Department of CSE / IT

Semester: I

Theory:

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BMA17008	BMA17003	Discrete Mathematics	M-3	4	3	1/0	0/0	Ty
BCS17001	NIL	Data Structures	PC	4	3	1/0	0/0	Ty
BCS17002	BES17ET2	Object Oriented Programming with C++	PC	4	3	0/1	0/0	Ty
BEC17I02	BES17001	Digital Systems	IDT-1	3	3	0/0	0/0	Ty

Practical:

BCS17L01	NIL	Data Structures Lab	PCL	1	0	0/0	3/0	Lb

Credits Sub Total: 16

Semester: II

Theory:

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BMA17016	BMA17013	Statistics for Computer Engineers	M-5	4	3	1/0	0/0	Ty
BCS17004	BCS17001	Database Management Systems	PC	4	3	0/1	0/0	Ty
BCS17005	BCS17001	Design and Analysis of Algorithms	PC	3	3	0/0	0/0	Ty
BCS17ET2	BCS17002	Java Programming	PC	3	1	0/2	0/0	ETL

Practical:

BCS17L03	BCS17L01	Database Management Systems Lab	PCL	1	0	0/0	3/0	Lb

Credits Sub Total: 15

Semester: III

Theory:

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BIT17I01	NIL	Computer Networks	IDT-3	3	3	0/0	0/0	Ty
BEC17I03	BES17I02	MicroProcessors and Micro Controllers	IDT-2	3	3	0/0	0/0	Ty
BCS17006	BCS17004	Operating System	PC	3	3	0/0	0/0	Ty
BCS17007	BES17I02	Computer Organization and Architecture	PC	4	3	1/0	0/0	Ty

Practical:

BCS17L05	NIL	Operating System Lab	PCL	1	0	0/0	3/0	Lb

Credits Sub Total: 14

Semester: IV

Theory:

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17009	BCS17002	Object Oriented Software Engineering	PC	4	3	1/0	0/0	Ty
BIT17I02	BIT17I01	Web Technology and Web Services	IDT-4	3	3	0/0	0/0	Ty
BCS17ET3	BCS17L03	PHP / MySQL	PC	3	1	0/2	0/0	ETL
BCS17008	BCS17003	System Software and Principles of Compiler Design	PC	3	3	0/0	0/0	Ty

Practical:

BIT17L08	BIT17IL01	Web Technology and Web Services Lab	PCL	1	0	0/0	3/0	Lb

Credits Sub Total: 14

Semester: V

Theory:

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17012	BIT17I02	Dot Net Framework	PC	4	3	1/0	0/0	Ty
BCS17OEX	NIL	Open Elective (OE) - E1(Interdisciplinary)	OE	3	3	0/0	0/0	Ty
BCS17EXX	NIL	ELECTIVE - II	PE	3	3	0/0	0/0	Ty
BMG17002	BES17ET3	Management Concepts and Organizational Behavior	MGMT-1	3	3	0/0	0/0	Ty

Practical:

BCS17L12	BIT17L08	Dot Net Lab	PCL	1	0	0/0	3/0	Lb

Credits Sub Total: 14

Semester: VI

Theory:

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17011	BCS17004	Data Warehousing and Data Mining	PC	4	3	0/0	0/2	Ty
BCS17EXX	NIL	ELECTIVE - III	PE	3	3	0/0	0/0	Ty
BCS17EXX	NIL	ELECTIVE - IV	PE	3	3	0/0	0/0	Ty
BCS17SEX	NIL	ELECTIVE - V (Special Elective)	SE	3	1	0/2	0/0	ETL

Practical:

BCS17L11	BCS17ET3	Data Mining Lab	PCL	1	0	0/0	3/0	Lb
BCS17L13	NIL	Project Phase – 1	PP1	2	0	0/0	6/0	Lb

Credits Sub Total: 16

Semester: VII

Theory:

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BMG17003	BMG17002	Total Quality Management	MGMT-2	3	3	0/0	0/0	Ty
BCS17010	BCS17ET3	Open Source Scripting Languages	PC	3	3	0/0	0/0	Ty

Practical*:*

BCS17L14	BCS17L13	Project (Phase – II)	PP2	10	0	0/0	20/0	Lb

Credits Sub Total: 16

* Internal evaluation (Departmental level Refer Annexure for evaluation methodology)

4 Credit papers should compulsorily have either P/R component.

Credit Summary

Semester 1 : 16
Semester 2 : 15
Semester 3 : 14
Semester 4 : 14
Semester 5 : 14
Semester 6 : 16
Semester 7 : 16

Total Credits : 105

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/S Lr	P/R	Ty / Lb/ ETL
BCS17OE1	NIL	Web Design	OE	3	3	0/0	0/0	Ty
BCS17OE2	NIL	Cyber Security Essentials	OE	3	3	0/0	0/0	Ty
BCS17OE3	NIL	Electronic Waste Management	OE	3	3	0/0	0/0	Ty
BCS17OE4	NIL	Software Testing	OE	3	3	0/0	0/0	Ty
BCS17OE5	NIL	Information Security Management	OE	3	3	0/0	0/0	Ty

6th sem Electives E- II (Common to CSE&IT)								
Course Code	**Prerequisite Course Code**	**Course Title**	**Category**	**C**	**L**	**T/S Lr**	**P/R**	**Ty / Lb/ ETL**
BCS17005	BCS17001	Design and Analysis of Algorithms (Only for IT)	PE	3	3	0/0	0/0	Ty
BCS17E01	BCS17ET1	Image Processing	PE	3	3	0/0	0/0	Ty
BCS17E02	NIL	Goegraphical Information Systems	PE	3	3	0/0	0/0	Ty
BCS17E03	BCS17004	Database Tuning	PE	3	3	0/0	0/0	Ty
BCS17E04	BCS17ET2 BCS17012	Component Based Technology	PE	3	3	0/0	0/0	Ty
BCS17E05	BIT17I02	E-Commerce	PE	3	3	0/0	0/0	Ty
BCS17E06	NIL	Artificial Intelligence	PE	3	3	0/0	0/0	Ty
BCS17E07	NIL	Human Computer Interaction	PE	3	3	0/0	0/0	Ty
BCS17E08 / BIS15005	BIT17I01	Wireless and Mobile Networking	PE	3	3	0/0	0/0	Ty

7th Sem Electives – E- III and E-IV (Common to CSE&IT)								
Course Code	**Prerequisite Course Code**	**Course Title**	**Category**	**C**	**L**	**T/S Lr**	**P/R**	**Ty / Lb/ ETL**
BCS17E09	BCS17011	Web Mining	PE	3	3	0/0	0/0	Ty
BCS17E10	BIT17I02	Web Data Design and Management	PE	3	3	0/0	0/0	Ty
BCS17E11	NIL	Risk Management	PE	3	3	0/0	0/0	Ty
BCS17E12	BIT17I02	M-Commerce	PE	3	3	0/0	0/0	Ty
BCS17E13	BIT17I01	Cryptography and Network Security	PE	3	3	0/0	0/0	Ty
BCS17E14	BIT17I01	Mobile Adhoc Networks	PE	3	3	0/0	0/0	Ty
BCS17E15	BIT17I01	TCP/IP Design and Implementation	PE	3	3	0/0	0/0	Ty
BCS17E16	BCS17OE5	Cyber Forensics and Internet Security	PE	3	3	0/0	0/0	Ty
BCS17E17	BCS17004	Database Security	PE	3	3	0/0	0/0	Ty
BCS17E18	BCS17006	Real Time Systems	PE	3	3	0/0	0/0	Ty
BCS17E19	BIT17I01 BCS17006	Distributed Computing	PE	3	3	0/0	0/0	Ty
BCS17E20	NIL	Optimization Techniques	PE	3	3	0/0	0/0	Ty
BCS17E21	BCS17004	Management Information Systems	PE	3	3	0/0	0/0	Ty

7th Semester – Special Elective –Technology Based (ES - EV) (Common to CSE&IT)								
Course Code	**Prerequisite Course Code**	**Course Title**	**Category**	**C**	**L**	**T/S Lr**	**P/R**	**Ty / Lb/ ETL**
BCS17E22	BCS17ET2	Mobile Application Development	SE	3	3	0/0	0/0	Ty
BCS17E23	BCS17004	Data Science and Big Data Analytics	SE	3	3	0/0	0/0	Ty
BIT17007	BIT17I01	Cloud Technology (only for CSE)	SE	3	3	0/0	0/0	Ty
BCS17E24	BIT17I01	Network Forensics	SE	3	3	0/0	0/0	Ty
BCS17E25	NIL	Internet of Things	SE	3	3	0/0	0/0	Ty
BCS17E26	NIL	Social Computing	SE	3	3	0/0	0/0	Ty
BCS17E27	NIL	Enterprise Architecture	SE	3	3	0/0	0/0	Ty
BCS17EXX	NIL	Any other that is important time to time based on Industry Demand	SE	3	3	0/0	0/0	Ty

8th Sem Electives E-VI and E-VII (CSE & IT)								
Course Code	**Prerequisite Course Code**	**Course Title**	**Category**	**C**	**L**	**T/SLr**	**P/R**	**Ty / Lb/ ETL**
BCS17E28	BCS17004	Information Storage Management	PE	3	3	0/0	0/0	Ty
BCS17E29	BIT17I01	Network Infrastructure Management	PE	3	3	0/0	0/0	Ty
BCS17E30	BCS17007	Foundations of Parallel Programming	PE	3	3	0/0	0/0	Ty
BCS17E31	BIT17007	Virtualization	PE	3	3	0/0	0/0	Ty
BCS17E32	BCS17006	Hadoop Distributed File System	PE	3	3	0/0	0/0	Ty
BCS17E33	BCS17004	Mobile Databases	PE	3	3	0/0	0/0	Ty
BCS17E34	BIT17I02	Web Engineering	PE	3	3	0/0	0/0	Ty
BCS17E35	BIT17I01	4G Networks	PE	3	3	0/0	0/0	Ty
BCS17E36	NIL	Enterprise Resource Planning	PE	3	3	0/0	0/0	Ty
BCS17E37	NIL	Supply Chain Management	PE	3	3	0/0	0/0	Ty
BCS17E38	BCS17004	Mainframe Computing	PE	c	3	0/0	0/0	Ty
BCS17E39	BCS17E06	Neuro Fuzzy Computing	PE	3	3	0/0	0/0	Ty
BCS17E40	BCS17E09	Web Content Management	PE	3	3	0/0	0/0	Ty
BCS17E41	BCS17E06	Machine Learning	PE	3	3	0/0	0/0	Ty

SEMESTER I

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/S Lr	P/R	Ty/ Lb/ ETL/ EVL
BMA17008	BMA17003	**DISCRETE MATHEMATICS**	M-3	4	3	1/0	0/0	Ty

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

Course Outcomes:

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 no. of hrs: 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).

Subject Code: BCS17001	Subject Name : DATA STRUCTURES	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

Master the implementation of linked data structures such as linked lists and binary trees

- with 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 some graph algorithms such as shortest path and minimum spanning tree
- Master the standard data structure library of a major programming language(C++)

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

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

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

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			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/S Lr	P/R	Ty/ Lb/ ETL/ EVL
BCS17001	NIL	**DATA STRUCTURES**	PC	4	3	1/0	0/0	Ty

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 and graph algorithms such as shortest path and minimum spanning tree

UNIT – I 12 Hrs

Data Representation: Introduction, Linear Lists, Formula Based Representation, indirect addressing, simulating pointers, comparisons and applications. Arrays, matrices, special and sparse matrices,

UNIT – II 12 Hrs

Stack Operations and Applications, Queue Operations and Applications, Single Linked List, Double Linked List, Circular Linked List.

UNIT – III 12 Hrs

Trees: Definitions and Properties, Representation of binary trees and its operations , Binary Tree Traversal, Binary Search Tree, AVL trees and its operations , 2-3 tree, 2-3-4 tree.

UNIT – IV 12 Hrs

Searching & Sorting: Selection Sort, Merge Sort, Quick Sort, Heap Sort, and Radix Sort - Complexity analysis. Sequential Search, Binary Search, Hashing and its Types.

UNIT – V 12 Hrs

Graphs: Definitions and Representation of Graphs, DFS, BFS, Prim's Algorithm, Kruskal's Algorithm

Total Hours: 60

Text Books:

1. S.Sahani,"Data Structures. Algorithms and Applications in C++", Tata Mc-Graw Hill, 2005
2. Yedidyah Langsam, MosheJ Augenstein Aaron M. Tenenbaum, "Data Structures using C and C++", Prentice Hall India,1996, Second Edition.

Reference Books:

1. Seymour Lipschutz (Schaum‟s Outline series). McGraw-Hill – 2005,3rd Edition
2. Sartaz Sahani McGraw – HillS.K. Srivatsava, Deepli Srivatsava. BPB Publications.

Subject Code: BCS17002	Subject Name : **Object Oriented Programming with C++**	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BES17ET2	Ty	3	0/1	0/0	4

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

OBJECTIVE :

- 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			
				✔								
Approval	**27th meeting of Academic council, June2017**											

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/S Lr	P/R	Ty/ Lb/ ETL/ EVL
BCS17002	BES17ET2	**OBJECT ORIENTED PROGRAMMING WITH C++**	PC	4	3	0/1	0/0	Ty

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.

UNIT-I 12 Hrs

Basics, Tokens, Expressions: 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 12 Hrs

Functions, Classes and Objects: 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 12 Hrs

Constructors and Destructors : 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 12 Hrs

Inheritance: 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 12 Hrs

Pointers, Virtual Functions and Polymorphism: 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.

Robert Lafore, "Object-Oriented Programming in C++", Sams Publishing-2002, Fourth Edition

Subject Code: BEC17I02	Subject Name : Digital Systems	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BES17001	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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			
		✔										

Approval	27th meeting of Academic council, June2017

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/S Lr	P/R	Ty/ Lb/ ETL/ EVL
BEC17I02	BES17001	**DIGITAL SYSTEMS**	IDT-1	3	3	0/0	0/0	Ty

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 LOG IC **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: BCS17L01	Subject Name : DATA STRUCTURES 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

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

OBJECTIVE :

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

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			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/S Lr	P/R	Ty/ Lb/ ETL/ EVL
BCS17L01	NIL	**DATA STRUCTURES LAB**	PCL	1	0	0/0	3/0	Lb

OBJECTIVE:

1. To strengthen their problem solving ability by applying the characteristics of an object-oriented approach.
2. To introduce object oriented concepts in C++.

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. Breadth first search of a graph.

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BMA17016	BMA17013	**STATISTICS FOR COMPUTER ENGINEERS**	M-5	4	3	1/0	0/0	Ty

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

Course Outcomes:

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 (9th ed)*, Prentice Hall of India, (2016).

Subject Code: BCS17004	Subject Name : DATABASE MANAGEMENT SYSTEMS	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17001	Ty	3	0/1	0/0	4

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

OBJECTIVE :

- 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 Skill	Soft Skills			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17004	BCS17001	**DATABASE MANAGEMENT SYSTEMS**	PC	4	3	0/1	0/0	Ty

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* (6th 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: BCS17005	DESIGN AND ANALYSIS OF ALGORITHMS	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17001	Ty	3	0/0	0/0	3

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

OBJECTIVE :

- 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	PO 1	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	PSO 1	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			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17005	BCS17001	**DESIGN AND ANALYSIS OF ALGORITHMS**	PC	3	3	0/0	0/0	Ty

OBJECTIVES:
The student should be made to

- 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: BCS17ET2	Subject Name : **JAVA PROGRAMMING**	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17002	ETL	1	0/2	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE: To teach the basic concepts and techniques which form the object oriented programming paradigm.

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			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17ET2	BCS17002	**JAVA PROGRAMMING**	PC	3	1	0/2	0/0	ETL

OBJECTIVES:

- To learn the basics of Java Language
- To understand the concepts of object oriented programming paradigm
- To get Knowledge on Standalone Programs and Web application

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: BCS17L03	Subject Name : **DATABASE MANAGEMENT SYSTEMS LAB**	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17L01	Lb	0	0/0	3/0	1

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

OBJECTIVE :

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			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17L03	BCS17L01	**DATABASE MANAGEMENT SYSTEMS LAB**	PCL	1	0	0/0	3/0	Lb

OBJECTIVES:

- To create a database and query using SQL.
- Understand the significance of integrity constraints, referential integrity constraints, triggers, assertions.

I. Program to learn DDL and DML commands

1. Execution of data descrption language commands
2. Execution of data manupulation language commands
3. Execution of data control language commands
4. Execution of transation 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: BIT17I01	Subject Name : **COMPUTER NETWORKS**	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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			

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BIT17I01	NIL	**COMPUTER NETWORKS**	IDT-3	3	3	0/0	0/0	Ty

OBJECTIVES:
The students will be able to:
1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.

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:	Subject Name :	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
BEC17I03	MICROPROCESSORS AND MICRO CONTROLLERS					
	Prerequisite: BES17I02	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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			
		✔										

Approval	**27th meeting of Academic council, June2017**

OBJECTIVES:

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BEC17I03	BES17I02	**MICROPROCESSORS AND MICRO CONTROLLERS**	IDT-2	3	3	0/0	0/0	Ty

- 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.

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: BCS17006	Subject Name : **OPERATING SYSTEM**	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17004	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- The students will understand the concepts of Operating System and process.
- Illustrate the Scheduling of a processor for a given problem instance, identify the dead lock situation and provide appropriate solution, analyze memory management techniques and implement page replacement Algorithm, understand the implementation of file systems and directories.
- To appreciate emerging trends in operating systems.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Master functions, structures and history of operating systems
CO2	Master understanding of design issues associated with operating systems
C03	Master various process management concepts including scheduling, synchronization, deadlocks and multithreading
C04	Master concepts of memory management including virtual memory
C05	Master issues related to file system interface and implementation, disk 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	H	L	M	M	L	L	L	M	M	H	L
CO2	H	H	M	L	L	H	M	M	M	M	M	M
C03	H	H	M	L	M	M	M	M	L	L	L	M
C04	H	H	M	L	L	L	L	M	M	H	M	M
C05	H	H	M	M	M	M	M	L	L	L	M	M

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

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17006	BCS17004	**OPERATING SYSTEM**	PC	3	3	0/0	0/0	Ty

OBJECTIVES**:**

The students will be able to

- Understand the concepts of Operating System and process.
- Illustrate the Scheduling of a processor for a given problem instance, identify the deadlock situation and provide appropriate solution, analyze memory management techniques and implement page replacement Algorithm,
- To appreciate emerging trends in operating systems.

UNIT I : CONCEPTS & PROCESSES **9 Hrs**

Computer system architecture-operating system structure-operations-management of process,memory,storage-protection and security-Operating System Services-System Calls-types-System Programs-System Structure-Virtual Machines-System Design and Implementation-Process concept-Process Scheduling-Operation on Process-Cooperating Processes- Inter Process Communication

UNIT II : PROCESS MANAGEMENT, SYNCHRONIZATION AND DEADLOCKS **9 Hrs**

Threads-Multithreading Models. CPU Scheduling concepts-Scheduling Criteria-Scheduling Algorithms-Threads and Multiple-Processor Scheduling-Real Time Scheduling- - Process Synchronization-The Critical Section Problem-Synchronization-Petersonsolution,mutex-Hardware-Semaphores monitor-Deadlocks-Deadlock Characterization-Methods of Handling Deadlocks-Deadlock Prevention-Deadlock Avoidance-Deadlock Detection-Recovery form Deadlock

UNIT III : MEMORY MANAGEMENT **9 Hrs**

Main Memory-Swapping-Contiguous Memory Allocation - Address Translation - Paging - Segmentation – Virtual memory-Demand paging-page replacement-thrashing-allocating Kernal memory.

UNIT IV : STORAGE MANAGEMENT **9 Hrs**

Files And Secondary Storage Management: File Concepts - Access Methods - Directory Structure - File System Mounting - File Sharing - Protection - File System Structure - Implementation - Recovery - Disk Structure - Disk Scheduling - Disk Management

UNIT V : CASE STUDY **9 Hrs**

Special purpose systems -Open source operating systems-Operating system generation-Examples of IPC systems-threading Issues-Operating system examples- Algorithm Evaluation of scheduling algorithms- Classical Problems Of Synchronization-Synchronization examples-Intel 32 bit and 64 bit architectures-ARM architecture-STREAMS.

Total Hours: 45

Text Book

1.Silberschatz. Galvin. Gagne (2012) *Operating System Concepts* (9th ed.), John Wiley

Reference Books

1. D.M.Dhamdhere. D. M. (2012) *Operating Systems*, (3 rd ed.), Tata McGraw Hill
2. Tanenbaum (2015) Modern *Operating Systems,Pearson Publication.*
3. William Stallings (2015) *Operating Systems* (8 th ed.) Prentice Hall of India

Subject Code: BCS17007	Subject Name : COMPUTER ORGANIZATION AND ARCHITECTURE	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BET17I02	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVES :

- To understand the major components of a computer including CPU, memory, I/O and storage, understand the uses for cache memory,
- To understand a wide variety of memory technologies both internal and external,
- To understand the role of the operating system in interfacing with the computer hardware

COURSE OUTCOMES (COs) : (3- 5)

CO1	Students will understand how computer hardware has evolved to meet the needs of multi-processing systems.
CO2	Students will understand the basic structure and operation of digital computer
CO3	Students will understand a wide variety of memory technologies both internal and external.
CO4	Students will understand the different ways of communicating with I/O devices and standard I/O interfaces

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	H	L	M	L	M	L	M	M	M	L
CO2	H	M	H	H	M	L	L	L	M	M	H	L
CO3	H	H	H	M	M	M	M	M	H	M	H	M
CO4	H	H	H	H	H	M	L	L	H	M	H	H

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

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17007	BET17I02	**COMPUTER ORGANIZATION AND ARCHITECTURE**	PC	4	3	1/0	0/0	Ty

OBJECTIVES:

The students will be able

- To understand the major components of a computer including CPU, memory, I/O and storage, understand the uses for cache memory,
- To understand a wide variety of memory technologies both internal and external,
- To understand the role of the operating system in interfacing with the computer hardware

UNIT I : BASIC STRUCTURE OF COMPUTERS 12 Hrs

Basic structure of Computer Hardware-Von-Neumann Architecture-Functional units – Bus Structures - Software performance - Memory locations and addresses - Memory operations - Instruction and instruction sequencing

UNIT II : ARITHMETIC AND LOGIC UNIT 12 Hrs

Fixed point arithmetic operation-addition – subtraction – multiplication - division Floating point arithmetic operation-Design of ALU

UNIT III : PROCESSOR UNIT 12 Hrs

Data path implementation-Control unit-hardwired control - micro programmed control, nano programming -Concepts of pipelining - Pipeline hazards

UNIT IV : MEMORY SYSTEM 12 Hrs

Memory hierarchy-Internal organization of RAM – ROM - Interleaved memory-Cache and associative memories -Virtual memory - Memory organization and cache coherence issues

UNIT V : INPUT/OUTPUT AND PERIPHERALS 12 Hrs

Accessing I/O devices – Programmed Input/ Output -Interrupts – Direct Memory Access – IO Processor - Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB) - I/O devices

Total Hours: 60

Text Books

1. John Hayes (2012) ,(2007)digitized Computer Architecture and Organization, Tata McGraw Hill
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw Hill, 2012.

Reference Books

1. Morris Mano (2009) Computer System Architecture,(3rd ed.),Pearson Education
2. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

Subject Code:	Subject Name :	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
BCS17L05	**OPERATING SYSTEM LAB**					
	Prerequisite: NIL	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

Ty/LbETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn shell programming and the use of filters in the UNIX environment
- To learn to use system calls through C programs
- To learn to use the file system related system calls.
- To gain knowledge of process creation and communication between processes.
- To learn how process synchronization can be done using semaphores.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Master functions, structures and history of operating systems
CO2	Master understanding of design issues associated with operating systems
C03	Master various process management concepts including scheduling, synchronization, deadlocks and multithreading
C04	Master concepts of memory management including virtual memory
C05	Master issues related to file system interface and implementation, disk 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	H	M	M	M	L	L	L	M	M	H	M
CO2	H	H	M	L	L	H	M	M	M	M	M	M
C03	H	H	M	M	M	M	M	M	L	L	L	M
C04	H	H	M	L	L	L	L	H	H	H	M	M
C05	H	H	M	M	M	M	M	L	L	M	M	M

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

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17L05	NIL	**OPERATING SYSTEM LAB**	PCL	1	0	0/0	3/0	Lb

OBJECTIVES:

- To learn shell programming and the use of filters in the UNIX environment and to use system calls through C programs
- To learn to use the file system related system calls and gain knowledge of process creation and communication between processes
- To learn how process synchronization can be done using semaphores.

LIST OF EXPERIMENTS

1. Basic UNIX commands – learning and usage.
2. Shell Programming.
3. File system related system calls. (Learn to create, open, read, write, seek into, close files & open, read, write, search, close directories).
4. Process management – Fork, Exec (Learn to create a new process and to overlay an executable binary image on an existing process).
5. Inter-process communication between related processes using pipes.
6. Process synchronization using semaphores (Solutions to synchronization problems like producer consumer problem, dining philosopher's problem etc...).
7. Inter-process communication among unrelated processes using Shared memory.
8. Inter-process communication among unrelated processes using Message Queues.
9. CPU Scheduling algorithms.
10. Contiguous memory allocation strategies – best fit, first fit and worst fit strategies.
11. Page replacement algorithms

Subject Code:	Subject Name :	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
BCS17009	**OBJECT ORIENTED SOFTWARE ENGINEERING**					
	Prerequisite: BCS17002	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17009	BCS17002	**OBJECT ORIENTED SOFTWARE ENGINEERING**	PC	4	3	1/0	0/0	Ty

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

Subject Code: BIT17I02	Subject Name : WEB TECHNOLOGY AND WEB SERVICES	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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			
		✔										

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BIT17I02	BIT17I01	**WEB TECHNOLOGY AND WEB SERVICES**	IDT-4	3	3	0/0	0/0	Ty

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: BCS17ET3	Subject Name : **PHP / MYSQL**	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17L03	**ETL**	1	0/2	0/0	3

L : Lecture T : Tutorial SLr : 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			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17ET3	BCS17L03	**PHP / MYSQL**	PC	3	1	0/2	0/0	ETL

OBJECTIVES**:**

- The students will learn the technology about scripting languages basics.
- To understand installation of PHP and 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:	Subject Name :	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
BCS17008	**SYSTEM SOFTWARE AND PRINCIPLES OF COMPILER DESIGN**					
	Prerequisite: BCS17003	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

The students will be able

- To understand the role played by system softwares such as assembler, interpreter, linker, loader and compilers in the development of IT solutions.
- To develop a large, complex, but well-structured software system that implements various phases of a compiler such as the scanner, parser, code generator, and optimizer.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand about the system softwares such as assembler, interpreter, linker, loader and compilers in the development of IT solutions.
CO2	Describe the design of a Compiler including its Phases and Components.
CO3	Develop a large, complex, but well-structured software system that implements various phases of a compiler such as the scanner, parser, code generator, and optimizer.
CO4	Identify the similarities and differences among various parsing techniques and grammar transformation 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	H	M	M	M	M	M	H	H	H	M
CO2	H	H	H	M	H	M	L	M	M	M	H	M
CO3	H	H	H	H	H	H	M	M	M	M	M	H
CO4	H	H	H	M	M	M	L	M	M	L	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	M	H	L	L	M	M
CO3	H	H	M	M	H	H
CO4	M	H	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			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17008	BCS17003	**SYSTEM SOFTWARE AND PRINCIPLES OF COMPILER DESIGN**	PC	3	3	0/0	0/0	Ty

OBJECTIVES:

The students will be able

- To understand the role played by system softwares such as assembler, interpreter, linker, loader and compilers in the development of IT solutions.
- To develop a large, complex, but well-structured software system that implements various phases of a compiler such as the scanner, parser, code generator, and optimizer.

UNIT I - ASSEMBLERS & MACROS 6 Hrs

Overview of Language processors – Assemblers: Design of two pass assemblers - single pass assemblers MACRO: Macro definition- macro call – macro expansion- nested macroadvanced macro facilities.

UNIT II - LINKERS & LOADERS 6 Hrs

Loaders and Linkers: Functions – design - bootstrap loader - machine dependent loader features - machine independent loader features - loader design options - Dynamic linking and Linkage Editors – Implementation Examples

UNIT III - COMPILERS : GRAMMARS & AUTOMATA 9 Hrs

Structure of compiler-Languages –Context free grammar - regular expression - Recognizing of patterns - finite automation (deterministic & non deterministic) Conversion of NDFA to DFA - Conversion of regular expression to DFA – Thompson's construction- minimization of NDFA - Lexical analysis- handles - token specification - design of lexical analysis (LEX) - Automatic generation of lexical analyzer - input buffering - A language for specifying lexical analyzers - implementation of lexical analyzer.

UNIT IV - SYNTAX ANALYSIS – PARSING 12 Hrs

Definition - role of parsers - top down parsing - bottom-up parsing - Left recursion - left factoring - Handle pruning , Shift reduce parsing - operator precedence parsing – FIRST- FOLLOW- LEADING- TRAILING- Predictive parsing - recursive descent parsing. LR parsing – LR (0) items - SLR parsing – Canonical LR - LALR parsing - generation of LALR - error recovery

UNIT V - SYNTAX DIRECTED TRANSLATION & CODE OPTIMIZATION 12 Hrs

Intermediate Languages - prefix - postfix - Quadruple - triple - indirect triples – syntax tree- Evaluation of expression - three-address code- Synthesized attributes – Inherited attributes – Conversion of Assignment statements- Boolean expressions –Backpatching - Declaration - CASE statements

CODE OPTIMIZATION: Local optimization- Loop Optimization techniques – DAG – Dominators- Flow graphs – Storage allocations- Peephole optimization – Issues in Code Generation.

Total Hours: 45

Text Books:

1. Alfred V Aho, Jeffrey D Ullman, Ravi Sethi, "Compilers, Techniques, and Tools", Addison Wesley, 2006

2. Leland L Beck, D. Manjula, "System Software",III Edition, Pearson Education -- First Impression, 2007

Reference Books

1. D.M.Dhamdhere (2009) Systems Programming and Operating Systems,(2nd ed.), Tata McGraw-Hill Publishing Company Ltd
2. John J Donavan (2009) System Programming, Tata McGraw- Hill Publishing Company Ltd
3. John R. Levine, "Linkers & Loaders", Morgan Kauffman, 2003.
4. Allen Holub I. (2007) Compiler Design in C, PHI
5. V Raghavan (2009) Principles of compiler, Tata Mc Graw Hill
6. Kenneth C Louden (2003) Compiler Construction Principles & Practice Thompson learning

Subject Code: BIT17L08	Subject Name **WEB TECHNOLOGY AND WEB SERVICES LAB**	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite:BIT17IL01	**Lb**	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : 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			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BIT17L08	BIT17IL01	**WEB TECHNOLOGY AND WEB SERVICES LAB**	PCL	1	0	0/0	3/0	Lb

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: BCS17012	**Subject Name :** **DOT NET FRAMEWORK**	**Ty / Lb/ ETL**	L	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: BIT17I02	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- To learn the concepts of C# Dot Net language and ability to write programs.
- To understand the concepts of VB Dot Net, ADO.NET language and learn to develop an application.
- To develop knowledge to design web based application using ASP.Net.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To develop, implement and creating Applications with C#.
CO2	Integrate selected advanced topics in a Visual Basic .NET project
CO3	Create web forms with ASP.NET controls

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	M	H	M
CO2	H	H	H	H	H	M	M	L	H	M	H	M
CO3	H	H	H	H	H	M	M	L	H	M	H	M

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

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17012	BIT17I02	**DOT NET FRAMEWORK**	PC	4	3	1/0	0/0	Ty

OBJECTIVES:

- To learn the concepts of C# Dot Net language and ability to write programs.
- To understand the concepts of VB Dot Net, ADO.NET language and learn to develop an application.
- To develop knowledge to design web based application using ASP.Net.

UNIT I : DOT NET FRAMEWORK **12 Hrs**

.NET platform, .NET Frame work, Common Language Runtime, Namespace, assemblies, .NET memory management Introduction to C#.net, Introduction to VB.NET

UNIT II: C#.NET **12 Hrs**

Introduction to C# , Understanding C# in .NET, Overview of C#, literals, Variables, Data Types. Operators, Expressions, Branching and Looping Operations- Methods, Arrays Strings. Structures and Enumerations – Classes and Objects- inheritance and Polymorphism ,Multiple Inheritance, Operator Overloading, Events, Console I/O Operations and Exception

UNIT III : VB.NET **12 Hrs**

Introduction, Windows application, Web application, Building Blocks, programming Fundamentals, Creation of Windows Forms, SDI Vs MDI, Crating run time Windows Controls. File handling, Interaction with other Applications, Creating and using reports, Debugging and Packaging

UNIT IV : ADO.NET **12 Hrs**

ADO.NET, Connected Objects, Disconnected Objects, Data Form Wizard, Data Bound Form, Various Connection Methodologies for Database, Querying database, usage of Data Adapter class. Working with data off-line, Data view object, strongly typed Dataset Objects. Working with XML data, Building Windows based and web based application, .Net data providers

UNIT V : ASP.NET& WEB SERVICES **12Hrs**

Creation of web services, web service with ASP.NET, ASP.NET applications with databases, cookies and session handling

Total Hours: 60

Text Books

1. ThuanL.Thai, Hoang Lam, (2003).*NET Framework Essentials*, (3rd ed.) O'reilly Media Inc.
2. Balagurusamy, E. (2010) *Programming in C#*(3rd ed.) Tata McGraw-Hill

Reference Books

1. Kogent Solutions Inc (2009) *C# 2008 Programming: Covers .Net 3.5 Black Book*, (Platinum ed.) Dreamtech Press
2. Kip R Irvine Tony Gaddis (2009) *Starting Out with Visual Basic 2008* (4th ed.) Addison Wesleypublication
3. Evjen, Hanselman, Rader (2005) *Profesional ASP.NET 2.0* , John Wiley & Sons
4. David Sceppa (2013) *Programming Microsoft ADO.NET4*, Amazon.com
5. web reference http://msdn.microsoft.com/en-us/vstudio/default.aspx

Subject Code:	Subject Name : MANAGEMENT CONCEPTS AND ORGANISATION BEHAVIOUR	Ty/Lb/ ETL/ EVL	L	T	P	C
BMG17002	Prerequisite: BES17ET3 Basic Knowledge such as Statistical Techniques and Probability Theory	Ty	3	0/0	0/0	3

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

OBJECTIVE: The student will learn:

- 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	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO8	PO 9	PO1 0	PO1 1	PO1 2
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	Soft Skills	Management Science		
										✓		
Approval												

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BMG17002	BES17ET3	**MANAGEMENT CONCEPTS AND ORGANIZATIONAL BEHAVIOR**	MGMT-1	3	3	0/0	0/0	Ty

OBJECTIVES:

- To understand the roles and skills of manager
- To understand the concept of Planning and Organizing the management
- To understand the qualities of Leadership control
- To understand the difference between Individual and Group behavior in running a management

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: BCS17L12	Subject Name : **DOT NET LAB**	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17L08	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- To learn write console application and web based applications in C#.net
- To learn the windows application in VB.net
- To have knowledge to develop web form application ASP.net
- To learn end user application using data base connection using ADO.Net.
- To have knowledge to develop a web service using net frame work.
- To have knowledge to design platform independent application using Dot net framework

COURSE OUTCOMES (COs) : (3- 5)

CO1	Display proficiency in C# by building stand-alone applications in the .NET framework using C#.
CO2	Create distributed data-driven applications using the .NET Framework, C#, SQL Server and ADO.NET
CO3	Create web-based distributed applications using C#, ASP.NET, SQL Server and ADO.NET

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	L	H	H	H	M
CO2	H	H	H	H	H	H	H	L	H	H	H	M
CO3	H	H	H	H	H	H	H	L	H	H	H	M

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

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17L12	BIT17L08	**DOT NET LAB**	PCL	1	0	0/0	3/0	Lb

OBJECTIVES:

- To learn write console application and web based applications in C#.net
- To learn the windows application in VB.net
- To have knowledge to develop web form application ASP.net
- To learn end user application using data base connection using ADO.Net.
- To have knowledge to develop a web service using net frame work.
- To have knowledge to design platform independent application using Dot net framework.

C# .NET

1. Implementation of Operator Overloading
    a. Complex Number
    b. Matrix
    c. Time(+.-)
2. Implementation of Multiple Inheritance
    a. Employee
    b. Area of an Object
3. Implementing Multithreading
4. Exception Handling

VB .NET

5. Designing a Calculator
6. Implement File Handling (Read, Delete, Modify)
7. Implement Exception Handling
    a. Voter problem
    b. Student Status

ASP .NET

8. Super Market
9. Hotel Management System

ADO. NET

10. Student Attendance Calculation
11. Hospital management System

WEB SERVICE

12. Income tax calculation

Subject Code: BCS17011	Subject Name : DATA WAREHOUSING AND DATA MINING	Ty / Lb / ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17004	Ty	3	0/0	0/2	4

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

OBJECTIVE : The objective of the course is

- 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	PO10	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			
				✔								

Approval	27th meeting of Academic council, June2017

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17011	BCS17004	**DATA WAREHOUSING AND DATA MINING**	PC	4	3	0/0	0/2	Ty

OBJECTIVE:
The objective of the course is

- 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: BCS17L11	Subject Name : DATA MINING LAB	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17ET3	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17L11	BCS17ET3	**DATA MINING LAB**	PCL	1	0	0/0	3/0	Lb

OBJECTIVES:

1. Able to write simple programs using Rattle an open source Tool(R)
2. Able to write simple programs using Weka machine learning toolkit
3. To learn how process Clustering and association can be done using Weka.

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: BCS17L13	Subject Name : **PROJECT PHASE - 1**	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Lb	0	0/0	6/0	2

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 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			
							✓					

Approval	

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17L13	NIL	**PROJECT PHASE – 1**	PP1	2	0	0/0	6/0	Lb

OBJECTIVES:

- Able to do main projects in their respective domain

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: BMG17003	Subject Name : TOTAL QUALITY MANAGEMENT	Ty / L/ ETL	L	T	P	C
	Prerequisite: BMG17002 Basic Knowledge as quality techniques and implementation	Ty	3	0/0	0/0	3

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

OBJECTIVE:

- To acquaint the students with the basic concept of Total Quality (TQ) from design assurance to service assurance.
- To give understand International Quality Certification Systems – ISO 9000 and other standards.
- To apply in design manufacturing, quality control and services, and to closely interlink management of quality, reliability and maintainability for total product assurance.
- To understand concepts related to quality of services in contemporary environment.

COURSE OUTCOMES (COs) :

CO1	To maintain quality in all aspects
CO2	To understand the basic tools for quality control
CO3	To bring out zero defect products

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

COs/POs	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PO12
CO1	H	M	H	M	M	L	L	H	H	H	M	H
CO2	M	M	M		M	L		H			H	M
CO3	H	H	M	M	H	M	M	H	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	Soft Skills	Management Science		
										✓		
Approval												

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BMG17003	BMG17002	**TOTAL QUALITY MANAGEMENT**	MGMT-2	3	3	0/0	0/0	Ty

OBJECTIVES:

- To know business excellence models and ISO standards
- To study the principles & theories of total quality management.
- To know the various management methods for different kinds of problems of an organization.

UNIT I: Introduction **9 Hrs**

Need for quality – Definitions of quality - Dimensions of quality, Basic concepts of TQM - Definitions of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM

UNIT II: TQM Principles **9 Hrs**

Leadership – Strategic quality planning - Employee Involvement – Motivation, Empowerment, Teamwork, Performance appraisal , Recognition and Reward - Continuous process improvement – PDCA cycle, 5S, Kaizen.

UNIT III: Quality Tools **9 Hrs**

7 QC tools, 7 new management tools – Six Sigma – Quality circle – Cost of Quality - Quality Function Deployment (QFD) - Failure Mode and Effect Analysis (FMEA) – Bench Marking

UNIT IV: Customer and Quality Standards **9 Hrs**

Customer focus – Customer Orientation – Customer satisfaction – Customer complaints – Customer retention - ISO : 9000, ISO : 14000, QS : 9000 – Quality Auditing

UNIT V: TQM Strategies **9 Hrs**

Strategic planning – Strategic Formation– Strategic Management – The TQM element approach – The guru approach – The Organization model approach – The Japanese total quality approach.

Total Hours: 45

Text Books:

1. D.R.Kiran (2016) Total Quality Management, BSP.
2. Dale H. Besterfield (2011) Total Quality Management, Pearson Education r3e

Reference Books:

1. Suganthi.L and Anand A Samuel (2011) Total Quality Management, Prentice Hall of India
2. Janakiraman. B and Gopal. R.K. (2006) Total Quality Management, Text & Cases, Prentice Hall of India.

Subject Code: BCS17010	Subject Name : OPEN SOURCE SCRIPTING LANGUAGES	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17ET3	Ty	3	0/0	0/0	3

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

OBJECTIVE :

- 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			
				✔								

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17010	BCS17ET3	**OPEN SOURCE SCRIPTING LANGUAGES**	PC	3	3	0/0	0/0	Ty

OBJECTIVES:

- The students will have knowledge about the scripting languages
- To study about the PERL & 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: BCS17L14	Subject Name : **PROJECT PHASE - II**	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17L13	Lb	0	0/0	20/0	10

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 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	`	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			
							✓					
Approval												

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17L14	BCS17L13	**PROJECT (PHASE – II)**	PP2	10	0	0/0	20/0	Lb

OBJCETIVES:

- Able to do main projects in their respective domain

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: BCS17OE1	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 SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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	The students have knowledge on networks
CO2	Able to design their own basic website and host the web site
CO3	Ability to design user interactive 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	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			
						✔						

Approval	**27th meeting of Academic Council, June 2017**

BCS17OE1	NIL	WEB DESIGN	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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: BCS17OE2	Subject Name : CYBER SECURITY ESSENTIALS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVES :

- Learn the Security standards
- Lear the techniques of cyber security attacks
- Learn the concept of basic computer networks

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the process design to protect computers, networks
CO2	Familiarize data from unauthorized access, vulnerabilities and attacks delivered via Internet by cyber criminals
CO3	Recognize the importance of cyber security 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	H	H	H	L	M	L	M	H	M	L
CO2	M	H	H	H	H	M	M	L	M	M	H	L
CO3	H	H	H	H	H	M	M	M	H	M	H	M

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

Approval	27th meeting of Academic council, June2017

			C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
BCS17OE2	**NIL**	**CYBER SECURITY ESSENTIALS**	3	3	0/0	0/0	Ty

OBJECTIVES:

The student should be able to:

- Learn the Security standards
- Lear the techniques of cyber security attacks
- Learn the concept of basic computer networks

UNIT I: Cyber Security Fundamentals **9 Hrs**

Network And Security Concepts: Information Assurance Fundamentals-Basic Cryptography-Public Key Encryption- The Domain Name System(DNS)- Firewalls

UNIT II: Attackers Technique And Motivations **9 Hrs**

Trackers Cover Their Tracks (Antiforensis), How And Why Attackers Use Proxies-Tunnelling Technique- Fraud Technique: Phising, Smishing, Vishing And Mobile Malicious Code- Rogue Antivirus- Threat Infrastructure: Botnets-Fast Flux.

UNIT III: Exploitation **9 Hrs**

Techniques To Gain A Foothold: Shellcode- Integer Overflow Vulnerabilities- Stack Based Buffer Overflows- SQL Injections – Malicious PDF Files.

UNIT IV: Malicious Code **9 Hrs**

Self-Replicating Malicious Code Worms-Viruses Persistent S/W Techniques: Basic I/P-O/P System- Legacy Text Files- Autostart Registary Entirier Root Kits- Spyware- Attacks Against Privileged User Accounts- Virtual Machine Detection.

UNIT V: Defence And Analysis Technique **9 Hrs**

Memory Forensics- Honeypots- Malicious Code Naming- Automated Malicious Code Analysis System-Intrution Defection System. Case study :Defence Special File Investigation Tools.

Total Hours: 45

Text Book:

1. James Graham, Ryan Olson, 2016 -Rick Howard, Cyber Security Essentials.

Subject Code: BCS17OE3	Subject Name : Electronic Waste Management	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

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

OBJECTIVE :

- The e-waste Rules is to regulate generation, collection, storage, transport, import, export, recycling, treatment and disposal of e-wastes.
- Defining necessary steps to protect health and environment against hazardous substances contained in such wastes.
- Ensure that each and every one involved in the generation of e-waste contributes to the objective of environmentally sound recycling treatment and disposal of e-waste.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To achieve great knowledge about E-Waste Management
CO2	Concern over the environmental harm in nature economies creates an economic disincentive.
CO3	To learn about E-Waste Rules and Regulations adapted in many Countries
CO4	Efficient way of Recycling and Recovery
CO5	Reuse and refurbishing offer a more environmentally friendly and socially conscious alternative to down cycling processes.

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	H	H	M	M	M	M	H
CO2	M	H	M	L	L	H	H	H	M	H	M	M
CO3	L	M	L	L	L	H	H	H	H	H	M	M
CO4	H	H	H	H	H	H	H	H	H	H	M	H
CO5	M	H	H	H	M	H	H	H	H	H	M	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	M	M	M	M	H
CO2	M	M	H	M	M	M
CO3	M	M	H	H	M	H
CO4	H	H	H	H	M	H
CO5	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			
						✔						
Approval	**27th meeting of Academic Council, June 2017**											

BCS17OE3	NIL	ELECTRONIC WASTE MANAGEMENT	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

- The e-waste Rules is to regulate generation, collection, storage, transport, import, export, recycling, treatment and disposal of e-wastes.
- Defining necessary steps to protect health and environment against hazardous substances contained in such wastes.
- Ensure that each and every one involved in the generation of e-waste contributes to the objective of environmentally sound recycling treatment and disposal of e-waste.

Unit I: Introduction **9 Hrs**

E-Waste: Definition and major sources - why is e-waste harmful? - Classification of e-waste – components of e-waste - composition of e-waste – future perspective on electronic scarp.

Unit II: Environmental and Health Impacts **9 Hrs**

WEEE (Waste Electrical and Electronic Equipment)--toxicity and health perspective - Hazardous substances in waste electrical and electronic equipment--toxicity and release - Occupational and environmental health perspectives of e-waste.

Unit III: E-waste Regulation **9 Hrs**

Regulating e-waste - International and national legal framework on e-waste - Extended producer responsibility - a key tool for international rules and regulations on e-waste - Optimal planning for computer waste - Guidelines for environmentally sound management of e-waste.

Unit IV: Recycling & Recovery **9 Hrs**

Recycling of e-scrap in a global environment - opportunities and challenges - European Recycling platform (ERP) - Technologies for recovery – Rapid assessment of Electronics Enclosure Plastics – Reuse – A bridge from unsustainable E-Waste to sustainable E- Resources.

Unit V: Case Studies **9 Hrs**

1. Overview of the International WEEE Directive 2. E- Waste Estimation in a particular country 3. Possible structure to establish a road-map for the implementation of an e-waste management strategy 4. Innovative idea in recycling the E-Waste.

Total Hours: 45

Text / Reference Books:

1. Ramzy Kahhat, Klaus Hieronymi, Eric Williams, 2013, E-waste Management: From Waste to Resource, Routledge.
2. Ronald E. Hester, Roy M. Harrison, 2009, Electronic Waste Management Design, Analysis and Application, REC Publishing.
3. Rakesh Johri, 2008, E-waste: implications, regulations, and management in India and current global best practices, TERI Press.

Subject Code:	Subject Name : SOFTWARE TESTING	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
BCS17OE4	Prerequisite: NIL	Ty	3	0/0	0/0	3

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

OBJECTIVE :

- Expose the criteria for test cases.
- Learn the design of test cases. have familiar with test management and test automation techniques.
- Be exposed to test metrics and measurements

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the importance of software quality/software testing and apply software testing techniques for information systems software testing techniques in commercial environments development.
CO2	Generate test cases from software requirements using various test processes for continuous quality improvement
CO3	Apply and assess the adequacy of test suites using control flow, data flow, and program mutation

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	M	L	L	M	M	M	M	M
CO2	H	H	M	M	L	L	L	M	M	M	M	M
CO3	H	H	M	M	L	L	L	L	L	L	L	M

COs / PSOs	PS01	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	M	L	L
CO2	H	H	L	L	M	M
CO3	H	H	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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17OE4	NIL	SOFTWARE TESTING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

- The student should be made to:
- Expose the criteria for test cases.
- Learn the design of test cases.
- familiar with test management and test automation techniques.
- Be exposed to test metrics and measurements

Unit I: Introduction **9 Hrs**

Software testing – Role of software testing – A structural approach to testing – Test strategy – methods for developing test strategy Testing methodologies.

Unit II: Life Cycle Testing Approach **9 Hrs**

Test plan – Requirements testing – Walk through test tool – Risk matrix test tool – Testing for requirements phase and design phase – Design renew test tool – Test data and volume test tools.

Unit III: Installation **9 Hrs**

Installation phase testing – Tools for acceptance test – Software acceptance process – Software maintenance – Methodologies for testing – Training and change installation.

Unit IV: Testing Methods **9 Hrs**

Tools and techniques – Cost estimate – For testing – Testing phase of life cycle – Point accumulation tracking system – Performance analysis of testing – Inspection plan and test plan documents.

Unit V: Testing Strategy **9 Hrs**

Rapid prototyping – Spiral testing – Tool selection processes – Structural system testing – Documentation of test results – Test effectiveness evaluation – Test measurement process – Test metrics.

Total Hours: 45

Text Books:

1. William Perry,2007, "Effective Methods for Software Testing", John Wiley & Sons,
2. Ron Patton, 2006, " Software Testing", Techmedia

Subject Code: BCS17OE5	Subject Name : **Information Security Management**	Ty / L b/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

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

OBJECTIVE : 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.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Develop an understanding of the key themes and principles of information security management
CO2	Apply the principles in designing solutions to manage security risks effectively
CO3	Apply the principles of information security management in a variety of contexts
CO4	Understand the various elements of information security management and its role in protecting organizations

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	L	L	H	M
CO2	H	H	H	H	M	H	H	H	H	H	H	H
CO3	H	H	H	M	M	H	M	H	M	H	H	H
CO4	M	M	M	H	M	H	H	H	H	M	M	H

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

Approval	**27th meeting of Academic council, June2017**

Course Code	Prerequisite Course Code	Course Title	Category	C	L	T/SLr	P/R	Ty/ Lb/ ETL/ EVL
BCS17OE5	NIL	**INFORMATION SECURITY MANAGEMENT**	OE	3	3	0/0	0/0	Ty

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.

6TH SEM ELECTIVES E-II (Common to CSE&IT)

Subject Code: BCS17005	Subject Name: DESIGN AND ANALYSIS OF ALGORITHMS	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite:BCS17001	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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	PO 1	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	PSO 1	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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17005	BCS17001	DESIGN AND ANALYSIS OF ALGORITHMS	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

- The students will be able to understand the design of advanced algorithms
- Create problems by applying Greedy methods and understand the dynamic programming
- Apply the graph coloring techniques to solve the real time problems.

UNIT I: Introduction **9 Hrs**

Fundamental characteristics of an algorithm. Basic algorithm analysis –Asymptotic analysis of complexity bounds – best, average and worst-case behaviour, standard notations for expressing algorithmic complexity. Empirical measurements of performance, time and space trade-offs in algorithms. Using recurrence relations to analyze recursive algorithms – illustrations using recursive algorithms.

UNIT II: Fundamental Algorithmic Strategies **9 Hrs**

Fundamental Algorithmic Strategies: Brute-Force, Greedy, Branch-and-Bound, Backtracking and Dynamic Programming methodologies as techniques for design of algorithms – Illustrations of these techniques for Problem Solving. Euristico- characteristics and their domains of applicability. Design of algorithms for String / Text matching problems, Huffman Code and Data compression problems, Subset-sum and Knapsack problems.

UNIT III: Graph and Tree Algorithms **9 Hrs**

Graph and Tree Algorithms: Depth- and Breadth- First traversals. Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sort, Network Flow problems.

UNIT IV: Tractable and Intractable Problems **9 Hrs**

Tractable and Intractable Problems: Computability. The Halting problem. Computability classes – P, NP, NP - complete and NP-hard. Cook‘s theorem. Standard NP complete problems Reduction techniques.

UNIT V: Advanced Algorithms **9 Hrs**

Approximation algorithms, Randomized algorithms, Class of problems beyond NP – SPACE.

Total Hours: 45

Text Books:

1. T.H. Corman et. al , (2009) Introduction to Algorithms Mit Press
2. Jon Kleinberg and Eva Tardos (2006) Algorithm Design, Pearson Education India.

Reference Books:

1. E. Horowitz et al (2008) Fundamentals of Algorithms –., Prentice Hall of India
2. Anany Levitin,(2003) "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia.

Subject Code: BCS17E01	Subject Name : IMAGE PROCESSING	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17ET1	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : 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	PO10	PO11	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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E01	BCS17ET1	IMAGE PROCESSING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

- To Lean the image fundamentals and mathematical transforms necessary for image proces sing.
- 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: BCS17E02	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 SLr : 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, 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			
					✔							

Approval	27 th meeting of Academic Council, June 2017

BCS17E02	NIL	GEOGRAPHICAL INFORMATION SYTEMS	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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*, (8^{th} 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: BCS17E03	Subject Name : DATA BASE TUNING	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17004	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

1. The students will be able to tune the databases for different data base applications
2. To develop case studies in data bases, and able to troubleshoot the data bases
3. 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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E03	BCS17004	DATABASE TUNING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

- The students will be able to tune the databases for different data base applications.
- To develop case studies in data bases
- Able to troubleshoot the data bases.

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: BCS17E04	Subject Name : COMPONENT BASED TECHNOLOGY	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17ET2 & BCS17012	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : 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 Skill	Soft Skills			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E04	BCS17ET2 & BCS17012	COMPONENT BASED TECHNOLOGY	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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 Publications Pvt. Ltd.
2. Tom Valesky (2002) - Enterprise Java Beans, Pearson Education.
3. Jason Pritchard (2000) ―COM and CORBA Side by Side, Addison Wesley.
4. Joel Murach,Anne Boehm (2012)- C#, Murach.

Subject Code: BCS17E05	Subject Name : E-COMMERCE	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I02	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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			
					✔							

Approval	27 th meeting of Academic Council, June 2017

BCS17E05	BIT17I02	E-COMMERCE	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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 e-Commerce;
- 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.

Subject Code: BCS17E06	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 SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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			
					✔							

Approval	27 th meeting of Academic Council, June 2017

BCS17E06	NIL	ARTIFICIAL INTELLIGENCE	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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

Subject Code: BCS17E07	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 SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

The student should be made to:

- 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			
					✔							

Approval	27 th meeting of Academic Council, June 2017

BCS17E07	NIL	HUMAN COMPUTER INTERACTION	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

The student should be made to:

- 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: BCS17E08/ BIS15005	Subject Name : WIRELESS AND MOBILE NETWORKING	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- To show the ability to critically discuss the key concepts in wireless and mobile communication standards and mobile networking concepts.

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

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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E08/ BIS15005	BIT17I01	WIRELESS AND MOBILE NETWORKING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

The lectures on wireless and mobile networking will help a student to understand

- 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:

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.

7TH SEM ELECTIVES – E-III AND E-IV (Common to CSE&IT)

Subject Code: BCS17E09	Subject Name : WEB MINING	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17011	Ty	3	0/0	0/0	3

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

OBJECTIVE :

1.To understand the characteristics of the Internet and data mining
2. To know about the web crawling algorithm implementation
3. 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			
					✔							

Approval	27 th meeting of Academic Council, June 2017

BCS17E09	BCS17011	WEB MINING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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 III: 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: **BCS17E10**	Subject Name : WEB DATA DESIGN & MANAGEMENT	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I02	Ty	3	0/0	0/0	3

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

OBJECTIVE :

- 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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E10	BIT17I02	WEB DATA DESIGN & MANAGEMENT	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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. 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: BCS17E11	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 SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

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	M
CO2	M	M	M	L	M	H
CO3	H	L	L	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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E11	NIL	RISK MANAGEMENT	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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.
- Suggest ways to finance risk.
- Apply the insurance mechanism in risk management.
- Describe the management of international risk.

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 Book:

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: BCS17E12	Subject Name : M - COMMERCE	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I02	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE

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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E12	BIT17I02	M- COMMERCE	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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:	Subject Name :	T / L/ ETL	L	T / S.Lr	P/ R	C
BCS17E13	**Cryptography and Network Security**					
	Prerequisite: BIT17I01	Ty	3	0/0	0/0	3

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

OBJECTIVE :

The student will be able :

- 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	To identify 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	PO 1	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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E13	BIT17I01	CRYPTOGRAPHY AND NETWORK SECURITY	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

The student will be able:

- 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
3. Bruce Schneier (2007) *Applied Cryptography*, John Wiley & Sons Inc.
4. Charles B. Pfleeger, Shari Lawrence Pfleeger (2007) *Security in Computing* (4th ed.), Pearson Education

Subject Code: BCS17E14	Subject Name : Mobile Adhoc Networks	Ty / Lb ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E14	BIT17I01	MOBILE ADHOC NETWORKS	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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.
- Thisincludes 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,

Subject Code: BCS17E15	Subject Name : TCP/IP Design and Implementation	Ty / Lb / ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE : The objective of the course is

- To learn the principles of TCP / IP and its Architecture
- Understand the transport layer protocols
- IP addressing and routing

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			
					✓							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E15	BIT17I01	TCP/IP DESIGN AND IMPLEMENTATION	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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: BCS17E16	Subject Name : Cyber Forensics and Internet Security	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite:BCS17OE5	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E16	BCS17OE5	CYBER FORENSICS AND INTERNET SECURITY	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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 Security Cryptographic 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: BCS17E17	Subject Name : Database Security	Ty / Lb / ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17004	Ty	3	0/0	0/0	3

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

OBJECTIVE : The objective of the course is

- 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			
					✓							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E17	BCS17004	DATABASE SECURITY	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVE:

- The objective of the course is to provide a foundation in database security, understand various database vulnerabilities and learn to mitigate database.

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: BCS17E18	Subject Name : REAL TIME SYSTEMS	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite:BCS17006	Ty	3	0/0	0/0	3

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

OBJECTIVE :

1. Real-time scheduling and schedulability analysis
2. Formal specification and verification of timing constraints and properties
3. Design methods for real-time systems

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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E18	BCS17006	REAL TIME SYSTEMS	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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 th edition,pearson.

Subject Code: BCS17E19	Subject Name : DISTRIBUTED COMPUTING	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I01 & BCS17006	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E19	BIT17I01 & BCS17006	DISTRIBUTED COMPUTING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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

Subject Code: BCS17E20	Subject Name : OPTIMIZATION TECHNIQUES	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E20	NIL	OPTIMIZATION TECHNIQUES	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVE:

- 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. **Network Analysis:** 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.

Subject Code: BCS17E21	Subject Name : MANAGEMENT INFORMATION SYSTEMS	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17004	Ty	3	0/0	0/0	3

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

OBJECTIVE :

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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E21	BCS17004	MANAGEMENT INFORMATION SYSTEMS	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

- why information systems are so important today for business and management;
- 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

7TH SEMESTER - SPECIAL ELECTIVE – TECHNOLOGY BASED (ES-EV) (Common to CSE&IT)

Subject Code: BCS17E22	Subject Name : Mobile Application Development	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17ET2	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE : 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	PO10	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		
										✔		

Approval	27 th meeting of Academic Council, June 2017

BCS17E22	BCS17ET2	MOBILE APPLICATION DEVELOPMENT	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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: BCS17E23	Subject Name : DATA SCIENCE AND BIG DATA ANALYTICS	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17004	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

1. Deploying the Data Analytics Lifecycle to address big data analytics projects
2. Reframing a business challenge as an analytics challenge
3. Applying appropriate analytic techniques and tools to analyze big data, create statistical models, and identify insights that can lead to actionable result
4. 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		
										✔		

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E23	BCS17004	DATA SCIENCE AND BIG DATA ANALYTICS	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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
- Selecting appropriate data visualizations to clearly communicate analytic insights to business sponsors and analytic audiences
- 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: BIT17007	Subject Name : Cloud Technology	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: **BIT17I01**	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

- **OBJECTIVE :** To learn Cloud computing infrastructure and services, to acquire knowledge about cloud storage. to understand cloud computing security and 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			

Approval	27 th meeting of Academic Council, June 2017

BIT17007	BIT17I01	CLOUD TECHNOLOGY	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

- To learn Cloud application Development
- To acquire knowledge about public and private cloud
- To understand critical success factor
- To examine cloud audit

UNIT I: Cloud Computing and Public Cloud 9 Hrs

Introduction – voice in the cloud – commerce in the cloud – distributed hosting in the cloud – Enterprise – Public cloud – virtualization – remote hosting – hosting services – cloud service model – deployment model – cloud software – divisive issues of multi tendency - public vs private cloud – hybrid solutions – Eucalyptus

UNIT II: Vision of Computer Utility 9 Hrs

Not remote hosting – desktop virtualization – PaaS – SaaS Applications – Moving into and around the cloud – portable software – openness – closed architecture – legacy applications and migration to the cloud – preventing vendor lock in – cloud software – Zend – Abiquo - 3Tera – Elastra – RightScale – VMWare's focus – OMTF – Cloud broker – Inter clouding – DTMF & OVFS.

UNIT III: Cloud Economics and Demystifying The Cloud 9 Hrs

Capacity planning – Queuing theory – capacity management – evidence based decision making – measuring resource conception - bottlenecks – strategies for capacity planning – critical success factors – key volume indicators – AWS - Amazon S3 functionality – Gladinet desktop face on S3 – move static content to S3 – move web servers and back end – accessing public data – Eucalyptus – Nimbula.

UNIT IV: Virtualization and Securing The Cloud 9 Hrs

Hypervisor – KVM – Xen – QEMU – Azure – Hyper-V – VPLEX and VMWare – Vmforce – spring for AppEngine – OpenStack – FUDD factor – leakage – virtualization is inherently more secure – cloud security provider employ – DoS attack – OASIS and SPLM – standards and vendor selection – Cloud security alliance – Cloud Audit.

UNIT V: Scale and Reuse 9 Hrs

Hardware reuse – Service oriented architecture – Windos Azure – prologue – deployment scenarios - Azure pricing – Google in the cloud – App Engine cost structure – Google web toolkit – Google gears R.I.P – Enterprise cloud vendors – Cloud service providers.

Total Hours: 45

TEXT BOOK:

1. David E.Y Sarna 2011 " Implementing and Developing cloud computing Applications" CRC Press.
2. Kevin Roebuck 2011" Cloud Application development Tools" Emereo pty Ltd.

REFERENCE BOOKS:

1. Scott Adkins 2016 "OpenStack cloud Application Development" Wrox
2. Christopher M Moyer 2011"Building Applications in the cloud -Concept Patterns and Projects" Pearson .

Subject Code: BCS17E24	Subject Name : Network Forensics	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I01	Ty	3	0/0	0/0	3

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

OBJECTIVE : The objective of the course is

- 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			
					✓							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E24	BIT17I01	NETWORK FORENSICS	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVE:

- This course provides 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 Forensics William 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: BCS17E25	Subject Name : INTERNET OF THINGS	T y/ Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : 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		
										✔		

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E25	NIL	INTERNET OF THINGS	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

The student should be able to:

- 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

BCS17E26	SOCIAL COMPUTING	Lb/ ETL		S.Lr	R	
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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		
										✔		

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E26	NIL	SOCIAL COMPUTING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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: BCS17E27	Subject Name : ENTERPRISE ARCHITECTURE	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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		
										✔		

Approval	27 th meeting of Academic Council, June 2017

BCS17E27	NIL	ENTERPRISE ARCHITECTURE	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVE:

- 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

BCS17EXX	**NIL**	**Any other that is important time to time based on Industry Demand**	**C**	**L**	**T/SLr**	**P/R**	**Ty /Lb /ETL/EVL**
			3	**3**	**0/0**	**0/0**	**Ty**

8TH SEM ELECTIVES E-VI AND E-VII (Common to CSE&IT)

Subject Code: BCS17E28	Subject Name : Information Storage Management	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17004	Ty	3	0/0	0/0	3

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

OBJECTIVE :

- 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			
					✔							

Approval	**27th meeting of Academic Council, June 2017**

BCS17E28	BCS17004	INFORMATION STORAGE MANAGEMENT	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

- To have a comprehensive understanding of the various storage infrastructure components in data center environments.
- To make informed decisions on storage-related technologies in an increasingly complex IT environment
- To have 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
- To learn about storage concepts and networking technologies such as FC SAN, IP SAN, and FCoE SAN

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 Implementation in 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: BCS17E29	Subject Name : Network Infrastructure Management	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE : To learn Network Layers functionality, to acquire knowledge about and VLANs, and to test Network security and wireless security.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the use of network infrastructure
CO2	Recognize the importance and relevance of VLANs 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			
					✔							

Approval	**27th meeting of Academic Council, June 2017**

BCS17E29	BIT17I01	NETWORK INFRASTRUCTURE MANAGEMENT	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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, VLSM And 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.

Subject Code: BCS17E30	Subject Name : Foundations of Parallel Programming	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17007	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

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
CO5	

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
CO5												

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
CO5						

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			
					✔							

Approval	**27th meeting of Academic Council, June 2017**

BCS17E30	BCS17007	FOUNDATIONS OF PARALLEL PROGRAMMING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES

The students will be able to understand and to apply

- 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: BCS17E31	Subject Name : VIRTUALIZATION	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17007	Ty	3	0/0	0/0	3

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

OBJECTIVE :

Candidates should know and understand the general concepts, theory and terminology of 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			
					✔							

Approval	27th meeting of Academic Council, June 2017

BCS17E31	BIT17007	VIRTUALIZATION	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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

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: BCS17E32	Subject Name : **HADOOP DISTRIBUTED FILE SYSTEM**	T y/ Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17006	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

- **OBJECTIVE :** To understand the concepts of Distributed file system, to acquire knowledge about Hbase, YARN, PIG and OOZIE and to examine MapReduce types and formats.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the application of distributed file system.
CO2	Recognize the importance and relevance of HDFS.
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			
					✔							

Approval	**27 th meeting of Academic Council, June 2017**

BCS17E32	BCS17006	HADOOP DISTRIBUTED FILE SYSTEM	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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: BCS17E33	Subject Name : MOBILE DATABASES	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17004	Ty	3	0/0	0/0	3

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

OBJECTIVE :

1.To learn about the fundamentals of distributed databases
2. To understand Data Processing and mobility models
3. To learn about the Data Consistency and Concurrency Control mechanisms
4. 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			
					✔							

Approval	**27th meeting of Academic Council, June 2017**

BCS17E33	BCS17004	MOBILE DATABASES	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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: BCS17E34	Subject Name : WEB ENGINEERING	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I02	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- 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			
					✔							

Approval	**27th meeting of Academic Council, June 2017**

BCS17E34	BIT17I02	WEB ENGINEERING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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.

Subject Code: BCS17E35	Subject Name : **4G Networks**	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIT17I01	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

To understand the latest technology in mobile communication and the high speed data communication through wireless network.

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			
					✔							

Approval	**27th meeting of Academic Council, June 2017**

BCS17E35	BIT17I01	4G NETWORKS	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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 Books:

1. Clint Smith, P.E., Daniel Collins, Wireless Networks: Design and Integration for TE,EVDO,HSPA and WiMax Third Generation.

Subject Code: BCS17E36	Subject Name : ENTERPRISE RESOURCE PLANNING	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

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

OBJECTIVE :

1. Know basic business functional areas and explains how they are related.
2. 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
3. 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			
					✔							

Approval	**27th meeting of Academic Council, June 2017**

BCS17E36	NIL	ENTERPRISE RESOURCE PLANNING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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.

Subject Code: BCS17E37	Subject Name : SUPPLY CHAIN MANAGEMENT	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

1. For students to analytically solve problems related to inventory management, facility location, and supply chain optimization
2. To utilize computer resources to research and analyze supply chain operations.
3. 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			
					✔							

Approval	**27th meeting of Academic Council, June 2017**

BCS17E37	NIL	SUPPLY CHAIN MANAGEMENT	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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: BCS17E38	Subject Name : MAIN FRAME COMPUTING	Ty / Lb ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17004	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

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			
					✔							

Approval	**27th meeting of Academic Council, June 2017**

BCS17E38	BCS17004	MAINFRAME COMPUTING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

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 **9 Hrs** 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

Subject Code: BCS17E39	Subject Name : Neuro Fuzzy Computing	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17E06	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : 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			
				✔								

Approval	27th meeting of Academic Council, June 2017

BCS17E39	BCS17E06	NEURO FUZZY COMPUTING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

- 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: BCS17E40	Subject Name : **WEB CONTENT MANAGEMENT**	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BCS17E09	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

OBJECTIVE :

- To Lean 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			
					✔							

Approval	**27th meeting of Academic Council, June 2017**

BCS17E40	BCS17E09	WEB CONTENT MANAGEMENT	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVES:

The student should be able:

- To Lean 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:	Subject Name : Machine Learning	T / L/ ETL	L	T / S.Lr	P/ R	C
BCS17E41	Prerequisite: BCS17E06	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

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

- **OBJECTIVE :** To learn machine learning techniques, to acquire knowledge about clustering and nonparametric methods and to design and analyze machine learning experiments.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the concept of Machine Learning
CO2	Recognize the importance and relevance of Machine 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			
					✔							

Approval	**27th meeting of Academic Council, June 2017**

BCS17E41	BCS17E06	MACHINE LEARNING	C	L	T/SLr	P/R	Ty /Lb /ETL/EVL
			3	3	0/0	0/0	Ty

OBJECTIVE:

- 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.