input for interaction-visual displays-haptic interfaces-nonspeech auditory output-network based interaction-wearable computers-design of computer workstation

UNIT III   Application/Domain Specific Design   9 Hrs

HCI in health care-designing emotions for games, entertainment interfaces and interactive products-motor vehicle driver interfaces-HCI in aerospace-user centred design in games

UNIT IV   Designing For Diversity   9 Hrs

The digital divide-the role of gender in HCI-IT and older adults-HCI for kids-IT for cognitive support-physical disabilities and computing technologies – an analysis of impairments-computing technologies for deaf and hard of hearing users

UNIT V   Managing HCI and Emerging Issues   9 Hrs

Technology transfer-augmenting cognition in HCI-human values, ethics and design, cost justification-future trends in HCI

Total Hours: 45

TEXT BOOK:
1. The Human Computer Interaction Handbook –Fundamentals evolving Technologies and emerging Applications – Andrew Sears,Julie A Jacko, CRC Press ,3rd edition,2012.

REFERENCE BOOK:
1. *Alan Dix , Janet Finlay, Gregory D.Abowd, Russell Beale, " Human Computer Interaction", Third Edition, Pearson Education.*

Subject Code: **BCS18E08**	Subject Name : **WIRELESS AND MOBILE NETWORKING**	Ty/ Lb/ ETL	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- Various forms of wireless communication and the standards and architecture of wireless LAN
- Concepts of mobile communications, their architecture and procedures; and
- Mobile networking and application layer including WAP protocols

COURSE OUTCOMES (COs) : (3- 5)

CO1	Various forms of wireless communication and the standards and architecture of wireless LAN
CO2	Concepts of mobile communications, their architecture and procedures
CO3	Mobile networking and application layer including WAP protocols

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M	M	L	H	L	H	M
CO2	H	H	M	M	H	L	L	L	H	L	H	H
CO3	H	H	H	H	H	H	M	L	H	L	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	H	H	M
CO2	H	M	M	H	M	H
CO3	H	H	M	H	M	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/ S.Lr	P/R	C
BCS18E08	WIRELESS AND MOBILE NETWORKING	Ty	3	0/0	0/0	3

OBJECTIVES:

- Various forms of wireless communication and the standards and architecture of wireless LAN
- Concepts of mobile communications, their architecture and procedures; and
- Mobile networking and application layer including WAP protocols

UNIT I   Wireless Communication   9 Hrs
Cellular systems- Frequency Management and Channel Assignment- dropped call rates & their evaluation - MAC–SDMA–FDMA–TDMA – CDMA – Cellular Wireless Networks.

UNIT II   Wireless LAN   9 Hrs
IEEE 802.11 Standards – Architecture – Services – Mobile Ad hoc Networks- WiFi and WiMAX -
 Wireless Local Loop.

UNIT III   Mobile Communications   9 Hrs
GSM-architecture-Location tracking and call setup- Mobility management- GSM SMS —-Mobile Number portability -VoIP service for Mobile Networks – GPRS –Architecture and procedures.

UNIT IV   Mobile Networking   9 Hrs
Mobile IP – Dynamic Host Configuration Protocol-Mobile Ad Hoc Routing Protocols– Multicast routing-TCP over Wireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery   -   Wireless Networks.

UNIT V   Application Layer   9 Hrs
WAP Model- Mobile Location based services -WAP Gateway –WAP protocols – WAP user agent profile-caching model-wireless bearers for WAP - WML – WMLScripts – WTA - iMode- SyncML.
                                                                    Total Hours: 45

TEXT BOOK:
1. Goldsmith, Andrea (2005). *Wireless Communications*. Cambridge University Press. ISBN 0-521-83716-2.

REFERENCES BOOKS:
1. Lenzini, L.; Luise, M.; Reggiannini, R. (June 2001). "CRDA: A Collision Resolution and Dynamic Allocation MAC Protocol to Integrate Date and Voice in Wireless Networks".*IEEE Journal on Selected Areas in Communications* (*IEEE Communications Society*) **19** (6): 1153-1163. *ISSN 0733-8716*
2. Pahlavan, Kaveh; Krishnamurthy, Prashant (2002). *Principles of Wireless Networks – a Unified Approach. Prentice Hall. ISBN 0-13-093003-2.*
3. Rappaport, Theodore (2002).*Wireless Communications: Principles and Practice. Prentice Hall. ISBN 0-13-042232-0.*

Subject Code: **BCS18005**	Subject Name : **DESIGN AND ANALYSIS OF ALGORITHMS**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18001	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To Learn the algorithm analysis techniques.
- To understand the different algorithm design techniques.
- To Understand Iterative algorithms
- To Understand the limitations of Algorithm power.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Design algorithms for various computing problems
CO2	Analyze the time and space complexity of algorithms.
CO3	Critically analyze the different algorithm design techniques for a given problem. Modify existing algorithms to improve efficiency.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	M	L	L	L	M	L	L	M	L
CO2	H	H	H	L	M	L	M	M	H	M	M	M
CO3	H	M	M	M	H	M	L	M	H	L	M	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		PSO6	
CO1	H	H	M	L	H	H	M	L
CO2	M	H	M	L	H	M	M	L
CO3	M	M	L	L	H	M	M	L

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

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DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18005	DESIGN AND ANALYSIS OF ALGORITHMS	Ty	3	0/0	0/0	3

OBJECTIVES:

- To Learn the algorithm analysis techniques.
- To understand the different algorithm design techniques.
- To Understand Iterative algorithms
- To Understand the limitations of Algorithm power.

UNIT I   INTRODUCTION   9 Hrs
Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms.

UNIT II   BRUTE FORCE AND DIVIDE-AND-CONQUER   9 Hrs
Brute Force – Closest-Pair and Convex Hull Problems-Exhaustive Search – Traveling Salesman Problem – Knapsack Problem – Assignment problem. Divide and conquer methodology – Merge sort – Quick sort – Binary   search   –   Multiplication   of   Large Integers – Strassen's Matrix Multiplication-Closest-Pair and Convex Hull Problems.

UNIT III   DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE   9 Hrs
Computing a Binomial Coefficient – Warshall's and Floyd' algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees.

UNIT IV   ITERATIVE IMPROVEMENT   9 Hrs
The Simplex Method-The Maximum-Flow Problem – Maximm Matching in Bipartite Graphs- The Stable marriage Problem.

UNIT V   COPING WITH THE LIMITATIONS OF ALGORITHM POWER   9 Hrs
Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems–Coping with the Limitations – Backtracking – n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem- Approximation Algorithms for NP – Hard Problems – Traveling Salesman problem – Knapsack problem.

Total Hours: 45

TEXT BOOK:
1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

REFERENCE BOOKS:
1. *Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.*
2. *Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.*
3. *Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009. Steven*
   S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
4. *http://nptel.ac.in/*

Subject Code: **BCS18E09**	Subject Name : **WEB MINING**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18011	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
- To understand the characteristics of the Internet and data mining
- To know about the web crawling algorithm implementation
- To study the web data collection and analysis of web data for new patterns

COURSE OUTCOMES (COs) : (3- 5)

CO1	• Develop semantic web related applications.
CO2	• Represent knowledge using ontology.
CO3	• Predict human behaviour in social web and related communities
CO4	• Visualize social networks

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8		PO9	PO10	PO11	PO12
CO1	M	M	M	H	M	M	M	L		H	H	M	M
CO2	H	L	L	M	H	H	M	H		H	L	H	L
CO3	M	H	H	H	M	H	M	M		M	L	L	M
CO4	M	H	M	M	M	M	M	H		M	M	H	M

COs / PSOs	PSO1		PSO2		PSO3		PSO4			PSO5		PSO6
CO1	M		M		H		H			L		M
CO2	H		M		M		H			H		H
CO3	M		H		H		L			H		M
CO4	M		L		M		M			M		M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill		Soft Skills			
					✔								

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2018 Regulation

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/ S.Lr	P/R	C
BCS18E09	WEB MINING	Ty	3	0/0	0/0	3

OBJECTIVES:
- To understand the characteristics of the Internet and data mining
- To know about the web crawling algorithm implementation
- To study the web data collection and analysis of web data for new patterns

UNIT I   Data Mining Foundations   9 Hrs
Association Rules and Sequential Patterns - Basic Concepts of Association Rules - Apriori Algorithm-Data Formats for Association Rule Mining - Mining with Multiple Minimum Supports - Mining Class Association Rules - Basic Concepts of Sequential Patterns - Generating Rules from Sequential Patterns.

UNIT II   Information Retrieval and Web Search   9 Hrs
Basic Concepts of Information Retrieval - Information Retrieval Models - Relevance Feedback - Evaluation Measures - Text and Web Page Pre-Processing - Inverted Index and Its Compression - Latent Semantic Indexing - Web Search - Meta-Search - Web Spamming.

UNIT II   Social Network Analysis   9 Hrs
Social Network Analysis - Co-Citation and Bibliographic Coupling – Page Rank – HITS- Community Discovery

UNIT IV   Web Crawling   9 Hrs
A Basic Crawler Algorithm - Implementation Issues - Universal Crawlers – Focused Crawlers - Crawler Ethics and Conflicts.

UNIT V   Opinion Mining and Sentiment Analysis   9 Hrs
The Problem of Opinion Mining - Document Sentiment Classification - Sentence Subjectivity and Sentiment Classification- Opinion Lexicon Expansion - Aspect-Based Opinion Mining - Mining Comparative Opinions - Opinion Search and Retrieval.

Total Hours: 45

TEXT BOOK:
1. Bing Liu**,** 2011,Web Data Mining Exploring Hyperlinks, Contents and Usage Data, , Second Edition, Springer.

REFERENCE BOOK:
1. *Soumen Chakrabarti,2002, "Mining the Web", Morgan-Kaufmann Publishers, Elseiver.*

Subject Code: **BCS18E10**	Subject Name : **WEB DATA DESIGN & MANAGEMENT**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BIT18I02	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- The students will be able to analysis and evaluate to propose a new web site based upon recent trend
- To learn to develop a client-server based application using server and client side scripting languages like Java script, JSP, ASP and PHP.
- To learn to develop a dynamic web site using scripting languages and the technologies like XML, AJAX.
- The student will learn how to plan, design, testing and production and post- production process in a web site designing.
- The student will have the ability to design a static and dynamic web site based upon the end user need.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Able to evaluate a web site
CO2	Ability to make a well interactive online applications.
CO3	Have knowledge to analysis and evaluate on web site and design a quality web site.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	L	H	M	L	L	M	M	H	H
CO2	H	M	H	M	H	H	M	L	H	M	H	H
CO3	H	H	H	H	H	M	M	L	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	H	H	H
CO2	H	H	L	H	H	H
CO3	H	H	L	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/ S.Lr	P/R	C
BCS18E10	**WEB DATA DESIGN & MANAGEMENT**	Ty	3	0/0	0/0	3

OBJECTIVES :

- The students will be able to analysis and evaluate to propose a new web site based upon recent trend
- To learn to develop a client-server based application using server and client side scripting languages like Java script, JSP, ASP and PHP.
- To learn to develop a dynamic web site using scripting languages and the technologies like XML, AJAX.
- The student will learn how to plan, design, testing and production and post- production process in a web site designing.
- The student will have the ability to design a static and dynamic web site based upon the end user need.

UNIT I   Site Organization and Navigation   9 Hrs
User centered design – Web medium – Web design process – Evaluating process – Site types and architectures – Navigation theory – Basic navigation practices – Search – Site maps

UNIT II   Elements of Page Design   9 Hrs
Browser compatible design issues - Pages and Layout – Templates – Text – Color – Images – Graphics and Multimedia - GUI Widgets and Forms – Web Design patterns.

UNIT III   Scripting Languages   9 Hrs
Client side scripting: XHTML – DHTML– JavaScript– XML Server side scripting: Perl – PHP – ASP/JSP Designing a Simple web application.

UNIT IV   Pre-Production Management   9 Hrs
Principles of Project Management – Web Project Method – Project Road Map – Project Clarification – Solution Definition – Project Specification – Content – Writing and Managing content.

UNIT V   Production, Maintenance and Evaluation   9 Hrs
Design and Construction – Testing, Launch and Handover – Maintenance – Review and Evaluation – Case Study

Total Hours: 45

TEXT BOOKS:
1. Themas A. Powell (2003)*The Complete Reference – Web Design* (3rd ed.), Tata   McGraw Hill
2. Ashley Friedlein (2001)*Web Project Management*, Morgan Kaufmann Publishers
3. H. M. Deitel, P. J. Deitel, A. B. Goldberg (2004)*Internet and World Wide Web – How to Program*(3rd ed.) Pearson Education

REFERENCE BOOKS:
1. *Joel Sklar (2001)Principles of Web Design, Thomson Learning*
2. *Van Duyne, Landay, and Hong (2006)The Design of Sites: Patterns for creating winning websites (2nd edition.) Prentice Hall*
3. *Lynch, Horton and Rosenfeld (2002) Web Style Guide: Basic Design Principles for Creating Web Sites (2nd edition.) Yale University Press.*

Subject Code: **BCS18E11**	Subject Name : **RISK MANAGEMENT**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
Identify and categories the various risks face by an organization
Explain the various risk control measures available
Design a risk management program for a business organization.

COURSE OUTCOMES (COs) : (3- 5)

CO1	demonstrate knowledge of the range of financial and financial related risks facing organizations
CO2	understand the approach to risk management through risk identification, risk measurement and risk management (or mitigation)
CO3	understand operational risk and how to manage it.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	M	M	H	M	L	M	M	M	H	H
CO2	L	L	M	H	H	M	M	H	H	H	L	H
CO3	H	M	L	H	M	L	H	M	L	L	M	M

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		M		M		M		H	H	M	M
CO2		M	M		M		L		M	H	M	H
CO3	H		L		L		M		M	M	H	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/ S.Lr	P/R	C
BCS18E11	**RISK MANAGEMENT**	Ty	3	0/0	0/0	3

OBJECTIVES :
- Identify and categories the various risks face by an organization
- Explain the various risk control measures available
- Design a risk management program for a business organization.

UNIT I   The Risk Management Process   9 Hrs
Introduction to software risk management, why do we need to manage risk in software development, Use, Objectives, Risk Management Paradigm, Risk management and litigation. Models for Risk Management.

UNIT II   Discovering Risk In Software Development   9 Hrs
Risk attributes and Identification, Identifying software risk, Common software project risks, Risk Taxonomy, Risk Mapping, statements, reviews., Risk ownership and stakeholder management.

UNIT III   Risk Assessment   9 Hrs
Objectives and goals. Approach to assessment, Risk assessment tools and techniques, presenting the risk findings.

UNIT IV   Planning Risk Mitigation Strategies   9 Hrs
Risk Planning, Best practices in the risk planning, Risk management tools, Risk mitigation strategies, Formulating and Implementing risk management plans.

UNIT V   Monitoring Risk In Software Projects   9 Hrs
Developing a process for monitoring risk, formulating a project risk database, Managing and tracking risk, Risk support tools. Software Risk Metrics, organization, estimation, development methodology.

Total Hours: 45

TEXT BOOKS:
1. Yacov Y. Haimes, (2011) Risk Modeling, Assessment, and Management, Wiley
2. John Mcmanus,(2004) Risk Management in software development projects,   Elsevier Butterworth-Heinemann

REFERENCE BOOKS:
1. *Martin Loosemore, John Raftery, (2006) Risk management in projects,Taylor& Francis Ltd*
2. *Ravindranath P. C, (2007) Applied Software Risk Management, Auerbach,*
3. *Dale Walter Karolak,,(1995) Software engineering risk management, Wiley-Ieee Computer Society*

Subject Code: **BCS18E12**	Subject Name : **CRYPTOGRAPHY AND NETWORK SECURITY**	Ty/ Lb/ ET L	L	T/ S.Lr	P/R	C
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- Understand OSI security architecture and classical encryption techniques.
- gain basic knowledge on the number theory.
- Understand various block cipher modes.
- understands the principles of public key cryptosystems, and different message authentication and integrity techniques

COURSE OUTCOMES (COs) : (3- 5)

CO1	Toidentify the major types of threats to Network security and the associated attacks
CO2	To develop strategies to protect organization information assets from common attacks, understand how security policies, standards and practices are developed
CO3	To design, analyse and implement different network security protocols

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M	M	M	M	M	M	L	L	L
CO2	H	M	H	M	H	M	M	M	M	L	L	L
CO3	H	H	H	M	H	M	M	M	M	L	L	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	M	M	L	H
CO2	H	L	M	M	L	H
CO3	H	L	M	M	L	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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2018 Regulation

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/ S.Lr	P/R	C
BCS18E12	**CRYPTOGRAPHY AND NETWORK SECURITY**	Ty	3	0/0	0/0	3

OBJECTIVES:

- Understand OSI security architecture and classical encryption techniques.
- gain basic knowledge on the number theory.
- Understand various block cipher modes.
- understands the principles of public key cryptosystems, and different message authentication and integrity techniques

UNIT I   Introduction & Number Theory   9 Hrs

OSI security architecture - Security attacks ,Services and Mechanisms - -Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, stenography)- **NUMBER THEORY**: Modular arithmetic-Euclid's algorithm- Fermat's and Euler's theorem- The Chinese remainder theorem- Discrete logarithms.

UNIT II   Block Ciphers & Public Key Cryptography   9 Hrs

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES -RC5 algorithm. **Public key cryptography:** Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange--Elliptic curve cryptography.

UNIT III   Cryptographic Data Integrity Algorithms   9 Hrs

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols-DSS.

UNIT IV   Network Security Practice   9 Hrs

Authentication Applications – Kerberos – X.509 Authentication Service – Electronic mail Security – Pretty Good Privacy – S/MIME – IP Security – Web Security.

UNIT V   System Security   9 Hrs

Intruders – Intrusion Detection – Password Management – Malicious Software – Viruses and Related Threats -Viruses Countermeasures – Distributed Denial of Service Attacks - Firewalls – Firewall Design Principles – Trusted Systems.

Total Hours: 45

TEXT BOOK:
1. William Stallings (2011) *Cryptography And Network Security – Principles and Practices*, (5th ed.) Pearson Education.

REFERENCE BOOKS:
1. *Atul Kahate (2008) Cryptography and Network Security Tata McGraw Hill*
2. *Bruce Schneier (2007) Applied Cryptography, John Wiley & Sons Inc.*
3. *Charles B. Pfleeger, Shari Lawrence Pfleeger (2007) Security in Computing (4th ed.), Pearson Education*

Subject Code: **BCS18E13**	Subject Name : **MOBILE ADHOC NETWORKS**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- knowledge of routing mechanisms
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.
- This includes their designs, operations, plus approaches to interoperability.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Have gained an understanding of the current topics in MANETs and WSNs, both from an industry and research point of views.
CO2	Have an understanding of the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
CO3	Understand how proactive routing protocols function and their implications on data transmission delay and bandwidth consumption.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	M	L	L	L	L	M	L	L
CO2	H	H	M	L	M	L	L	L	L	M	L	L
CO3	H	M	M	L	M	L	L	L	L	M	L	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	L	H	L
CO2	H	L	L	M	M	L
CO3	H	M	L	M	L	L

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/ S.Lr	P/R	C
BCS18E13	MOBILE ADHOC NETWORKS	Ty	3	0/0	0/0	3

OBJECTIVES:
- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- knowledge of routing mechanisms
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.
- This includes their designs, operations, plus approaches to interoperability.

UNIT I   Introduction   9 Hrs
Introduction to adhoc networks – definition, characteristics features, applications -Characteristics of Wireless channel, Adhoc Mobility Models:- Indoor and outdoor models.

UNIT II   Medium Access Protocols   9 Hrs
MAC Protocols: design issues, goals and classification. Contention based protocols- with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN .

UNIT III   Network Protocols   9 Hrs
Routing Protocols: Design issues, goals and classification.Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

UNIT IV   End-End Delivery and Security   9 Hrs
Transport layer : Issues in desiging- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

UNIT V   Cross Layer Design And Integration of Adhoc For 4g   9 Hrs
Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary prespective. Intergration of adhoc with Mobile IP networks.
Total Hours: 45

TEXT BOOKS:
1. C.Siva Ram Murthy and B.S.Manoj (2007) Ad hoc Wireless Networks Architectures and Protocols, (2nd ed.), Pearson Education
2. Charles E. Perkins (2000) Ad hoc Networking , Addison Wesley

REFERENCE BOOKS:
1. Mohammad Ilyas (2002) The handbook of adhoc wireless networks, CRC press,
2. T. Camp, J. Boleng, and V. Davies ,A Survey of Mobility Models for Ad Hoc Network Research, WirelessCommun. and Mobile Comp., Special Issue on Mobile
3. V.T.Raisinhani and S.Iyer (2004) ÉCLAIR; "An Efficient Cross-Layer Architecture for wireless protocol stacks, World Wireless cong., San francisco,CA,

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Subject Code: **BCS18E14**	Subject Name : **TCP/IP DESIGN AND IMPLEMENTATION**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Understand the IP addressing schemes.
- Understand the fundamentals of network design and implementation
- Understand the design and implementation of TCP/IP networks
- Understand on network management issues
- Learn to design and implement network applications.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand IP Addressing schemes and TCP/IP Architecture
CO2	Learn the fundamentals of network design and implementation
CO3	Understand network management issues
CO4	Learn and implement network applications

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	L	M	M	L	H	M	H	M
CO2	H	M	M	L	M	M	M	L	H	M	H	M
CO3	H	H	H	M	M	M	M	L	H	M	H	M
CO4	H	H	H	M	M	M	M	M	H	M	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PS06
CO1	H	H	L	M	H	M
CO2	H	H	M	H	H	H
CO3	H	H	M	H	H	H
CO4	H	H	L	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/ S.Lr	P/R	C
BCS18E14	**TCP/IP DESIGN AND IMPLEMENTATION**	Ty	3	0/0	0/0	3

OBJECTIVES:
- Understand the IP addressing schemes.
- Understand the fundamentals of network design and implementation
- Understand the design and implementation of TCP/IP networks
- Understand on network management issues
- Learn to design and implement network applications.

UNIT I   Introduction   9 Hrs

Protocols and standards-standards organizations-internet standards-internet administration – Protocol layers-OSI model-TCP/IP Protocol suite-addressing.

UNIT II   Underlying Technologies   9 Hrs

Wired LANs: IEEE Standards, frame format, addressing, Ethernet evolution, standard Ethernet, fast Ethernet Gigabyte Ethernet, Ten-Gigabyte Ethernet-Wireless LAN- Point-to-Point WANS-Switched WANs-Connecting Devices- Case study – developing simple LAN setup using ns-2 simulator

UNIT III   IP Addresses and Routing   9 Hrs

Switching-network layer services- issues- IPv4 Addresses: Classful addressing, classless addressing, special addresses-delivery-forwarding- IPv4: datagrams, fragmentation, options, checksums, IP package-ARP- RARP- ICMP-IGMP- Case study – Analyzing the trace file using awk and plot graph using xgraph.

UNIT IV   Unicast and Multicast Routing Protocols   9 Hrs

Unicast routing – intra and inter domain routing – distance vector routing :Routing Information Protocol(RIP) – link state routing: Open Shortest Path First (OSPF) – path vector routing: Border Gateway Protocol (BGP) – Multicasting and Multicast routing protocols - - Case study – Developing a topology using more than two router and analyze the routing.

UNIT V   TCP & UDP   9 Hrs

Introduction to Transport Layer – Services – Protocols. UDP – user datagram – UDP services – UDP package – UDP applications. TCP – segment - flow control – error control – congestion control – state transition diagram – TCP package. SCTP – services – features – Case study – Develop a network, attach various type TCP variant and analyze the trace file.

Total Hours: 45

TEXT BOOK:
1. Behrouz A. Forouzam (2010), "TCP/IP Protocol Suite", 4th Edition, Tata McGraw Hill..

REFERENCE BOOKS:
1. *Douglas E. Comer, David L. Stevens (2009), "Internetworking with TCP/IP Volume – II, III" 3rd Edition, PHI Learning Private Limited.*
2. *Richard Stevens W., (2011) "TCP/IP Illustrated, The Protocol-Volume I, II, II", 2nd Edition Addison-Wesley Pub Co.*
3. *Dougles E. Comer,(2000) "Internetworking with TCP/IP–Principles, Protocols & Architecture", 4th Edition,Pearson education.*

Subject Code: BCS18E15	Subject Name : **CYBER FORENSICS AND INTERNET SECURITY**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite:BCS18OE5	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To learn the computer forensic fundamentals
- To understand various types of cyber crime activities involved in the digital world
- To study various network security technologies to prevent the data from hacker or intruder

COURSE OUTCOMES (COs) : (3- 5)

CO1	Students understood how to protect the data or how to secure their personal and official data in their computer.
CO2	The students have the awareness on digital forensics frauds
CO3	The students have the knowledge on keep the data in secure manner in the network using network security technologies.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	L	H	H	H	L	M	M	H	H
CO2	H	H	H	M	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	H	M	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	H	H
CO2	H	H	M	H	H	H
CO3	H	H	M	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/ S.Lr	P/R	C
BCS18E15	**CYBER FORENSICS AND INTERNET SECURITY**	Ty	3	0/0	0/0	3

OBJECTIVES:
- To learn the computer forensic fundamentals
- To understand various types of cyber crime activities involved in the digital world
- To study various network security technologies to prevent the data from hacker or intruder

UNIT I   Cyber Forensics Fundamentals   9 Hrs

Introduction to Cyber forensics: Information Security Investigations, Corporate Cyber Forensics, Scientific method in forensic analysis, investigating large scale Data breach cases. Analyzing Malicious software.

UNIT II   Computer Forensics Technology   9 Hrs

Types of Computer Forensics Technology, Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised Internet Tracing Methods, Security and Wireless Technologies, Avoiding Pitfalls with Firewalls Biometric Security Systems

UNIT III   Computer Forensics Systems   9 Hrs

Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Storage Area Network Security Systems, Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless Network Security Systems, Satellite Encryption Security Systems, Instant Messaging (IM) Security Systems, Net Privacy Systems, Identity Management Security Systems, Identity Theft, Biometric Security Systems

UNIT IV   Network Security Techniques   9 Hrs

Network Security Applications, Authentication Mechanisms: Passwords, Cryptographic authentication protocol, Smart Card, Biometrics, Digital Signatures and seals, Kerberos, X.509 LDAP, Directory. Web Security: SSL Encryption, TLS, SET

UNIT V   Case Study   9 Hrs

E-mail Security, Pretty Good Privacy (PGPs) / MIME, IP Security, Access and System Security, Intruders, Intrusion Detection and Prevention, Firewall, Hardware Firewall, Software Firewall, Application Firewall, Packet Filtering. , Packet Analysis, Proxy Servers, Firewall setting in Proxy, ACL in Proxy.

Total Hours: 45

TEXT BOOKS:
1. John R. Vacca, (2005) Computer Forensics: Computer Crime Scene Investigation, 2nd Edition, Charles River Media.
2. Man Young Rhee, (2003) "Internet SecurityCryptographic Principles, Algorithms and Protocols", WILEY.

REFERENCE BOOKS:
1. *William Stallings, "Cryptography and Network Security: Principles and Standards", Prentice Hall India, 3rd Edition, 2003*
2. *Computer Forensics: Investigating Network Intrusions and Cyber Crime (Ec-Council Press Series: Computer Forensics), 2010*
3. *Christof Paar, Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, 2nd Edition, Springers, 2010.*

Subject Code: **BCS18E16**	Subject Name : **DATABASE SECURITY**	Ty/ Lb/ ET L	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BCS18004	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To provide a foundation in database security
- Understand the various database vulnerabilities
- Learn to audit the databases.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the fundamentals of security and architecture.
CO2	To identify risks and vulnerabilities in operating systems from a database perspective
CO3	To learn security policies and techniques.
CO4	To understand the various database security models and their advantages.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	L	L	H	H	M	H	M	H	L
CO2	H	H	M	H	H	H	M	M	H	M	H	M
CO3	H	H	H	H	M	M	M	M	H	M	H	M
CO4	H	H	M	L	M	M	M	M	H	M	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PS06
CO1	H	H	L	M	H	H
CO2	H	H	H	M	H	H
CO3	H	H	M	M	H	H
CO4	H	H	M	L	H	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/ S.Lr	P/R	C
BCS18E16	DATABASE SECURITY	Ty	3	0/0	0/0	3

OBJECTIVE:

- To provide a foundation in database security
- Understand the various database vulnerabilities
- Learn to audit the databases.

UNIT I   Security Architecture & Operating System Security Fundamentals   9 Hrs

Security Architecture: Introduction-Information Systems- Database Management Systems-Information Security Architecture- Database Security–Asset Types and value-Security Methods Operating System Security Fundamentals: Introduction-Operating System Overview-Security Environment – Components-Authentication Methods-User Administration-Password Policies-Vulnerabilities-E-mail Security.

UNIT II   Administration of Users, Profiles, Password Policies, Privileges and Roles   9 Hrs

Administration of Users: Introduction-Authentication-Creating Users, SQL Server User-Removing, Modifying Users-Default, Remote Users-Database Links-Linked Servers-Remote Servers-Practices for Administrators and Managers-Best Practices Profiles, Password Policies, Privileges and Roles: Introduction-Defining and Using Profiles-Designing and Implementing Password Policies-Granting and Revoking User Privileges-Creating, Assigning and Revoking User Roles-Best Practices.

UNIT III   Database Application Security Models   9 Hrs

Introduction-Types of Users-Security Models: Access Matrix model, Access mode model- Application Types: Client/Server Applications, Web Applications, Data ware house applications- Application Security Models-Data Encryption.

UNIT IV   Virtual Private Databases   9 Hrs

Virtual Private Databases: Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager Implementing Row and Column level Security with SQL Server.

UNIT V   Security and Auditing Project Cases   9 Hrs

Case Studies : Developing an online database, payroll management, tracking database changes, developing a secured authorization repository.

Total Hours: 45

TEXT BOOK:
1. Hassan A. Afyouni, 2009 "Database Security and Auditing", Third Edition, Cengage Learning.

REFERENCE BOOKS:
1. *Charu C. Aggarwal, Philip S Yu, 2008, "Privacy Preserving Data Mining": Models and Algorithms, Kluwer Academic Publishers.*
2. *Ron Ben Natan, 2005, "Implementing Database Security and Auditing", Elsevier Digital Press.*

Subject Code: **BCS18E17**	Subject Name : **MANAGEMENT INFORMATION SYSTEMS**	Ty/ Lb/ ETL	L	T/ S.Lr	P/ R	C
	Prerequisite: BCS18004	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Evaluate the role of the major types of information systems in a business environment and their relationship to each other;
- Assess the impact of the Internet and Internet technology on business electronic commerce and electronic business;
- Identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges

COURSE OUTCOMES (COs) : (3- 5)

CO1	Describe the role of information technology and information systems in business
CO2	Record the current issues of information technology and relate those issues to the firm
CO3	Reproduce a working knowledge of concepts and terminology related to information technology

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	L	L	L	M	L	M	L	L
CO2	H	H	L	H	M	L	L	M	L	M	L	L
CO3	H	M	M	L	L	L	L	M	L	M	L	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	M	L	L
CO2	H	L	L	L	L	L
CO3	H	M	L	M	L	L

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E17	MANAGEMENT INFORMATION SYSTEMS	Ty	3	0/0	0/0	3

OBJECTIVES:
- Evaluate the role of the major types of information systems in a business environment and their relationship to each other;
- Assess the impact of the Internet and Internet technology on business electronic commerce and electronic business;
- Identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges

UNIT I   Organizations, Management and The Networked Enterprise   9 Hrs

Information Systems in Global Business- Global E-Business-Information Systems-Strategy Systems-Ethical and Social issues in Information System - Analyzing Business Resource for an Enterprise System.

UNIT II   IT Infrastructure   9 Hrs

IT infrastructure- Emerging Technology - Business Intelligence: Databases and Information Management – Telecommunication - Internet and Wireless Technology - Information Security Systems

UNIT III   Key System Application For The Digital Age   9 Hrs

Enterprise application- Ecommerce-Digital Markets- Digital Goods- Managing knowledge- Decision Making – Enterprise portal design

UNIT IV   Building and Managing Systems   9 Hrs

Building Systems - Project Management- Establishing Business values - Managing Change - Managing Global System - Redesigning Business Processes- Case studies

UNIT V   Advanced Concepts In Information System   9 Hrs

Enterprise Resource Planning - modules : Human Resources, Finance – Accounting - Production & Logistics - Supply Chain Management – CRM - Procurement - Management System Object Oriented modeling- case studies

Total Hours: 45

TEXT BOOKS :
1. James A, O' Brian,(2007) Management information systems ,(7th ed.), TMH Publisher
2. Kenneth C. Laudon, Jane P.(2008) Management Information Systems: Managing the Digital Firms Pearson Education, TMH, 2008.

REFERENCE BOOKS:
1. *James A. O'Brien, Northern Arizona University,George M. Marakas, University of Kansas, (2007) Introduction to Information Systems*
2. *Ross and Clagget (2004) Information System for Modern Management, Prentice-Hall of India Pvt. Ltd.*
3. *Alexis Leon,(2007) Enterprise Resource Planning, TMH*

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7th SEMESTER ELECTIVES E-III (Common to CSE&IT)

Subject Code: **BCS18E18**	Subject Name : **DATA SCIENCE AND BIG DATA ANALYTICS**	Ty/Lb/ETL	L	T/S.Lr	P/R	C
	Prerequisite: BCS18004	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
- Deploying the Data Analytics Lifecycle to address big data analytics projects
- Reframing a business challenge as an analytics challenge
- Applying appropriate analytic techniques and tools to analyze big data, create statistical models, and identify insights   that   can lead to actionable result
- Using tools such as: R and RStudio, MapReduce/Hadoop, in-database analytics,Window and MADlib functions.

COURSE OUTCOMES (Cos) : (3- 5)

CO1	Deploying the Data Analytics Lifecycle to address big data analytics projects
CO2	Reframing a business challenge as an analytics challenge
CO3	Applying appropriate analytic techniques and tools to analyze big data, create statistical models, and identify insights that can lead to actionable results
C04	To explore the next generation of big data tools and applications, and other advanced topics if time permits.

Mapping of Course Outcomes with Program Outcomes (Pos)

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M	H	H	H	M	H	M	H	H
CO2	H	H	M	H	H	H	H	L	H	M	H	M
CO3	H	H	H	H	M	M	H	M	H	L	H	H
CO4	H	H	H	H	M	H	L	H	H	H	H	H

Cos / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	L	H
CO2	H	H	H	M	H	H
CO3	H	H	M	H	H	M
CO4	H	H	H	M	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Special elective		
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty/Lb/	L	T/S.Lr	P/R	C
BCS18E18	**DATA SCIENCE AND BIG DATA ANALYTICS**	Ty	3	0/0	0/0	3

OBJECTIVES:
- Deploying the Data Analytics Lifecycle to address big data analytics projects
- Reframing a business challenge as an analytics challenge
- Applying appropriate analytic techniques and tools to analyze big data, create statistical models, and identify insights that can lead to actionable result
- Using tools such as: R and RStudio, MapReduce/Hadoop, in-database analytics,Window and MADlib functions.**UNIT I   Introduction**
9 Hrs

Big data overview - State of the practice in analytics, BI vs data science, current analytical architecture, drivers of big data - Big data ecosystem - **Data analytics lifecycle -** overview – Discovery Phase - Data preparation Phase - Model Planning Phase - Model building Phase - Communicate results Phase - Operationalisation Phase.

UNIT II   Basic Data Analytic Methods Using R   9 Hrs
Introduction to R , R Graphical User interfaces, Data import and export, Attribute and data types, descriptive statistics - Exploratory data analysis, visualization data analysis, dirty data, visualizing a single variable, examining multiple variables, data exploration vs presentation, - Statistical methods for evaluation, Hypothesis testing, Difference of Means, Wilcoxon Rank-sum test, Type I and II errors, power and sample size, ANOVA

UNIT III Advanced Analytical Theory & Methods (Clustering, Association Rules And Regression)
9 Hrs

Clustering- k-means, use cases, determining the number of clusters, diagnostics, Reasons to choose and cautions, additional algorithms - Association rules- Apriori algorithm, Evaluation of candidate rules, Application of association rules, an example- transactions in a grocery store, the groceries dataset, frequent itemset generation, rule generation and visualization, validation and testing, diagnostics - Regression-linear and logistic regression, usecases, model description, diagnostics – Additional Regression Models

UNIT IV Advanced Analytical Theory & Methods (Classification, Time Series Analysis And Text Analysis)   9 Hrs
Classification - Decision Trees, general algorithm, evaluating a decision tree, Decision trees in R - Naive Bayes - Bayes theorem, Naive Bayes classifier, Smoothing, diagnostics, Additional Classification Methods - Time Series Analysis- Box-Jenkins Methodology, ARIMA Model, Auto correlation Function(ACF), Auto regressive models, moving average models, ARMA and ARIMA Models, building and evaluating a ARIMA Model - Text Analysis- collecting raw text, representing text, term frequency-Inverse document frequency(TFIDF), Categorizing documents by topics, determining sentiments, gaining insights

UNIT V   Advanced Analytics-Technology and Tools: Mapreduce and Hadoop   9Hrs
Analytics for unstructured data, usecases, Mapreduce, Apache Hadoop - **The Hadoop Ecosystem -** Pig, Hive, HBase, Mahout, NoSQL **- In-database analytics** - SQL Essentials, Joins, Set operations, Grouping extensions, In-Database text analytics, Advanced SQL, Window functions, User-defined functions and aggregates, Ordered Aggregates, MADlib.

Total Hours: 45

TEXT BOOK:
1. EMC Education Services (Editor), 2015 Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data,Wiley Publications, ISBN: 978-1-118-87613-8

Subject Code: **BCS18E19**	Subject Name : **NETWORK FORENSICS**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Provide a comprehensive understanding of network forensic analysis principles
- Understand the relationship between network forensic analysis and network security technologies.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Learn to identify network security incidents and potential sources of digital evidence.
CO2	Demonstrate the ability to perform basic network data acquisition and analysis using computer based applications and utilities
CO3	Identify potential applications for the integration of network forensic technologies
CO4	Apply tools for network forensic investigation

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	L	H	L	H	H	M	H	M	H	M
CO2	H	H	H	H	H	M	M	M	H	M	H	M
CO3	H	H	H	H	H	M	M	M	H	M	H	L
CO4	H	H	H	H	H	M	M	H	M	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PS06
CO1	H	H	L	M	H	H
CO2	H	H	M	M	H	H
CO3	H	H	L	M	H	H
CO4	H	H	M	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							

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SUBJECT CODE	SUBJECT NAME	Ty/Lb	L	T/S.Lr	P/R	C
BCS18E19	NETWORK FORENSICS	Ty	3	0/0	0/0	3

OBJECTIVE:

- Provide a comprehensive understanding of network forensic analysis principles
- Understand the relationship between network forensic analysis and network security technologies.

UNIT I   Technical Fundamentals   9 Hrs
Concepts in digital evidence- challenges- investigative methodology- sources of network based evidence- principles of internetworking-Internet Protocol suite- Evidence acquisition

UNIT II   Packet and Statistical Flow Analysis   9 Hrs
Packet analysis - protocol analysis - flow analysis- higher layer traffic analysis – Statistical Flow analysis:- sensors-flow record export protocols- collection and aggregation- analysis tools and techniques – Case study and Tools Analysis: Wire Shark

UNIT III   Network Intrusion Detection and Analysis   9 Hrs
NIDS/NIPS functionality- modes of detection-types-NIDS/NIPS evidence acquisition -NIPS/NIDS interfaces –packet logging – Case study and Tools Analysis : Snort

UNIT IV   Network Devices and Servers   9 Hrs
Sources of Logs-Network log architecture- collecting and analyzing evidence- Switches- routers – firewalls-interfaces-logging - Case study and Tools Analysis: Angry IP Scanner

UNIT V   Network Tunnelling and Case Studies   9 Hrs
Tunneling for functionality, confidentiality- covert tunneling- trends in malware evolution-network behavior of malware – future of malware and network forensics - Case study and Tools Analysis : Cuckoo Sandbox

Total Hours: 45

TEXT BOOK:
1. Network Forensics : Tracking Hackers Through CyberSpace Sherri Davidoff,Jonathan Ham Pearson Education 2012

REFERENCE BOOKS:
1. *Introduction to Security and Network ForensicsWilliam J. Buchanan Auerbach Publications 2012*
2. *Handbook of Digital Forensics and Investigations, 1st Edition Eoghan Casey ed., Elsevier Academic Press, ISBN 13: 978-0-12-374267-4,.*

Subject Code: BCS18E20	Subject Name : INTERNET OF THINGS	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Vision and introduction to IoT
- Data knowledge management and use of devices in IoT Technology
- Understand the state of Art – Iot Architecture
- Real world Iot Design constraints, industrial automation and commercial building automation in IoT

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the vision of IoT from a global context.
CO2	Determine the Market perspective of IoT.
CO3	Use of Devices, Gateways and Data Management in IoT
CO4	Understand the Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	M	M	M	L	L	H	M	H	H
CO2	M	M	H	H	H	L	H	L	H	M	H	H
CO3	H	H	H	H	H	H	H	M	H	M	H	M
CO4	H	H	H	H	H	H	H	M	H	H	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	M	H	L
CO2	H	H	M	H	M	H
CO3	M	H	H	H	M	H
CO4	H	H	L	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Special Elective		
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty/Lb	L	T/S.Lr	P/R	C
BCS18E20	INTERNET OF THINGS	Ty	3	0/0	0/0	3

OBJECTIVES:

- Vision and introduction to IoT
- Data knowledge management and use of devices in IoT Technology
- Understand the state of Art – Iot Architecture
- Real world Iot Design constraints, industrial automation and commercial building automation in IoT

UNIT I   Introduction To IoT   9 Hrs

Definition – characteristics of IoT-Physical Design of IoT – Logical Design of IoT- IoT enabling technologies – IoT Levels and Deployment Templates

UNIT II   IoT and M2M   9 Hrs

M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT III   IoT Platforms Design Methodology   9 Hrs

Introduction – IoT Design Methodoloy – Case study on IoT system for Weather Monitoring – Motivation of using Python

UNIT IV   IoT Physical Devices and Endpoints   9 Hrs

IoT Device – Basic building blocks of an IoT Device – Exemplary Device: Raspberry Pi – Linux on Raspberry Pi – Raspberry Pi Interfaces – Raspberry Pi with Python – Simple
Programs

UNIT V   IoT Applications For Value Creations   9 Hrs

Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth. Case Studies Illustrating to IoT Design.

Total Hours: 45

TEXT BOOK:
1. Vijay Madisetti and Arshdeep Bahga, , 2015"Internet of Things (A Hands-on-Approach)", Universities Press

REFERENCE BOOKS:
1. *Francis daCosta, 2013 "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, A press Publications*
2. *Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493-9357-1*

Subject Code: **BCS18E21**	Subject Name : **SOCIAL COMPUTING**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Understand important features of social computing.
- Design and prototype new social computing systems.
- Analyze data left behind in social media.
- Understand the research issues in this field.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand emerging themes in social and web based computing – focusing on current Research topics dominant in this area.
CO2	Use specialist Application Programming Interfaces (APIs) for analysing social media data feeds
CO3	Understand the use of graph theory in representing relationships in social networks and distributed systems
CO4	Understand and make use of specialist technologies used to harvest, analyse and visualise "social data
CO5	Demonstrate the use of specialist programming environments and tools for managing distributed social data.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	L	M	M	M	M	L	L	M	M
CO2	H	H	M	M	L	L	M	M	L	M	M	M
CO3	H	H	M	M	L	L	L	L	M	L	M	M
CO4	H	H	L	M	M	M	M	L	L	L	M	M
CO5	H	H	M	M	M	L	L	L	M	M	M	M

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		H		M		M		L		M	
CO2	H		H		M		L		L		M	
CO3	H		H		M		M		M		L	
CO4	H		H		L		L		M		M	
CO5	H		H		M		M		M		L	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Special Elective		
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DEPARTMENT OF INFORMATION TECHNOLOGY
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SUBJECT CODE	SUBJECT NAME	Ty / Lb	L	T/ S.Lr	P/R	C
BCS18E21	SOCIAL COMPUTING	Ty	3	0/0	0/0	3

OBJECTIVES:

- Understand important features of social computing.
- Design and prototype new social computing systems.
- Analyze data left behind in social media.
- Understand the research issues in this field.

UNIT I   Basic Concepts   9 Hrs

Web 2.0 Introduction – Advantages & Disadvantages of Web2.0 – Business Aspects of Web2.0 – Web2.0 Principles – Characteristics – design aspects – Introduction to Web services.

UNIT II   Web2.0 Services   9 Hrs

Web2.0 Services – Applications –Communication - Blogs – Topic, Event, Marketing, Learning , Scholarly - Wiki – Wikia, Wetpaint, Pbwiki, Wikispaces -Podcasting , Vodcasting - 21st century skills - Social Networking- Social Bookmarking – RSS & Syndication –Newer Web2.0 services and Applications

UNIT III   Technology   9 Hrs

Ajax – Alternatives to Ajax – Open APIs –SOAP –REST - Microformats – Client side technologies – Web gateway - Security Challenges with Web2.0 – Content Management System(CMS)

UNIT IV   Application Creation   9 Hrs

DOJO toolkit - Creation of Application with DOJO, JSON ,Adobe Flex, Cloud computing, Hadoop – Building Offline Applications using Adobe AIR.

UNIT V   Case Studies   9 Hrs

Teaching & Learning Issues – Research – Academic Publishing – Library – Repositories – Archiving – Future of Web2.0 – Web2.0 & Semantic Web –Emergence of Web Science.

Total Hours: 45

REFERENCE BOOKS:

1. *shelly / Frydenberg, 2011, "Web2.0- concepts & Applications", Cengage Learning.*
2. *Gwen Solomon, Lynne Schrum, 2007, "Web 2.0 – new tools, new schools" , ISTE Publication.*
3. *www.jisc.ac.uk - JISC Technology and Standards Watch, Feb. 2007 Web 2.0(PDF)*
4. *Web2.0 Tutorials(from web)*
5. *Mastering Web2.0 Technologies(from web)*
6. *www.dojotoolkit.org*

Subject Code: **BCS18E22**	Subject Name : **ENTERPRISE ARCHITECTURE**		Ty/ Lb/ ET L	L	T/ S.L r	P/R	C
	Prerequisite: NIL		Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To define and explain gaps
- Help to achieve the business strategy, vision and Target Operating Model
- Provide the flexibility to include new ideas in the future
- Enable faster decision making, avoiding the need for long studies
- Learn UML and BPMN Modeling.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Construct models for enterprise architecture definition which conform to industry standards and frameworks
CO2	Analyze alternative models for enterprise architecture components and processes for different organizations
CO3	Identify critical success factors for common enterprise architect approaches

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	H	M	H	H	L	H	L	M	H
CO2	H	M	H	H	M	M	H	L	H	M	H	H
CO3	H	H	M	H	M	H	H	M	H	M	L	M

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		H		M		H		M		M	
CO2	H		H		M		H		H		H	
CO3	H		H		H		M		M		M	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Special Elective		
					✔							

DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

SUBJECT CODE	SUBJECT NAME	Ty/ /ETL Lb	L	T/ S.Lr	P/R	C
BCS18E22	ENTERPRISE ARCHITECTURE		3	0/0	0/0	3

OBJECTIVES:
- To define and explain gaps
- Help to achieve the business strategy, vision and Target Operating Model
- Provide the flexibility to include new ideas in the future
- Enable faster decision making, avoiding the need for long studies
- Learn UML and BPMN Modeling.

UNIT I   Introduction   9 Hrs
TOGAF- General Presentation-Keypoints-ADM Method: ADM Cycle-The Phases of the ADM-Iterations-ADM Techniques and Guidelines. **Components of TOGAF Architecture:** Architecture components-The Metamodel-Artifacts-Building Blocks-Deliverables. Repository and Governance: Architecture Repository-Architecture Governance.

UNIT II   Key Modeling Techniques   9 Hrs
Models: Benefits Uses and Characteristics-The concepts of viewpoints-Special role played by diagrams-consistency and traceability-Architecture Repository-Risks and main difficulties-Repository governance-Tools and Languages. **TOGAF Models:** TOGAF Artifacts-UML and BPMN for TOGAF Modeling-**Model Vision**: Stakeholder Matrix-Artifacts linked to Goals, Requirement, and Business Process-Solution Concept Diagram-Value Chain Diagram.

UNIT III   Model Business Architecture   9 Hrs
Business Dictionary Artifacts-Artifacts linked to Enterprise Organization, function and Services, Business Processes, Data. Information System Architecture: Application Communication Diagram-Migration Diagram- User Location Diagram-System use Case Diagram-Process System Realization Diagram-Enterprise Manageability diagram-Data Architecture-Service Data Diagram-

UNIT IV   Technology Architecture   9 Hrs
 Environment and Location Diagram-Processing Diagram-Network Computing Hardware Diagram-Benefits Diagram. SOA Processes and Information:SOA-Business Processes-Information-TOGAF Within AMUE, EDF. Archimate.

UNIT V   9 Hrs
Draw Business Process Diagram Using UML and BPMN.
                                                                                    Total Hours: 45

TEXT BOOK:
1. Philippe Desfray, Gilbert Raymond (2014) –Modelling Enterprise Architecture with TOGAF A Practical Guide Using UML and BPMN. Elsevier Pub.

REFERENCE BOOKS:
1. *Peter Rittgen, (2007)-Enterprise Modeling and Computing with UML , Idea Group Publishing.*
2. *Marc Lankhorst et al (2013) , The Enterprise Engineering Series, Springer*

BCS18EXX	**Subject based on Industry Demand**	Ty	3	0/0	0/0	3

Subject Code:	Subject Name : OPTIMIZATION TECHNIQUES		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E23	Prerequisite: NIL		Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To understand importance of optimization of industrial process management and apply basic concepts of mathematics to formulate an optimization problem.
- To analyse and appreciate variety of performance measures for various optimization problems

COURSE OUTCOMES (COs) : (3- 5)

CO1	Apply knowledge of optimization to formulate and solve engineering problems.
CO2	Understand the different methods of optimization and be able to suggest a technique for a specific problem.
CO3	Understand how optimization can be used to solve industrial problems of relevance to the chemical and oil industries.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	L	L	L	L	M	M	L	M	L
CO2	H	H	M	L	L	L	L	M	M	L	M	L
CO3	H	M	M	L	L	L	L	M	M	L	M	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	M	L	L
CO2	H	H	L	M	L	L
CO3	H	H	L	M	L	L

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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SUBJECT CODE	SUBJECT NAME	Ty / Lb	L	T/ S.Lr	P/R	C
BCS18E23	**OPTIMIZATION TECHNIQUES**	Ty	3	0/0	0/0	3

OBJECTIVES:
- To understand importance of optimization of industrial process management and apply basic concepts of mathematics to formulate an optimization problem.
- To analyse and appreciate variety of performance measures for various optimization problems

UNIT I   Introduction to Operation Research   9 Hrs
Operation Research approach, scientific methods, introduction to models and modeling techniques, general methods for Operation Research models, methodology and advantages of Operation Research, history of Operation Research.

UNIT II   Linear Programming (LP)   9 Hrs
Introduction to LP and formulation of Linear Programming problems, Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using Big-M method, Two phase method, Duality in linear programming, Integer linear programming.

UNIT III   Transportation & Assignment Problems   9 Hrs
Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem, introduction to Assignment problems, variations in Assignment problems

UNIT IV   Network Analysis   9 Hrs
Network definition and Network diagram, probability in PERT analysis, project time cost trade off, introduction to resource smoothing and allocation.

UNIT V   Sequencing   9 Hrs
Introduction, processing N jobs through two machines, processing N jobs through three machines, processing N jobs through m machines. **Inventory Model:** Introduction to inventory control, deterministic inventory model, EOQ model with quantity discount. **Queuing Models:** Concepts relating to queuing systems, basic elements of queuing model, role of Poison & exponential distribution, concepts of birth and death process.

                                                                                                    Total Hours: 45

REFERENCE BOOKS :
1. *J K Sharma, Operations Research Theory and Applications, MacMillan India Ltd.*
2. *N D Vohra, Quantitative Techniques in management, Tata McGraw Hill.*
3. *Handy A Taha, Operations Research – An Introduction, Prentice Hall of India, New Delhi.*
4. *Wagner H M, Principles of Operations Research: With Applications to Management Decisions, Prentice-Hall of India, New Delhi.*

8th SEMESTER ELECTIVES E-IV AND E-V (Common to CSE&IT)

Subject Code: **BCS18E24**	Subject Name : **INFORMATION STORAGE MANAGEMENT**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18004	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T / L/ ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Provides a comprehensive understanding of the various storage infrastructure components in data center environments.
- It enables participants to make informed decisions on storage-related technologies in an increasingly complex IT environment
- The adoption of software-defined infrastructure management and third platform technologies.
- It provides a strong understanding of storage technologies and prepares participants for advanced concepts, technologies, and processes.
- To learn the architectures, features, and benefits of intelligent storage systems
- Includes block-based, file-based, object-based, and unified storage; software-defined storage; storage networking technologies such as FC SAN, IP SAN, and FCoE SAN; business continuity solutions such as backup and replication; the highly-critical area of information security; and storage infrastructure management.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, CAS
CO2	Define backup, recovery, disaster recovery, business continuity, and replication
CO3	Understand logical and physical components of a storage infrastructure
CO4	Identify components of managing and monitoring the data center
CO5	Define information security and identify different storage virtualization technologies

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	H	H	H	H	H
CO2	H	H	M	H	H	H	M	H	H	H	H	H
CO3	H	H	H	H	H	H	M	M	H	M	H	M
CO4	H	H	H	H	H	M	M	M	H	H	H	H
CO5	H	H	H	H	H	H	M	M	H	M	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	M	H	H	H
CO3	H	M	M	H	H	M
CO4	H	M	M	H	H	H
CO5	H	H	H	H	H	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E24	INFORMATION STORAGE MANAGEMENT	Ty	3	0/0	0/0	3

OBJECTIVES:
- Provides a comprehensive understanding of the various storage infrastructure components in data center environments.
- It enables participants to make informed decisions on storage-related technologies in an increasingly complex IT environment
- The adoption of software-defined infrastructure management and third platform technologies.
- It provides a strong understanding of storage technologies and prepares participants for advanced concepts, technologies, and processes.
- To learn the architectures, features, and benefits of intelligent storage systems
- Includes block-based, file-based, object-based, and unified storage; software-defined storage; storage networking technologies such as FC SAN, IP SAN, and FCoE SAN; business continuity solutions such as backup and replication; the highly-critical area of information security; and storage infrastructure management.

UNIT I   Storage Systems   9Hrs
Information Storage - Evolution of Storage Technology and Architecture – Data Centre – Infrastructure – ILM – Components of Storage System Environment – Logical Components of Host RAID: Implementation, levels & comparison – ISS components, Intelligent Storage Array.

UNIT II   Storage Technologies   9Hrs
Networking Technologies & Virtualization DAS – SCSI – SAN – NAS –IPSAN – CAS –Forms of Virtualization.

UNIT III   Business Continuity   9Hrs
Information availability – BC Planning Life Cycle failure analysis – Backup & Recovery – Local Replication – Remote Replication.

UNIT IV   Storage Security   9Hrs
Storage Security Framework – Risk Triad – Storage Security Domains – Security Implementationin Storage Networking.

UNIT V   Managing Storage Infrastructure   9Hrs
Infrastructure – Storage Management Activities and Challenges – Developing an Ideal solution.

                                                                    Total Hours: 45

TEXT BOOK:
   1. EMC Corporation, Information Storage and Management, Wiley India, 2nd edition 2012

REFERENCE BOOKS:
   1. *Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill , Osborne,2003.*
   2. *Marc Farley, "Building Storage Networks", Tata McGraw Hill, Osborne, 2001.*

Subject Code: **BCS18E25**	Subject Name : **NETWORK INFRASTRUCTURE MANAGEMENT**	Ty/ Lb/ ETL	L	T/ S.Lr	P/ R	C
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To learn Network Layers functionality
- To acquire knowledge about and VLANs
- To understand IP routing, EIGRP and OSPF
- To test Network security and wireless security

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the use of network infrastructure
CO2	RecognizetheimportanceandrelevanceofVLANs and EIGRP
CO3	Troubleshoot the network infrastructure

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	H	H	M	M	M	M	M	H	H
CO2	H	H	M	H	M	H	M	H	H	H	M	H
CO3	H	H	M	H	H	M	H	M	H	M	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	M	M
CO2	M	H	H	H	H	H
CO3	H	H	H	H	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E25	**NETWORK INFRASTRUCTURE MANAGEMENT**	Ty	3	0/0	0/0	3

OBJECTIVES:
- To learn Network Layers functionality
- To acquire knowledge about and VLANs
- To understand IP routing, EIGRP and OSPF
- To test Network security and wireless security

UNIT I   Internetworking & Ip Addressing   9Hrs
Internetworking Models – Layered Approach – OSI Reference Models – Ethernet Networking – Cabling – Data Encapsulation – Three Layer Hierarchical model – core layer – distribution layer – Access layer – TCP/IP and DoD Model – IP Addressing – Hierarchical IP Addressing scheme - Broadcast Address.

UNIT II   Subnetting, VLSMAnd Ios   9Hrs
Subnetting basics – CIDR – VLSM Design – Summarization – Troubleshooting IP Addressing – IOS user interface – CLI – Router and switch Administrative Configuration – Router Interfaces – viewing, saving, and erasing configuration

UNIT III   Managing Internetwork And Ip Routing   9Hrs
Internal component of a Router – routing boot sequence – configuration register – backing up and restoring configuration – CDP – resolving hostnames – Checking network connectivity – IP routing basics – Static routing – default routing – dynamic routing – RIP – IGRP

UNIT IV   Eigrp, OSPF, STP and VLANS   9Hrs
EIGRP features – RTP – DUAL – EIGRP to support large Networks –Configuring EIGRP - Load balancing – OSPF terminology – Configuring and verifying OSPF – DR and BDR elections – Loopback interfaces – troubleshooting – STP spanning tree terms and operations – VLANs Basics – memberships – VTP – Configuring VLAN – Inter VLAN routing.

UNIT V   ACLS, NAT and Wireless Technologies   9Hrs
Access Lists, VTY access, advanced Access List, Named ACLs, monitoring Access List, configuring access list – NAT names – PAT configuration – NAT using SDM – Wireless technologies – Unified wireless solutions – split MAC architecture – MESH and LWAPP - wireless security

Total Hours: 45

TEXT BOOKS:
1. Todd Lammle, 2011 "CCNA Cisco Certified Network Associate study guide – Wiley India.
2. Brian Hill, 2013 "The complete Reference - Cisco " Tata McGraw-Hill.

REFERENCE BOOKS:
1. *Richard Deal, 2013 "CCNA Cisco Certified Network Associate study guide" Tata McGraw-Hill.*
2. *Steven Latre et al 2015 "Intelligent Mechanism for Network Component and Security" Springer.*

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Subject Code: **BCS18E26**	Subject Name : **FOUNDATIONS OF PARALLEL PROGRAMMING**	Ty/Lb/ETL	L	T/S.Lr	P/R	C
	Prerequisite: BCS18007	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T / L/ ETL: Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Fundamental concepts of Multi threaded, Parallel and Distributed Computing paradigms of parallel programs.
- Systematic methods for developing parallel programs.
- Techniques typical for parallel programming in Java.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understanding of Concurrent Programming Concepts
CO2	Understand and handle Semaphores and Monitors
CO3	Learn the Message Passing methods and Process Interaction for Parallel Programming
CO4	Understand the practical parallel programming scenarios and possibilities

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	L	L	L	L	M	M	L	M	L
CO2	H	H	M	L	L	L	L	M	M	L	M	L
CO3	H	M	M	L	L	L	L	M	M	L	M	L
CO4	H	M	M	L	L	L	L	L	M	M	L	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	M	L	L
CO2	H	H	L	M	L	L
CO3	H	M	L	M	L	L
CO4	H	H	L	M	L	L

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill			
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E26	FOUNDATIONS OF PARALLEL PROGRAMMING	Ty	3	0/0	0/0	3

OBJECTIVES:

- Fundamental concepts of Multi threaded, Parallel and Distributed Computing paradigms of parallel programs.
- Systematic methods for developing parallel programs.
- Techniques typical for parallel programming in Java.

UNIT I   Concurrent Programming Concepts   9Hrs
Concurrent programming concepts, Techniques for parallelizing programs, Shared Variable Programming: Process and Synchronisation - Synchronization, atomic actions, and await statements, Semantics of concurrent programs; ways to avoid interference, Safety and liveness properties; Critical sections: spin locks , efficient spin locks; fair solutions , Parallel programming concepts; bag of tasks paradigm; Pthreads library , Barriers: counter, coordinator, combining tree , Symmetric barriers; data parallel algorithms , Parallel scientific computing

UNIT II   Semaphores And Monitors   9Hrs
Semaphores: mutual exclusion, signaling, split binary, resource counting, dining philosophers, readers/writers , passing the baton, resource allocation and scheduling, Implementations of Semaphores in kernels, multiprocessors;
Monitors: basic concepts, signaling disciplines, synchronization techniques, larger examples; use in Java, Pthreads, Implementation of Monitors in Kernel

UNIT III   Message Passing And RMI   9Hrs
Message passing: basic concepts and examples , clients and servers , file servers, interacting peers, Synchronous, Message passing in MPI, and Java; **Remote operations**; RPC; Java RMI , **Rendezvous, distributed readers and writers**

UNIT IV   Process Interaction And Distributed Programming   9Hrs
Process interaction Paradigms: Managers/Workers, heartbeat algorithms; pipeline algorithms, Probe/Echo Algorithm, Broadcast Algorithm, Token Passing Algorithms - **Distributed programming**: replicated files, dining philosophers, distributed file systems

UNIT V   Parallel Programming   9Hrs
Speed and Efficiency, Overhead and Challenges – **Scientific Computing** : Grid Computations, Particle Computations, Matrix Computations – **Case Study of Parallel Programming Libraries** in Pthread, MPI and OpenMP **– Parallelizing Compilers** – Other Parallel Programming Models – **Parallel Programming Tools**

Total Hours: 45

TEXT BOOK:
1. Greg Andrews ,*2000, Foundations of Multithreaded, Parallel, and Distributed Programming*. Addison-Wesley, Digitized in 16 Nov 2007, ISBN 0201357526, 9780201357523

REFERENCE BOOK:
1. *Zbigniew J. Czech, 2016, Introduction to Parallel Computing, Cambridge University Press, ISBN 1316802787, 9781316802786*

Subject Code:	Subject Name :	Ty/	L	T/	P/R	C
BCS18E27	**VIRTUALIZATION**	Lb/ ETL		S.Lr		
	Prerequisite: BIT18007	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Candidates should know and understand the general concepts, theory and terminology of Virtualization.
- Work in Network virtualization

COURSE OUTCOMES (COs) : (3- 5)

CO1	Server virtualization and desktop virtualization
CO2	Virtual machines installation, configuration and administration
CO3	Introduction to networking fundamentals and layering structure

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	M	L	L	L	L	L	L	M
CO2	H	M	M	L	M	L	L	L	L	L	L	M
CO3	H	M	M	L	M	L	L	L	L	L	L	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	M	M	L
CO2	H	M	L	M	M	L
CO3	H	M	L	M	M	L

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty / Lb	L	T/ S.Lr	P/R	C
BCS18E27	VIRTUALIZATION	Ty	3	0/0	0/0	3

OBJECTIVES:
- Candidates should know and understand the general concepts, theory and terminology of Virtualization.
- Work in Network virtualization

UNIT I   Overview of Virtualization   9Hrs
Basics of Virtualization - Virtualization Types – Desktop Virtualization – Network Virtualization – Server and Machine Virtualization – Storage Virtualization – System-level or Operating Virtualization – Application Virtualization-Virtualization Advantages - Virtual Machine Basics – Taxonomy of Virtual machines - Process Virtual Machines - System Virtual Machines – Hypervisor - Key Concepts

UNIT II   Server Consolidation   9 Hrs
Hardware Virtualization – Virtual Hardware Overview - Sever Virtualization – Physical and Logical Partitioning - Types of Server Virtualization – Business cases for Sever Virtualization – Uses of Virtual server Consolidation – Planning for Development – Selecting server Virtualization Platform

UNIT III   Network Virtualization   9Hrs
Design of Scalable Enterprise Networks - Virtualizing the Campus WAN Design - WAN Architecture - WAN Virtualization - Virtual Enterprise Transport Virtualization–VLANs and Scalability - Theory Network Device Virtualization Layer 2 - VLANs Layer 3 VRF Instances Layer 2 - VFIs Virtual Firewall Contexts Network Device Virtualization - Data-Path Virtualization Layer 2: 802.1q - Trunking Generic Routing Encapsulation - IPsec L2TPv3 Label Switched Paths - Control-Plane Virtualization–Routing Protocols- VRF - Aware Routing Multi-Topology Routing.

UNIT IV   Virtualizing Storage   9Hrs
SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables – Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – SNIA Shared Storage Model – Host based Architecture – Storage based architecture – Network based Architecture – Fault tolerance to SAN – Performing Backups – Virtual tape libraries.

UNIT V   Virtual Machines Products   9Hrs
Xen Virtual machine monitors- Xen API – VMware – VMware products - Vmware Features – Microsoft Virtual Server – Features of Microsoft Virtual Server
                                                                                        Total Hours: 45

TEXT BOOKS:
1. William von Hagen (2008) Professional Xen Virtualization, Wrox Publications
2. Chris Wolf , Erick M. Halter (2005) Virtualization: From the Desktop to the Enterprise, APress
3.

REFERENCE BOOKS:
1. *Reddy, Victor Moreno (2006) Network virtualization, Cisco Press*
2. *James E. Smith, Ravi Nair (2005) Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann*
3. *David Marshall, Wade A. Reynolds (2006) Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach Publications*

Subject Code:	Subject Name :		Ty/	L	T/	P/R	C

BCS18E28	HADOOP DISTRIBUTED FILE SYSTEM	Lb/ ETL		S.Lr		
	Prerequisite: BCS18006	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To understand the concepts of Distributed file system
- To acquire knowledge about Hbase, YARN, PIG and OOZIE
- To understand MapReduce types and formats
- To examine Hadoop Usage
- To understand the concepts of NoSQL, Flume and Sqoop

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the application of distributed file system.
CO2	Recognize the importanceandrelevanceofHDFS.
CO3	Create efficient application using Pig and Oozie.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	H	H	H	M	M	M	H	M	H	H
CO2	H	M	H	M	H	M	M	H	M	H	M	M
CO3	H	H	M	H	H	M	M	M	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	M	M
CO2	M	M	H	M	H	H
CO3	H	H	H	M	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

SUBJECT CODE	SUBJECT NAME	Ty/ Lb	L	T/ S.Lr	P/R	C
BCS18E28	HADOOP DISTRIBUTED FILE SYSTEM	Ty	3	0/0	0/0	3

OBJECTIVES:
- To understand the concepts of Distributed file system
- To acquire knowledge about Hbase, YARN, PIG and OOZIE
- To understand MapReduce types and formats
- To examine Hadoop Usage
- To understand the concepts of NoSQL, Flume and Sqoop

UNIT I   Hadoop Introduction   9Hrs
Distributed and parallel computing - HDFS and MapReduce – Hadoop function – cloud deployment and delivery model – In memory computing technology – Hadoop ecosystem – Hadoop distributed file system – HDFS architecture – HDFS files – HDFS high availability – Hadoop YARN – Hbase and HDFS – Hive – Pig – Sqoop – ZooKeeper – Flume – Oozie.

UNIT II   MapReduce, HBase And Big Data Technology   9Hrs
MapReduce framework – optimaize MapReduce job – roles of HBase in Big Data Processing. Big Data stack – Virtualization and Big Data – Virtualization Approaches – CAP Theorem – non-relational database – polyglot persistence – Big Data analytics and Data warehouse – simple MapReduce application – designing MapReduce.

UNIT III   YARN And Hive   9hrs
Background of YARN – Advantages – Architecture –schedulers – configurations – commands – YARN containers – Registry – Hive Services – data types – built in functions – Hive DDL – data manipulation in Hive – Data retrieval Queries – using JOINS in Hive.

UNIT IV   Pig And Oozie   9Hrs
Pig architecture – running Pig – Pig Latin – working with operators in Pig – Debugging Pig – functions in pig – Error Handling in Pig – Oozie – benefits – configuration – Oozie workflow – Oozie coordinator – Oozie bundle – Oozie parameterization – Oozie job execution model – Oozie SLA.

UNIT V   NosQL, Flume And Sqoop   9Hrs
Characteristics of NoSQL – Types of NoSQL data Models – Schema less databases – materialized view – distribution models – sharding – Flume – Flume Architecture – Sqoop – importing data – Mahout – machine learning – collaborative filtering – clustering – classification – Mahout algorithms – Environment for Mahout

Total Hours: 45

TEXT BOOKS:
1. DT Editorial Services, 2016 "Big Data Black Book" dreamteck press .
2. Alex Holmes, 2015 " Hadoop in Practice" dreamteck press.

REFERENCE BOOKS:
1. *Tom White, 2015 " Hadoop – The Definitive Guide 4th edition Oreilly.*
2. *Shiva Achari 2015 " Hadoop Essentials" Packt Publishing.*
3. *Henry H Liu, 2014 "Hadoop 2 Essential" Creative Independent Publishing.*
4. *Jeffrey Aren, 2017 "Sams Teach Yourself Hadoop in 24 hours" Pearson.*

Subject Code: BCS18E29	Subject Name : MOBILE DATABASES		Ty/ Lb/ ETL	L	T/ S.L r	P/R	C
	Prerequisite: BCS18004		Ty	3	0/0	0/0	3

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To learn about the fundamentals of distributed databases
- To understand Data Processing and mobility models
- To learn about the Data Consistency and Concurrency Control mechanisms
- To study mobile Database Recovery techniques and Wireless Information Broadcast schemes

COURSE OUTCOMES (COs) : (3- 5)

CO1	Design and implement a complete problem solution using current database technology
CO2	Propose, implement and maintain database security mechanisms
CO3	Become familiar with the expanding role of Mobile database technology.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	M	H	H	H	H	H
CO2	M	H	M	H	H	M		M	M	M	L	L
CO3	H	M	H	M	M	H	H	H		L	M	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M		H	H	H	H
CO2	H	H	M	L	H	L
CO3	H	M	H	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E29	MOBILE DATABASES	Ty	3	0/0	0/0	3

OBJECTIVES:
- To learn about the fundamentals of distributed databases
- To understand Data Processing and mobility models
- To learn about the Data Consistency and Concurrency Control mechanisms
- To study mobile Database Recovery techniques and Wireless Information Broadcast schemes

UNIT I   Introduction   9Hrs
Fully connected information space – Types of Mobility – Wireless Network Communication. Radio Frequency: Spectrum and Band – Cellular Communication - Continuous Connectivity – Structure of a Channel – Absence of Free Channel – Signal Fading – Frequency Reuse – PCS and GSM – PCS Personal Communication Service – Interface – Call Processing – GSM Global System for Mobile Communication – Location and Handoff Management – Location Management – Handoff Management – Roaming.

UNIT II   Fundamentals of Distributed Databases   9Hrs
Conventional Database Architecture – Database Partition and Distribution – Database Processing – Transaction Structure – Serialization of Transactions – Serializability – Based Correctness Criteria – Serializability Theory – Degree of Isolation – Advanced Transaction Model – Nested Transaction Model – SAGA – Cooperative Transaction – ConTract – Flex Transaction – Introduction to Concurrency Control Mechanisms – Ways of Locking Data Items – The Phantom Problem – Multigranularity Locking – Heuristic Approach in Locking Schemes – Non-Locking Based Schemes

UNIT III   Data Processing and Mobility   9Hrs
Effect of Mobility on the Management of Data – Transaction Management in Mobile Database Systems – Mobile Database System – Transaction Execution in MDS – Mobile Transaction Model – Execution Model based on ACID Transaction 230 CS-Engg&Tech-SRM-2013 Framework – Pre-write Transaction Execution Model – Mobile Transaction Models – HiCoMo – Moflex - Kangaroo – MDSTPM Transaction Execution Model – Mobilaction – Atomicity for Mobilaction – Isolation for Mobilaction – Consistency and Durability for Mobilaction

UNIT IV   Data Consistency and Concurrency   9Hrs
 Data Consistency in intermittent |Connectivity - The Consistency Model – Weak Connectivity Operation – A Consistency Restoration Schema – Concurrency Control Mechanism – Transaction Commit – Commitment of Mobile Transactions – Transaction Commitment in Mobile Database Systems.

UNIT V   Mobile Database Recovery   9Hrs
Log Management in Mobile Database Systems – Mobile Database Recovery Schemes – Wireless information Broadcast – introduction – Broadcast Disk – Broadcast Infrastructure – Exponential Index – Location-Based Indexing – OnDemand Data Scheduling – Data Dissemination System.

Total Hours: 45

TEXT BOOK:
    1. Vijay Kumar , 2006 "Mobile Database Systems", Wiley Inderscience Publication, 2006
REFERENCE BOOKS:
    1. *Leong (Hong VA) , 1999 Lee (Wang Chen), "Mobile Data Access", Springer.*
    2. *Rifaat A. Dayem, 1997 "Mobile Data & Wireless LAN Technologies", Prentice Hall Inc.*
    3. *TAN(Kian Lee), Franklin(Michael J), "Mobile Data Management", Springer.*

Subject Code: BCS18E30	Subject Name : WEB ENGINEERING		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BIT18I02		Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To be able to analyze and design comprehensive systems for the creation, dissemination, storage, retrieval, and use of electronic records and documents
- To learn and use some of the client-side and server-side languages used to manipulate information on the World Wide Web – i.e. ASP.NET, and Javascript.
- To learn techniques and evaluation metrics for ensuring the proper operability, maintenance and security of a web application.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Apply the web engineering methodologies for Web application development
CO2	Develop a component based web solution and use UML diagrams to describe such a solution.
CO3	Identify and discuss the security risk of a Web application.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	H	M	M	H	M	M	L	L	M	M
CO2	M	M	M	H	M	M	M	M	H	M	M	M
CO3	H	L	M	H	H	L	L	L	M	H	L	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	M	M	H	H	H
CO2	M	M	L	M	M	M
CO3	L	L	M	M	L	L

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

DEPARTMENT OF INFORMATION TECHNOLOGY
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E30	**WEB ENGINEERING**	Ty	3	0/0	0/0	3

OBJECTIVES:
- To be able to analyze and design comprehensive systems for the creation, dissemination, storage, retrieval, and use of electronic records and documents
- To learn and use some of the client-side and server-side languages used to manipulate information on the World Wide Web – i.e. ASP.NET, and Javascript.
- To learn techniques and evaluation metrics for ensuring the proper operability, maintenance and security of a web application.

UNIT I   Web-Based Systems   9 Hrs
The Web-Web Applications-Web Engineering-The Components of Web Engineering

UNIT II   A Web Engineering Process   9 Hrs
Defining the Framework-Incremental Process Flow- Generic Actions and Tasks for the Web Framework-Umbrella Activities

UNIT III   Communication   9 Hrs
The Communication Activity – Formulation – Elicitation- Identifying Web App Increments- Negotiation

UNIT IV   Planning   9 Hrs
 Refining Framework Activities-Building a Web Team - Managing Risk - Developing a Schedule

UNIT V   The Modelling Activity: 9 Hrs
Modelling as a Concept - Modelling Frameworks - Modelling Languages - Existing Modelling Approaches
Total Hours: 45

TEXT BOOK:
1. Web Engineering: A Practitioner's Approach by Roger Pressman and David Lowe, McGraw-Hill, 2009.

REFERENCE BOOKS:
1. *Denise M. Woods and William J. Dorin 2012 HTML and CSS: Comprehensive 7th edition,. Publisher: Cengage Learning; ISBN-10: 1133526144*
2. *Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, 2012 Internet & World Wide Web How to Program, 5/e Pearson Education.*

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Subject Code: **BCS18E31**	Subject Name : **4G NETWORKS**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T / L/ ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To understand the latest technology in mobile communication.
- To know recent development in wireless communication.
- To understand the high speed data communication through wireless network
- To learn the technology behind VoLTE, VoIP technology

COURSE OUTCOMES (COs) : (3- 5)

CO1	Able to develop new technology in wireless communication
CO2	Capable to design new protocols for high speed mobile devices
CO3	Able to design new air interface for effective communication in mobile technology

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	L	H	M	M	H	H	H	H	M
CO2	H	M	M	M	H	H	M	M	H	H	H	M
CO3	H	H	H	M	L	H	M	M	H	M	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	M	H	H	H
CO2	H	H	M	M	H	M
CO3	H	M	M	M	H	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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2018 Regulation

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E31	4G NETWORKS	Ty	3	0/0	0/0	3

OBJECTIVES:
- To understand the latest technology in mobile communication.
- To know recent development in wireless communication.
- To understand the high speed data communication through wireless network
- To learn the technology behind VoLTE, VoIP technology

UNIT I   LTE Network Architecture and Protocols   9 Hrs
Evolution of 3GPP Standards-Radio Interface Techniques in 3GPP Systems-Radio Access Mode Operations-Spectrum Allocation in UMTS and LTE-EPS Interfaces-EPS Protocols and Planes-EPS Procedures.

UNIT II   LTE Air Interface and Procedures   9 Hrs
LTE Protocol Stack - SDU and PDU - LTE Radio Resource Control (RRC) - LTE Packet Data Convergence Protocol Layer (PDCP)- LTE Radio Link Control (RLC)- LTE Medium Access Control (MAC) - LTE Physical Layer (PHY)- Channel Mapping of Protocol Layers- LTE Air Interface

UNIT III   Analysis and Optimization of LTE System Performance   9Hrs
Deployment Optimization Processes - LTE Performance Analysis Based on Field Measurements - LTE Case Studies and Troubleshooting- LTE Inter-RAT Cell Reselection- Inter-RAT Cell Reselection Optimization Considerations- LTE to LTE Inter-frequency Cell Reselection- LTE Connected Mode Discontinuous Reception - Circuit Switch Fallback (CSFB) for LTE Voice Calls- Multiple-Input, Multiple-Output (MIMO) Techniques.

UNIT IV   Coverage And Capacity Planning Of 4G Networks   9 Hrs
LTE System Foundation- PCI and TA Planning- PRACH Planning- Coverage Planning- LTE Throughput and Capacity Analysis.

UNIT V   Voice Evolution in 4G Networks   9 Hrs
Voice over IP Basics- Voice Options for LTE- IMS Single Radio Voice Call Continuity- VoLTE Features-Deployment Considerations for VoLTE. Carrier Aggregation- Enhanced MIMO.

Total Hours: 45

TEXT BOOK:
1. Design, Deployment and Performance of 4G-LTE Networks- A Practical Approach- Ayman Elnashar Emirates Integrated Telecomms Co., UAE- Mohamed A. El-saidny QUALCOMM Technologies, Inc., USA- Mahmoud R. Sherif Emirates Integrated Telecomms Co., UAE. Wiley Publication.

REFERENCE BOOK:
1. *Clint Smith, P.E., Daniel Collins, Wireless Networks: Design and Integration for TE,EVDO,HSPA and WiMax Third Generation.*

Subject Code:	Subject Name : **ENTERPRISE RESOURCE PLANNING**		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E32	Prerequisite: NIL		Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Know basic business functional areas and explains how they are related.
- Illustrate how unintegrated information systems fail to support business decision and how integrated information systems can help a company prosper by providing business managers with accurate, consistent, and current data.
- Understand how Enterprise Resource Planning software is used to optimize business processes Acquire experience in using ERP software that can be applied in further coursework

COURSE OUTCOMES (COs) : (3- 5)

CO1	Able to integrate Business Enterprises, with web through Service Oriented Architecture
CO2	Understand how technology has evolved and the reason why existing systems are the way they are.
CO3	Can explore the synergy between information and communication systems and how this synergy can be best exploited for EAI and B2B integration

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	H	H	H	H	L	H	M	H	H
CO2	H	H	H	M	H	H	H	M	H	H	H	H
CO3	H	M	H	H	H	M	H	L	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	H
CO2	H	H	M	H	M	M
CO3	H	H	H	M	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E32	**ENTERPRISE RESOURCE PLANNING**	Ty	3	0/0	0/0	3

OBJECTIVES:
- Know basic business functional areas and explains how they are related.
- Illustrate how unintegrated information systems fail to support business decision and how integrated information systems can help a company prosper by providing business managers with accurate, consistent, and current data.
- Understand how Enterprise Resource Planning software is used to optimize business processes Acquire experience in using ERP software that can be applied in further coursework

UNIT I   Introduction   9 Hrs
Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to be consider in planning design and implementation of cross functional integrated ERP systems - Case studies.

UNIT II   ERP Solutions And Functional Modules   9 Hrs
Overview of ERP software solutions- Small medium and large enterprise vendor solutions, BPR, Business Engineering and best Business practices - Business process Management. Overview of ERP modules -sales and Marketing, Accounting and Finance, Materials and Production management etc. -Case studies.

UNIT III   ERP Implementation   9 Hrs
Planning Evaluation and selection of ERP systems-Implementation life cycle - ERP implementation, Methodology and Frame work- Training – Data Migration. People Organization in implementation- Consultants, Vendors and Employees-Case studies.

UNIT IV   Post Implementation   9 Hrs
Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of and ERP Implementation -case studies.

UNIT V   Emerging Trends on ERP   9 Hrs
Extended ERP systems and ERP bolt –on -CRM, SCM, Business analytics etc- Future trends in ERP systems-web enabled, Wireless technologies so on-Case studies.

Total Hours: 45

TEXT BOOK:
1. Alexis Leon, 2006 ERP demystified, second Edition Tata McGraw-Hill.

REFERENCE BOOKS:
1. *Jagan Nathan Vaman, 2008 ERP in Practice, Tata McGraw-Hill.*
2. *Alexis Leon, 2008 Enterprise Resource Planning, second edition, Tata McGraw-Hill.*
3. *Mahadeo Jaiswal and Ganesh Vanapalli, 2006 ERP Macmillan India.*
4. *Vinod Kumar Grag and N.K. Venkitakrishnan,2006, ERP- Concepts and Practice, Prentice Hall of India.*
5. *Summer, 2008 ERP, Pearson Education.*

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Subject Code: BCS18E33	Subject Name : SUPPLY CHAIN MANAGEMENT		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL		Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
- This will provide the foundation for design and analysis of supply chains.
- For students to analytically solve problems related to inventory management, facility
- location, and supply chain optimization.
- To utilize computer resources to research and analyze supply chain operations.
- To understand the global environment and strategic alliances in modern business and their impact on supply chain management.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand recent trends in green legislation with respect to supply chains.
CO2	Understand the environmental impacts of supply chains and hence the need for green supply chains
CO3	Integrate green practices, based on green legislation, into supply chain activities for sustainable development

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M	H	H	L	H	M	H	H
CO2	H	H	M	H	H	H	H	M	H	M	H	H
CO3	H	H	H	H	M	M	H	L	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	L	M
CO2	H	H	M	H	H	M
CO3	H	H	M	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill Soft Skills			
					✔						

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2018 Regulation

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E33	SUPPLY CHAIN MANAGEMENT	Ty	3	0/0	0/0	3

OBJECTIVES:
- This will provide the foundation for design and analysis of supply chains.
- For students to analytically solve problems related to inventory management, facility
- location, and supply chain optimization.
- To utilize computer resources to research and analyze supply chain operations.
- To understand the global environment and strategic alliances in modern business and their impact on supply chain management.

UNIT I   Introduction   9 Hrs
Defining Supply Chain management and logistics management. Evolution. Supply Chain – Fundamentals, , and Importance. Supply chain strategy, Enablers/ Drivers of Supply Chain Performance. Supply Chain relationships.

UNIT II   Logistics Management   9 Hrs
Logistics – functions, objectives, solution. Customer Service. Warehousing and Material Storage, Material Handling, Transportation and Packaging – 3PL and 4PL.

UNIT III   Network Design   9 Hrs
Distribution Network Design – Role, Factors Influencing, Options, Value Additions. Models for Facility Location and Capacity allocation. Impact of uncertainty on Network Design. Network Design decisions using Decision trees.

UNIT IV   Sourcing And Inventory Management   9 Hrs
Sourcing – Make vs buy decision, Creating World Class Supply base, World Wide Sourcing Inventory Management – managing cycle inventory, safety inventory. Value of information, Bullwhip effect, Coordination in supply chain, Analysing impact of supply chain redesign on the inventory.

UNIT V   Current Trends   9 Hrs
E-Business – Framework and Role of Supply Chain in e- business and b2b practices. Supply Chain IT Framework.E-Supply Chains, E – Logistics- eSRM, eLRM, eSCM, Agile Supply Chains. Reverse Logistics, Global Logistics.

Total Hours: 45

TEXT BOOKS:
1. Bowersox Donald J, 2000 Logistical Management – The Integrated Supply Chain Process" Tata McGraw Hill.
2. Sunil Chopra and Peter Meindl, 2007 Supply Chain Management-Strategy Planning and Operation, Prentice Hall.

REFERENCE BOOKS:
1. *Donald J. Bowersox, David J. Closs and M. Bixby Cooper, 2008 "Supply Chain Logistics Management", Tata McGraw Hill.*
2. *Altekar Rahul V, 2005 Supply Chain Management-Concept and Cases, Prentice Hall India.*

Subject Code: BCS18E34	Subject Name : MAIN FRAME COMPUTING	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18004	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To understand the concepts of MVS, JCL, VSAM and IDCAMS
- To study the details of COBOL and DB2
- To understand CICS and supply transactions

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the concepts of MVS, JCL, VSAM and IDCAMS
CO2	Write moderately complex COBOL programs to process files.
CO3	Understand CICS and supply transactions

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M	H	M	M	H	M	H	H
CO2	H	H	H	H	M	H	M	M	H	H	H	H
CO3	H	H	H	M	M	M	M	M	H	H	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	M	H	M	M
CO3	H	H	M	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E34	MAINFRAME COMPUTING	Ty	3	0/0	0/0	3

OBJECTIVES:
- To understand the concepts of MVS, JCL, VSAM and IDCAMS
- To study the details of COBOL and DB2
- To understand CICS and supply transactions

UNIT I   MVS Concepts   9 Hrs
Main frame in Todays Business -Introduction to Z series H/W , Z/OS .- MVS overview-system initialization-storage management-job management ISPF Editor ISPF Data Utility Functions -managing work-data management-I/O processing-termination and recovery.TSO commands-general syntax of JCL statements

UNIT II   JCL and VSAM   9 Hrs
Explanation of job statements-explanation of EXEC statements-explanation of DD statements-additional parameters on JOB,EXEC,DD statements-classification-instream and catalog procedures-utilities-abend codes.VSAM data set organization structure-IDCAMS commands-JCL for VSAM-buffering-alternative index-repro-backup and recovery-export and import.

UNIT III   COBOL/370   9Hrs
Structured programming constructs-fundamentals of COBOL-data definition-conditional statements-perform statements-compiler option-table definition-COBOL call and parameter passing-file handling.

UNIT IV   DB2   9Hrs
RDBMS concepts-structural query language-normalisation-DB2 architecture-DB2 objects-locks-program preparation-cursors-null indicators-optimisation - utilities.

UNIT V   CICS   9Hrs
CICS introduction-terminal control-application house keeping-EXEC,interface locks-supply transactions – CESM,CESF,CEMT,CEDF-NMDS-BMS-abend codes-file control-program control-TSQ-TDQ-pseudo conversation-recovery and roll back.

Total Hours: 45

TEXT BOOKS:
1. Mike Ebbers, John Kettner,WayneO'Brien,Bill Ogden,(2011) Introduction to the New Mainframe: z/OSBasics, IBM Redbooks(SG24-6366-01)
2. Alexis Leon , IBM Mainframe Handbook, vikas Publishing, 2014

REFERNCE BOOKS:
1. *M.K. Roy and D.GoshDastidar ,(2006) COBOL PROGRAMMING,John Wiley And Sons*
2. *Stern & Stern (2007) STRUCTURED COBOL PROGRAMMING,(8th ed.),JOHN Wiley India*
3. *Grant Allen(2008) Beginning DB2 : from Novice to Professional , Apress*
4. *Mary Lovelace, Jose Dovidauskas, Alvaro Salo, Valerio Sokai, (2012) VSAM Demystified (SG246105)IBM Red Books*
5. *Doug Lowe ,(1994) MVS JCL,(2nd ed.),MIKE MURACH ASSOCIATE*
Saba Zamir, ChandanRanade , (2007) MVS JCLPrimer,McGrawhil

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Subject Code: **BCS18E35**	Subject Name : **NEURO FUZZY COMPUTING**		Ty/ Lb/ ETL	L	T/ S.L r	P/ R	C
	Prerequisite: BCS18E06		Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
- The students will be able to design and develop neuro fuzzy modeling and will have the ability to understand Neural Network.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To know about the basics of soft computing techniques and also their use in some real life situations
CO2	To solve the problems using neural networks techniques.
CO3	To find the solution using different fuzzy logic techniques

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H	H	M	H	H	M	L	H	H
CO2	H	H	M	H	H	M	H	H	M	M	H	H
CO3	H	H	M	H	M	M	M	H	M	L	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	H	H
CO2	H	M	H	H	M	H
CO3	H	M	H	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E35	NEURO FUZZY COMPUTING	Ty	3	0/0	0/0	3

OBJECTIVE:
- The students will be able to design and develop neuro fuzzy modeling and will have the ability to understand Neural Network.

UNIT I   Neuro – Fuzzy and Soft Computing Fuzzy Systems   9 Hrs
Introduction to Fuzzy Sets – Fuzzy Rules and -   - Fuzzy Reasoning and - Inference- Fuzzy Inference Systems - Compositional Rules of Inference in Fuzzy System – Defuzzification Strategies , Fuzzy Models– System Identification – Several Least Square Methods – Optimization Techniques- Derivative-based Optimization, Derivative and Free Optimization.

UNIT II   Regression and Optimization   9 Hrs
System Identification – Several Least Square Methods – Optimization Techniques- Derivative-based and Derivative Free Optimization.

UNIT III   Neural Network   9 Hrs
Neural Network Architecture -Network Inputs and Outputs – Feed back Inter Connections and Network Stability – Feed Forward Networks –Back Propagation Networks- Learning Methods- Adaptive Networks – Supervised Learning Neural Networks –RBFN – Unsupervised Learning Networks - Self Organizing maps,   Adaptive Resonance Architectures, Radial Basis Networks- LVQM , Principle Component Anlaysis.

UNIT IV   Neuro Fuzzy Modelling   9 Hrs
Neural Component of a Fuzzy System – Fuzzy neural Network Controllers – Adaptive Neuro Fuzzy Inference System(ANFIS) – CANFIS – Neural Networks based Fuzzy Inference System - Classification and Regression Tests – Data Clustering Techniques and Algorithms – Rule base Structure Identification

UNIT V   Artificial Neural Networks Hardware   9 Hrs
Implementation Issues – Evaluation of Neural network Architectures – Hardware Realization – VLSI approach – Optical techniques.

Total Hours: 45

TEXT BOOK:
1. Jyh-shing roger Jang, Chnesy-tasi sur, Eiji Miziltazui," *Neuro and Soft Computing: A Computational Approach to Learning and machine Intelligence*", Pearson Education 2004, Digitized in 2007 ISBN 0132610663, 9780132610667

REFERENCE BOOKS:
1. *Timothy J.rass (2011), " Fuzzy Logic with Engineering Application", (3rd ed.)Wiley India,*
2. *S.Rajasekaran , G.A.Vijayalakshmi Pai , Neural N/Ws, Fuzzy Logic and Genetic Algorithm Sysnthesis and Applications, PHI (2004)*

Subject Code: **BCS18E36**	Subject Name : **WEB CONTENT MANAGEMENT**	Ty/ Lb/ ET L	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18E09	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T / L/ ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- To Learn the basics of Content Management System
- To Learn the Tools and techniques
- To Learn the use of web browser,navigate to a web page
- To Learn the CMS tools for backup and customization

COURSE OUTCOMES (COs) : (3- 5)

CO1	Exploring CMS terminology, including open source, PHP, etc.,
CO2	Capable of designing personalized template for content publishing.
CO3	Implementing API code for text editor.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	L	H	M	M	H	H	H	H	M
CO2	H	M	M	M	H	H	M	M	H	H	H	M
CO3	H	H	H	M	L	H	M	M	H	M	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	M	H	H	H
CO2	H	H	M	M	H	M
CO3	H	M	M	M	H	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E36	WEB CONTENT MANAGEMENT	Ty	3	0/0	0/0	3

OBJECTIVES:

The student should be able:

- To Learn the basics of Content Management System
- To Learn the Tools and techniques
- To Learn the use of web browser,navigate to a web page
- To Learn the CMS tools for backup and customization

UNIT I   Introduction to Content Management   9 Hrs

CMS – Types of CMS –Create Content –System Versus implementation – Platform versus product – Open source versus commercial – management versus delivery – Content model manageability

UNIT II   Editorial Tools and Workflow   9 Hrs

Shape of Content – Aggregation Models: Implicit and Explicit – URL Addressability of Aggregations – Content Lifecycle – workflow and approvals – Content File Management - Permissions

UNIT III   Output and Publication Management   9 Hrs

Templating - Publishing Content – Multiple Language handling – Language Rules – Personalization, Analytics and Marketing Automation – Form Building – URL Management – Reporting Tools and Dashboards

UNIT IV   Implementation   9 Hrs

APIs and Extensibility: Code API-Event Models-Customizing Rich Text Editors – CMS implementation – Types of implementation – Implementation process

UNIT V   Working With External Integrators   9 Hrs

Engagement models – Sales and scoping – costs –Written agreements – Production – Training and support

Total Hours: 45

TEXT BOOK:

1. Deane Barker,2016, Web content Management systems, Features and Best Practices, O'Reilly Publications

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Subject Code: **BCS18E37**	**Subject Name :** **MACHINE LEARNING**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18E06	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To learn machine learning techniques
- To acquire knowledge about clustering and nonparametric methods
- To understand multilayer perceptrons and dimensionality reduction
- To design and analyze machine learning experiments.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the concept of Machine Learning
CO2	RecognizetheimportanceandrelevanceofMachine Learning Models
CO3	Design the efficient Machine Learning Application .

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H	H	M	M	M	H	M	H	H
CO2	M	H	M	H	H	M	M	H	M	H	M	H
CO3	H	H	M	H	H	M	H	M	H	M	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	M	H	M	M
CO2	M	M	H	M	H	H
CO3	H	H	H	M	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E37	**MACHINE LEARNING**	Ty	3	0/0	0/0	3

OBJECTIVES:
- To learn machine learning techniques
- To acquire knowledge about clustering and nonparametric methods
- To understand multilayer perceptrons and dimensionality reduction
- To design and analyze machine learning experiments.

UNIT I   Introduction to Machine Learning   9Hrs
Machine Learning – Machine learning applications – learning association – supervised learning – learning a class from examples – learning multiple classes – regression – model selection and generation – Bayestan decision theory – losses and risk – discriminant functions – association rules.

UNIT II   Parametric and Multivariate Methods   9Hrs
Parametric methods – maximum likelihood estimation – Baye's estimator – parametric classification – regression – tuning model – multivariate methods – multivariate data – multivariate normal distribution – multivariate regression – dimensionality reduction – subset selection – factor analysis – multidimensional scaling – Isomap

UNIT III   Clustering and Nonparametric Methods   9Hrs
Clustering - Mixtures densities – k mean clustering – special and hierarchal clustering – Nonparametric density estimation – generalization to multivariate data – nonparametric classification – outlier data – decision trees – univariate trees – pruning – rule extraction from trees – multivariate trees.

UNIT IV   Linear Discrimination and Multilayer Perceptrons   9Hrs
Linear discrimination – generalizing the linear model – pair wise separation – logistic discrimination – discrimination by regression – multilayer preceptrons – MLP – back propagation algorithms – training procedures – tuning – dimensionality reduction – deep learning – local models – competitive learning – radial basis – normalized basis – learning vector quantization - mixture of experts.

UNIT V   Kernel Machines and Graphical Models   9Hrs
Kernel machine – optimal separating hyper plane – v SVM – multiple kernel learning – large margin nearest neighbour classifier – graphical models – generative models – d Separation -
belief propagation – Hidden morkov models – Bayesten estimation – combining multiple learners – reinforcement learning.

Total Hours: 45

TEXT BOOKS:
1. Ethem Alpaydin, 2014 "Introduction to Machine Learning" 3r.d Edition PHI
2. Snila Gollapudi, 2016 "Practical Machine Learning" PACKT.

REFERENCE BOOKS:
1. *Tom M Mitchell, 2013 "Machine Learning" McGraw-Hill.*
2. *David Barber, 2015 "Bayesian Reasoning and Machine Learning" Cambridge University Press.*

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Subject Code: BCS18E38	Subject Name : M - COMMERCE	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BIT18I02	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES
- To understand the E – commerce strategies and value chains
- To understand the M-commerce services
- To understand M – commerce infrastructure and applications.
- To know the availability of latest technology and applications of M- commerce in various domains.
- To apply mobile commerce in business-to-business application.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Various forms of wireless communication and the standards and architecture of wireless LAN
CO2	Concepts of mobile communications, their architecture and procedures; and
CO3	Mobile networking and application layer including WAP protocols

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	M	H	M	H	M
CO2	H	H	H	H	H	H	H	M	H	H	M	M
CO3	H	H	H	H	H	M	M	M	M	M	M	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E38	M- COMMERCE	Ty	3	0/0	0/0	3

OBJECTIVES:
- To understand the E – commerce strategies and value chains
- To understand the M-commerce services
- To understand M – commerce infrastructure and applications.
- To know the availability of latest technology and applications of M- commerce in various domains.
- To apply mobile commerce in business-to-business application.

UNIT I: Electronic Commerce 9 Hrs

Traditional commerce and E-commerce – Internet and WWW – Role of WWW – Value Chains – Strategic Business And Industry Value Chains – Role of E-commerce. Packet Switched Networks – TCP/IP Protocol Script – Internet Utility Programmes – SGML, HTML and XML – Web Client And Servers – Web Client/Server Architecture.

UNIT II: Mobile Commerce 9 Hrs

Introduction – Infrastructure of M–Commerce – Types Of Mobile Commerce Services – Technologies Of Wireless Business – Benefits And Limitations, Support, Mobile Marketing & Advertisement, Non–Internet Applications In M–Commerce – Wireless/Wired Commerce Comparisons.

UNIT III: Mobile Technology 9Hrs

A Framework For The Study Of Mobile Commerce – NTT Docomo's I-Mode – Wireless Devices For Mobile Commerce – Towards A Classification Framework For Mobile Location Based Services – Wireless Personal And Local Area Networks .

UNIT IV: Theory and Applications 9Hrs

The Ecology Of Mobile Commerce – The Wireless Application Protocol – Mobile Business Services – Mobile Portal – Factors Influencing The Adoption of Mobile Gaming Services – Mobile Data Technologies And Small Business Adoption And Diffusion – E–commerce in The Automotive Industry – Location– Based Services.

UNIT V: Business– To– Business Mobile E– Commerce 9Hrs

Enterprise Enablement – Email and Messaging – Field Force Automation (Insurance, Real Estate, Maintenance, Healthcare) – Field Sales Support (Content Access, Inventory) – Asset Tracking and Maintenance/Management – Remote IT Support – Customer Retention (B2C Services, Financial, Special Deals) – Warehouse Automation – Security.

Total Hours: 45

Text Books:
1. E.BrianMennecke, J.TroyStrader, (2005) Mobile Commerce: Technology, Theory and Applications, Idea Group
2. Ravi Kalakota, B.AndrewWhinston,(2007) Frontiers of Electronic Commerce, Pearson Education

Reference Books:
1. P. J. Louis (2009) M-Commerce Crash Course, McGraw- Hill Companies
2. Paul May (2006) Mobile Commerce: Opportunities, Applications, and Technologies Of Wireless Business,,Cambridge University Press.

Subject Code: **BCS18E39**	Subject Name : **REAL TIME SYSTEMS**	Ty/ Lb/ ETL	L	T/ S.Lr	P/ R	C
	Prerequisite:BCS18006	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/LbETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Real-time scheduling and schedulability analysis
- Formal specification and verification of timing constraints and properties
- Design methods for real-time systems
- Development and implementation of new techniques to advance the state-of-the-art real-time systems research

COURSE OUTCOMES (COs) : (3- 5)

CO1	An ability to understand advanced concepts in theory of computer science
CO2	An ability to understand advanced concepts in applications of computer science
CO3	An ability to apply knowledge of advanced computer science to formulate the analyze problems in computing and solve them

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	M	H	M	L	M	M	M	H	H
CO2	L	M	M	H	H	M	M	H	H	H	L	H
CO3	H	M	L	H	M	L	H	M	L	L	M	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	H	M	M	M	H	M	M	M
CO2	M	M	M	L	M	H	M	M
CO3	H	L	L	M	M	H	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E39	REAL TIME SYSTEMS	Ty	3	0/0	0/0	3

OBJECTIVES:
Student Learning Objectives/Outcomes:
- Real-time scheduling and schedulability analysis
- Formal specification and verification of timing constraints and properties
- Design methods for real-time systems
- Development and implementation of new techniques to advance the state-of-the-art real-time systems research

UNIT I   Introduction   9 Hrs
Architecture of real time systems/embedded systems-operating systems issues-performance measures-estimating program run times.

UNIT II   Task Assignment and Scheduling   9 Hrs
Uniprocessor scheduling-IRIS tasks-task assignment algorithms- mode changes –fault tolerance scheduling.

UNIT III   Programming Languages and Tools   9 Hrs
Desired characteristics based on ADA-data typing-control structures-packages-exception handling-overloading-multitasking-timing specification-task scheduling-just in time compilation-run time support.

UNIT IV   Real Time Databases   9 Hrs
Basic definitions-main memory databases -transaction processing-concurrency control-disk scheduling algorithms-serialization and consistency-real time communication

UNIT V   Fault Tolerance, Reliability and Synchornization   9 Hrs
Fault types-fault detection and containment-redundancy-data diversity-reversal checks-obtaining parameter values-reliability models for hardware redundancy-software error models-clocks-fault tolerance synchronization-synchronization and software.

Total Hours: 45

TEXT BOOK:
1. C.M.Krishna, Kang.G.Shin, 2010, Realtime Systems, McGraw Hill.

REFERENCE BOOKS:
1. *Rajib Mall, 2007 ''Real-time systems: theory and practice'', Pearson Education.*
2. *Phillip A.Laplante 2011 Real Time System Design and Analysis,4 th edition,Wiley.*
3. *Alan burns and andy wellings,2009 ''Real time systems and prog. Languages'', 4 thedition,pearson.*

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Subject Code:	Subject Name :	Ty/Lb/ETL	L	T/S.Lr	P/R	C
BCS18E40	**DISTRIBUTED COMPUTING**					
	Prerequisite: BIT18I01 & BCS18006	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- The students will be able to understand the design of distributed systems
- To understand communication concepts of distributed systems
- To apply the memory management design of distributed systems to design a new memory

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the design of distributed computing systems
CO2	Understand the communication concepts of distributed systems
CO3	Design a new memory by applying the memory management design of distributed systems
CO4	Understand the distributed file system security

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	M	M	H	H	M	H	M	H	H
CO2	H	H	H	H	M	H	H	H	H	H	H	H
CO3	H	M	H	M	M	H	M	M	H	M	H	M
CO4	H	M	H	M	M	H	H	H	H	H	H	H

Mapping of Course Outcomes with Program Specific Outcomes (PSOs)

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	M	M
CO2	H	H	H	H	H	M
CO3	H	H	M	M	M	M
CO4	H	H	H	M	H	H

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

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2018 Regulation

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E40	DISTRIBUTED COMPUTING	Ty	3	0/0	0/0	3

OBJECTIVES:
- The students will be able to understand the design of distributed systems
- To understand communication concepts of distributed systems
- To apply the memory management design of distributed systems to design a new memory

UNIT I   Fundamentals   9 Hrs
Introduction to distributed computing system, Evolution, Different models, Gaining popularity, Definition,Issues in design, DCE, Message passing-Introduction, Desirable features of a good message passing system, Issues in IPC, Synchronization, Buffering, Multidatagram, Process addressing, Failure handling, Group communication.

UNIT II   Remote Procedure Call   9 Hrs
Introduction, RPC model, transparency of RPC, Implementing RPC mechanism, Stub generation, RPC messages, Marshalling arguments and results, Sever management, parameter-passing semantics, Call semantics, Communication protocols for RPCs, Complicated RPC, Client-server binding, exceptional handling, security, Lightweight RPC.

UNIT III   Distributed Shared Memory and Synchronization   9 Hrs
Introduction, General architecture of DSM systems, Design and implementation issues of DSM,Granularity, Structure of shared memory space, Consistency model, Replacement strategy, Thrashing, Different approaches to DSM, Advantages of DSM, Clock synchronization, Event ordering, Mutual exclusion, Deadlock, Election algorithm.

UNIT IV   Resource and Process Management   9 Hrs
Introduction, Desirable features of a good global scheduling algorithm, Task assignment approach, Load balancing approach, Load sharing approach, Process migration, Threads.

UNIT V   DFS/DCE Security   9 Hrs
Desirable features of good DFS, File models, File accessing, models, File sharing semantics, File cachingschemes, File replication, Fault tolerance, Atomic Transaction, Design principles, Authentication, Access control,Digital signatures, DCE security service.

Total Hours: 45

TEXT BOOK:
1. Pradeep K. Sinha (2012 Reprint) , *Distributed Operating System Concepts and Design* PHI

REFERENCE BOOKS:
1. *Andrew S. Tenenbaum (2012), Modern Operating System (3rd ed.) PHI*
2. *Ajay D. Kshemkalyani , Mukesh Singhal (2008), Distributed computing : principles,   algorithms and systems – Cambridge University Press*
3. *Andrew S. Tenenbaum &Maatren Vansteen (2012) Distributed systems: Principles & Paradigms (2nd ed.),PHI*
4. *Hagit Attiya And Jennifer Welch (2004) Distributed computing fundamentals, simulations and Advanced Topics (Digitized in 2007) (2nd ed.), Wiley*
5. *Jean Dollimore, Tim Kindberg, And George Coulouris (2005) Distributed Systems: Concepts and Design (4th ed.) Pearson Education*

Open Electives

Subject Code: **BIT18OE1**	Subject Name : **WEB DESIGN**		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: Nil		Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- The students will learn the Network and Internet works.
- To learn the HTML program structure, elements and Tags.
- To have knowledge to design basic website for their own.
- To learn how to design an effective website using CSS.
- To learn and develop a dynamic web sites using scripting languages.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Basics of Network and Internet works.
CO2	Able to evaluate a web site
CO3	Ability to make a well interactive online applications.
CO4	Have knowledge to analysis and evaluate on web site and design a quality web site.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	M	L	L	H	L	L	H	M	L	L
CO2	H	M	L	H	L	L	L	L	L	L	L	H
CO3	M	M	H	L	H	M	H	L	M	M	L	L
CO4	M	M	H	L	L	M	L	L	M	M	L	L

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	L		H		L		L		M		L	
CO2	L		H		L		L		M		L	
CO3	H		M		L		L		M		M	
CO4	H		M		L		L		M		M	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						✔						

Course Code	Course Title	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18OE1	WEB DESIGN	Ty	3	0/0	0/0	3

OBJECTIVES:
- The students will learn the Network and Internet works.
- To learn the HTML program structure, elements and Tags.
- To have knowledge to design basic website for their own.
- To learn how to design an effective website using CSS.
- To learn and develop a dynamic web sites using scripting languages.

UNIT I: Introduction to Network   9 Hrs
Introduction to computer networks and uses - Network: devices, topology and types – Communication media. Introduction to OSI layers, Port and Protocols, Network applications. Client / Serverarchitecture. Internet server provider, DNS and Hosting.

UNIT II: Web Design Principles   9 Hrs
Brief History of Internet - What is World Wide Web - Why create a web site - Web Standards - Audience requirement. Basic principles involved in developing a web site - Planning process - Five Golden rules of web designing - Designing navigation bar - Page design - Home Page Layout - Design Concept.

UNIT III: HTML   9 Hrs
Introduction to HTML- HTML version- Basic structure of an HTML document – Creating HTML document – HTML Elements - HTML Tags - Working with Text - Working with Lists, Tables and Frames - Working with Hyperlinks, Images and Multimedia - Working with Forms and controls .

UNIT IV: Cascading Style Sheet   9 Hrs
Concept of CSS - Creating Style Sheet - CSS Properties - CSSStyling (Background, Text Format, Controlling Fonts) - Working with block elements and objects - Working with Lists and Tables - CSS Id and Class - Box Model(Introduction, Border properties, Padding Properties, Margin properties) - CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) - CSS Color - Creating page Layout and Site Designs.

UNIT IV: Scripting Languages   9 Hrs
JavaScript introduction – control structures – functions – arrays – objects – simple web applications. Web hosting and maintenance.

Total Hours: 45

Text Books:
1. Computer Networks by A Tanenbaum - 5th edition , Pearson Education
2. Mastering HTML, CSS & JavaScript Web Publishing by Laura Lemay, Rafe Coburn, Jennifer Kyrnin , Pearson Education.
3. HTML & CSS: The Complete Reference, Fifth Edition by Thomas A. Powell, McGraw-Hill publication.

Subject Code: **BIT18OE2**	Subject Name : **DIGITAL MARKETING**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

B.Tech – Information Technology (Full Time) – 2018 Regulation After CDC of Universal Human Values

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- This course helps the students to understand the fundamental principles of Digital marketing, the past, present and future potential of Digital marketing.
- At the end of the course students will be able to identify the role of e-marketing in the present context and develop an e-marketing plan with appropriate e-marketing strategies.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the concepts and uses of Digital Marketing
CO2	Develop Strategic Planning for the Market
CO3	Evaluate the Ethical and Legal Values
CO4	Predict the Marketing Trends

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	M	L	L	L	L	H	L	M	L	L
CO2	H	M	L	L	L	L	H	L	L	L	L	H
CO3	M	M	H	L	H	M	L	L	M	M	L	L
CO4	M	M	H	L	L	M	L	L	M	M	H	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	L	H	L	L	M	L
CO2	L	H	L	L	M	L
CO3	H	M	L	L	M	M
CO4	H	M	L	L	M	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						✔						

Course Code	Course Title	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18OE2	**DIGITAL MARKETING**	Ty	3	0/0	0/0	3

OBJECTIVES:
- This course helps the students to understand the fundamental principles of Digital marketing, the past, present and future potential of Digital marketing.
- At the end of the course students will be able to identify the role of e-marketing in the present context and develop an e-marketing plan with appropriate e-marketing strategies.

UNIT I: INTRODUCTION 9 Hrs

Digital-Marketing Past, Present & Future – Digital-Marketing Landscape, Digital-marketing's Past - Web 1.0, Digital Marketing Present - Web 2.0, Future -Web 3.0, Strategic Digital-Marketing, and Digital -Business Models – Online Revenue Models, Value Models, and Strategic Digital-Business Models.

UNIT II: DIGITAL MARKETING PLAN 9 Hrs

Process, Creating a Digital-Marketing Plan, Seven Steps –Situation Analysis, Strategic Planning, Objectives, Digital-Marketing Strategies – Product, Price, Distribution, Communication, Relationship Management; Implementation plan, Budget, Evaluation.

UNIT III: DIGITAL -MARKETING ENVIRON MENT 9 Hrs

Overview of Digital-Marketing Environment, Global Digital -Markets, Wireless Internet Access, Digital divide, Building inclusive Digital markets, social networking, Ethical and Legal Issues – Overview, Digital Property, Emerging issues.

UNIT IV: DIGITAL-MARKETING MANAGEMENT 9 Hrs

Online offer – Creating customer value online, Product Benefits, Digital Marketing enhanced product development, Payment options, Pricing Strategies; Internet as distribution, Digital Marketing Communication – Owned Media, Paid media, Earned Media.

UNIT V: EMERGING TRENDS 9 Hrs

Emerging trends in Digital-marketing, Content Marketing, Social Media Marketing, Email Marketing, Affiliate Marketing, Video Marketing, Mobile Marketing, Interactive advertising, International Online Marketing, Search Engine Marketing, Online Partnership, Viral Marketing, E-CRM, E-Business, E-Tailing.

Total Hours: 45

TEXT BOOK:
1. Strauss Judy, Frost Raymond (2013), E-Marketing, 7/e; New Delhi: Prentice Hall.
2.

REFERENCE BOOKS:
1. Chaffey Dave and Smith PR (2013), Emarketing Excellence: Planning and Optimizing your Digital Marketing; 4/e; Routledge.
2. Ryan Damian, (2014), Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, 3/e; Kogan Page Limited.

Subject Code: **BIT18OE3**	Subject Name : **INFORMATION SECURITY MANAGEMENT**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

➢ To provide an understanding of the principles of information security management commonly used in business

➢ Introduce the commonly used frameworks and methods

➢ Explore critically the suitability and appropriateness of security needs.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To Understand the Security and classification of Components.
CO2	Concept of Security Analysis, Design and Implementation
CO3	Develop the security plan methodology and follow policy procedures
CO4	Using ISO to enhance security

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	M	L	L	L	H	L	L	M	L	H
CO2	H	M	L	H	L	L	L	L	L	L	L	L
CO3	M	M	H	L	L	M	L	H	M	M	L	L
CO4	M	M	H	L	H	M	L	L	M	M	L	L

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	L		H		L		H		M		L	
CO2	L		H		L		L		M		L	
CO3	H		M		H		L		M		M	
CO4	H		M		L		L		M		M	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						✔						

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Course Code	Course Title	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18OE3	**INFORMATION SECURITY MANAGEMENT**	Ty	3	0/0	0/0	3

OBJECTIVES :
   The objective of the course is
   ➢ To provide an understanding of the principles of information security management commonly used in business
   ➢ Introduce the commonly used frameworks and methods
   ➢ Explore critically the suitability and appropriateness of security needs.

UNIT I : INTRODUCTION TO INFORMATION SECURITY AND MANAGEMENT   9 Hrs
Information sensitivity classification-governance-computing environment- security of various components – Management Concepts: traditional management skills and security literacy, managerial skills, redefining Mintzberg's Managerial roles, IS Security management activities-information security management life cycles- security management vs functional management

UNIT II : INFORMATION SECURITY LIFECYCLE   9 Hrs
Introduction-Security planning in SLC-Security analysis-security design- security implementation – design- continual security

UNIT III : SECURITY PLAN AND POLICY   9 Hrs
Security plan: Development guidelines-security plan methodologies- Policy: security policy, standards and guidelines- security policy methodologies

UNIT IV: SECURITY RISK MANAGEMENT   9 Hrs
Introduction- risk management life cycle- preparation efforts- security culture-factors affecting security risk- ALE risk methodology- operational, functional and strategic risks- ABLE methodology

UNIT V: SECURITY DESIGN AND IMPLENTATION   9 Hrs
ISO/IEC 27002- Using ISO/IEC 27002 to enhance security- measurement and implementation-general ISMS Framework- ISMS Model and design- integration of ISMS Subsystems-self assessment for compliance- Security solutions: security management, access control, security analysis

Total Hours: 45

Text Book
1. "Information Security Management: Concepts and Practice "Bell G. Raggard, CRC Press 2010

Reference Books:
   1. "Information Security Management Principles" David Alexander, Amanda Finch, BCS Learning and Development Ltd, 2013
   2. "Security Analysis and Portfolio Management" Ronald E Fischer, S.Kevin PHI Learning Pvt Ltd, 2015.

Subject Code:	Subject Name : **Introduction to Multimedia**	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

1. To learn about Basics of Computer Graphics.
2. To understand the difference between normal, 2D and 3D Dimensional Graphics
3. To understand the conversion of 2D to 3D Pictures.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the various types of Display
CO2	Transform geometrical structures, perform clipping on geometrical objects
CO3	Concept of Various Clipping Operations
CO4	Analyze a 3D structure

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	M	H	H	L	L	L	L	M	L	L
CO2	H	M	L	L	L	L	L	L	L	L	L	H
CO3	M	M	H	L	L	M	H	H	M	M	L	L
CO4	M	M	H	L	L	M	L	L	M	M	H	L

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	L		H		L		L		M		L	
CO2	L		H		H		L		M		L	
CO3	H		M		L		H		M		M	
CO4	H		M		L		L		M		M	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						✔						

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Course Code	Course Title	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18OE4	**INTRODUCTION TO MULTIMEDIA**	Ty	3	0/0	0/0	3

Objectives:
1. To learn about Basics of Computer Graphics.
2. To understand the difference between normal, 2D and 3D Dimensional Graphics
3. To understand the conversion of 2D to 3D Pictures.

Unit – I   Types of Display   9 Hrs
Video display device: Cathode ray tube, Raster scan displays, Random scan displays. Raster scan systems, Random scan systems, Input devices, Graphics software.

Unit – II   Basic Algorithm of Drawings   9 Hrs
Output Primitives: Points & Lines, Line drawing Algorithms, Loading the frame buffer, Circle & Ellipse generating Algorithms, Pixel addressing & Object geometry, Fill area primitives, Character generation

Unit – III   Types of Transformation   9 Hrs
2-D Geometric Transformations : Basic Transformations , Matrix representation & Homogeneous Coordinates, Composite Transformations, Other Transformations, Transformations between Coordinate Systems, Raster methods for Transformations

Unit – IV   Clippings Operation   9 Hrs
2- Dimensional Viewing: Viewing pipeline, Viewing Coordinate reference frame, Window-to-view port coordinate transformation, Line clipping, Polygon Clipping, Curve Clipping.

Unit – V   3D Effects   9 Hrs
3 -D Concepts: 3 -D display methods. 3-D Geometric & Modeling Transformations: Translation, Rotation, Scaling, Other Transformations, Composite Transformations, Modeling & Coordinate.
Total Number of Hours: 45

Text Book:
1. D.Hearn & M.P.Becker , "Computer graphics"; 2 nd Ed., Prentice Hall India- 1995

References:
1. Foley Vandam & Hughes, " Computer Graphics"; Addision Wesly.
2. Angel Edward., "Interactive Computer Graphics – A Top-down Approach with OpenGL" ,Addison-Wesley 1996.
      3. Newmann W and Sproull R.F., Principles of Interactive Computer Graphics, McGraw-Hill, 1980

Subject Code: BCS18OL1	Subject Name : **VISUAL PROGRAMMING LAB**				T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: **C,C++.**				Lb	0	0/0	0/0	1

L : Lecture T : Tutorial   SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
- The objective is to review the basics of Visual programming.
- Students will also understand the concepts of Visual Basic programming.
- Getting more knowledge about windows programming.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand concept of Visual Programming.
CO2	Will be able to understand the problem and will have the creativity for writing programe.
CO3	Will have a basic knowledge on intercommunication of windows programming.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	L	L	L	M	L	M	L	L
CO2	H	H	L	H	M	L	L	M	L	M	L	L
CO3	H	M	M	L	L	L	L	M	L	M	L	L

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		M		L		M		L		L	
CO2	H		L		L		L		L		L	
CO3	H		M		L		M		L		L	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

Course Code	Course Title	T / L/ ETL	L	T / S.Lr	P/ R	C
BCS18OL1	**VISUAL PROGRAMMING LAB**	Lb	0	0/0	0/0	1

OBJECTIVES:

- The objective is to review the basics of Visual programming.
- Students will also understand the concepts of Visual Basic programming.
- Getting more knowledge about windows programming.

1. VISUAL BASIC

   1. Adding menus to forms

   2. Creating dialog boxes with various options

   3. MDI applications

   4. Writing code for various keyboard and mouse events

   5. OLE container control

   6. Data access through Data control and DAO.

   7. Active X control

   8. Active X Document

   9. Active X DLL 2.

2. VISUAL C++

   1. Creating applications with App wizard

   2. Working with MFC

   3. Exception handling

   4. Loading - Editing and - Adding resources - Linking resources to applications

   5. Drawing bitmaps

   6. Threads

   7. OLE

   8. Graph Applications

LEARNING OUTCOMES: Upon completion of this course, the student will be able to:

a. Design, create, build, and debug Visual Basic applications.

b. Explore Visual Basic's Integrated Development Environment (IDE).

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Subject Code: BCS18OL2	Subject Name : WEB DESIGN LAB		T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL		Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- Overview Object Web Technologies
- Basic Concept of Web Technologies
- Advance Programming.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand concept of web technologies.
CO2	Will be able to design the web programming.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	L	L	L	M	L	M	L	L
CO2	H	H	L	H	M	L	L	M	L	M	L	L

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		M		L		M		L		L	
CO2	H		L		L		L		L		L	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

DEPARTMENT OF INFORMATION TECHNOLOGY

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Course Code	Course Title	T / L/ ETL	L	T / S.Lr	P/ R	C
BCS18OL2	**WEB DESIGN LAB**	Lb	0	0/0	0/0	1

OBJECTIVES :

- Overview Object Web Technologies
- Basic Concept of Web Technologies
- Advance Programming.

1. Practice Internet applications.

2. Explore Web browsers, search engines

3. Familiarise with web portals, e-commerce sites, blogs etc

4. Basic Html Tags

5. Hyper Links, Tables & Multimedia

6. Frames & iFrames

7. Inline, Internal and External Style sheets

8. Design a web page to display your full bio-data.

9. Simple Validating Form (a) HTML forms, (b) JavaScript

10. Registration Form with Multi-Validating

11. Design a web page to select the elective subject through online with registration form.

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Subject Code: BCS18OL3	Subject Name : PYTHON PROGRAMMING LAB		T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Basic knowledge on computers, C.		Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Read and write data from/to files in Python.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand, write and test simple python program.
CO2	Execute Python programs with conditionals and circles.
CO3	Use capacities for organizing Python programs.
CO4	Students can Create own phython program.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	L	M	L	L	L	L	L	L	M
CO2	H	M	L	L	M	L	L	L	L	L	L	M
CO3	H	M	L	L	M	L	L	L	L	L	L	M
CO4	H	M	L	L	M	L	L	L	L	L	L	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	L	L	M
CO2	H	M	L	L	L	M
CO3	H	M	L	L	L	M
CO4	H	M	L	L	L	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

Course Code	Course Title	T / L/ ETL	L	T / S.Lr	P/ R	C
BCS18OL3	**PYTHON PROGRAMMING LAB**	Lb	0	0/0	0/0	1

OBJECTIVES :
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Read and write data from/to files in Python.

1. Write a python program to perform all arithmetic operation.

2. Write a python program to change the last character in a word.

3. Write a python program to check for palindrome.

4. Write a python program to check for prime number.

5. Write a python program to find the length of the word and display either the length is odd or even.

6. Write a python program to perform Fibonacci series for n numbers.

7. Write a python program to display the words using Dictionaries.

8. Write a python program to to change the alternative characters of a word.

9. Write a python program to find the ASCII value for your name.

10. Write a python program to to perform stack operation using array.

Subject Code: BCS18OL4	Subject Name : COMPUTER NETWORK LAB		T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: C++, java.		Lb	0	0/0	0/0	1

L : Lecture T : Tutorial   SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To understand the working difference between straight cable and cross over cable.
- To use the packet tracer to simulate various networks.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand concept and working of different cables.
CO2	Will be able to use stimulator and can stimulate various networks.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	L	L	L	M	L	M	L	L
CO2	H	H	L	H	M	L	L	M	L	M	L	L

COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		M		L		M		L		L	
CO2	H		L		L		L		L		L	

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

Course Code	Course Title	T / L/ ET L	L	T / S.L r	P/ R	C
BCS18OL4	**COMPUTER NETWORK LAB**	Lb	0	0/0	0/0	1

OBJECTIVES :

- To understand the working difference between straight cable and cross over cable.
- To use the packet tracer to simulate various networks.

1. Study of different types of Network cables and Practically

    implement the cross-wired cable

2. Study of Network Devices in Detail.

        2a. Study of Network Devices in layer1(HUB, REPEATER)

        2b.Study of Network Devices in layer2(Swith)

        2c.Study of Network Devices in layer3(Router)

3. Study of FIREWALL

4. Connect the computers in Local Area Network.

5. Study of Network IP.

        5a. IPV4

        5b. IPV6

6. Study of Network Topologies

        6a. Bus Topology

        6b. Ring Toplogy

        6c. Star Topology

7. Study of MAC address and port numbers.

Subject Code: BCS18OL5	Subject Name : PHP / MySQL PROGRAMMING LAB	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Basic of computers, DBMS, HTML, XML.	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial   SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :
- To Become a Web Site developer / Programmer
- To Enable the Students to become expert in MySQL.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the requirement and develop the website.
CO2	To establish a back-end connectivity for data storage and utilization.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	L	M	L	L	L	L	L	L	M
CO2	H	M	L	L	M	L	L	L	L	L	L	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	L	L	L	M
CO2	H	M	L	L	L	M

H/M/L indicates Strength of Correlation   H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

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DEPARTMENT OF INFORMATION TECHNOLOGY
2018 Regulation

Course Code	Course Title	T / L/ ETL	L	T / S.Lr	P/ R	C
BCS18OL5	**PHP / MySQL PROGRAMMING LAB**	Lb	0	0/0	0/0	1

OBJECTIVES :

- To Become a Web Site developer / Programmer
- To Enable the Students to become expert in MySQL.

1. Use of select statements for queries

2. Nested queries using SQL

3. Built in functions in SQL

4. Update operations using SQL.

5. Use of index, creating views and querying in views

6. Create a php program to find odd or even number from given number

7. Write a php program to find maximum of three numbers.

8. Write a PHP program to swap two numbers.

9. Write a PHP Program to demonstrate the variable function: Gettype():

10. Write a PHP program to drop table using MySQL.

11. Create a student Registration in PHP and Save and Display the student Records

12. Write a program to Develop student registration form and display all the submitted data on another page.