



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**  
**B.Tech – Computer Science and Engineering (Part Time)**  
**Curriculum and Syllabus**  
**2018 Regulation**

I SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BMA18008	Discrete Mathematics	Ty	3	1/0	0/0	4
2	BCS18004	Database Management Systems	Ty	3	0/1	0/0	4
3	BEC18I01	Digital Systems	Ty	3	0/0	0/0	3
4	BCS18002	Object Oriented Programming with C++	Ty	3	0/1	0/0	4
<b>PRACTICALS*</b>							
1	BCS18L02	Object Oriented Programming with C++Lab	Lb	0	0/0	3/0	1
2	BCS18ET1	Java Programming	ETL	1	0/1	3/0	3
<b>Credits Sub Total</b>							<b>19</b>

II SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BMA18016	Statistics for Computer Engineers	Ty	3	1/0	0/0	4
2	BCS18003	Computer Organization and Architecture	Ty	3	1/0	0/0	4
3	BCS18001	Data Structures	Ty	3	1/0	0/0	4
<b>PRACTICALS*</b>							
1	BCS18ET2	Computer Graphics	ETL	1	0/1	3/0	3
2	BCS18L01	Data Structures Lab	Lb	0	0/0	3/0	1
<b>Credits Sub Total</b>							<b>16</b>

III SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BCS18007	Computer Networks	Ty	3	0/0	0/0	3
2	BCS18005	Design and Analysis of Algorithms	Ty	3	0/0	0/0	3
3	BEC18I02	Microprocessors and Microcontrollers	Ty	3	0/0	0/0	3
<b>PRACTICALS*</b>							
1	BCS18ET3	PHP/MySQL	ETL	1	0/1	3/0	3
2	BCS18L05	Network Programming Lab	Lb	0	0/0	3/0	1
<b>Credits Sub Total</b>							<b>13</b>

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

IV SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BCS18009	Object Oriented Software Engineering	Ty	3	1/0	0/0	4
2	BIT18003	Web Technology and Web Services	Ty	3	0/0	0/0	3
3	BCS18012	Open Source Scripting Languages	Ty	3	0/0	0/0	3
4	BXX18EXX	ELECTIVE 1	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BCS18L08	Object Oriented Software Engineering Lab	Lb	0	0/0	3/0	1

**Credits Sub Total: 14**

V SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BCS18008	System Software and Principles Of Compiler Design	Ty	3	0/0	0/0	3
2	BCS18006	Operating Systems	Ty	3	0/0	0/0	3
3	BCS18011	Dot Net Framework	Ty	3	1/0	0/0	3
4	BXX18EXX	ELECTIVE II	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BCS18L06	Operating Systems lab	Lb	0	0/0	3/0	1

**Credits Sub Total 14**

VI SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BCS18010	Data Warehousing and Data Mining	Ty	3	0/0	0/3	4
2	BMG18002	Management Concepts and Organizational Behavior	Ty	3	0/0	0/0	3
3	BXX18EXX	ELECTIVE III	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BCS18L13	PROJECT PHASE - I	Lb	0	0/0	3/3	2
2	BCS18L11	Data Mining Lab	Lb	0	0/0	3/0	1

**Credits Sub Total 13**

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>VII SEMESTER</b>							
<b>S.NO.</b>	<b>SUBJECT CODE</b>	<b>SUBJECT NAME</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ SLr</b>	<b>P/R</b>	<b>C</b>
1	BXX18EX X	ELECTIVE IV	Ty	3	0/0	0/0	3
<b>PRACTICALS*</b>							
1	BCS18L14	Project (Phase – II)	Lb	0	0/0	12/1 2	8
<b>Credits Sub Total</b>							<b>11</b>

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

**Credit Summary**

**Semester 1: 19**

**Semester 2: 16**

**Semester 3: 13**

**Semester 4: 14**

**Semester 5: 14**

**Semester 6: 13**

**Semester 7: 11**

**Total Credits: 100**



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

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

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

<b>ELECTIVE –III</b>							
<b>S.NO.</b>	<b>SUBJECT CODE</b>	<b>SUBJECT NAME</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>
1	BCS18E41	Mobile Application Development(only for CSE)	Ty	3	0/0	0/0	3
2	BCS18E18	Data Science and Big Data Analytics	Ty	3	0/0	0/0	3
3	BIT18006	Cloud Technology (only for CSE)	Ty	3	0/0	0/0	3
4	BCS18E19	Network Forensics	Ty	3	0/0	0/0	3
5	BCS18E20	Internet of Things	Ty	3	0/0	0/0	3
6	BCS18E21	Social Computing	Ty	3	0/0	0/0	3
7	BCS18E22	Enterprise Architecture	Ty	3	0/0	0/0	3
8	BCS18EXX	Subject based on Industry Demand	Ty	3	0/0	0/0	3
9	BCS18E23	Optimization Techniques	Ty	3	0/0	0/0	3



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

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



**Dr.M.G.R.**  
**Educational and Research Institute**  
**(DEEMED TO BE UNIVERSITY)**  
(An ISO Certified Institution)  
**University with Graded Autonomy Status**  
Maduravoyal , Chennai - 600 095



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**  
**SEMESTER – I**

Subject Code : <b>BMA18008</b>	Subject Name : <b>DISCRETE MATHEMATICS</b>	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
	Prerequisite : None	Ty	3	1/0	0/0	4

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

**OBJECTIVES :**

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

**COURSE OUTCOMES (COs) :**

Students completing the course were able to

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

**Mapping of Course Outcomes with Program Outcomes (POs)**

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

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

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BMA18008</b>	<b>DISCRETE MATHEMATICS</b>	<b>Ty</b>	<b>3</b>	<b>1/0</b>	<b>0/0</b>	<b>4</b>
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(Common to II yr. / III Sem. B.Tech (Full Time), I yr. / I Sem. B.Tech (Part Time) - CSE,IT)

**UNIT I LOGIC 12 Hrs**

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

**UNIT II COMBINATORICS 12 Hrs**

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

**UNIT III GROUPS 12 Hrs**

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

**UNIT IV LATTICES 12 Hrs**

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

**UNIT V GRAPHS 12 Hrs**

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

**Total Hours: 60**

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BCS18004</b>	Subject Name : <b>DATABASE MANAGEMENT SYSTEMS</b>	Ty/ Lb/ ETL	L	T/ SLr	P/R	C						
	Prerequisite: BCS18001	Ty	3	0/1	0/0	4						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>To understand the different issues involved in the design and implementation of a database system.</li> <li>To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.</li> <li>To develop an understanding of essential DBMS concepts such as: database security, integrity, and concurrency.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
CO1	• Understand the most fundamental DBMS concepts and techniques											
CO2	• Learn techniques required for building, maintaining, and querying databases.											
CO3	• Design Databases for applications											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
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	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18004</b>	<b>DATABASE MANAGEMENT SYSTEMS</b>	<b>Ty</b>	<b>3</b>	<b>0/1</b>	<b>0/0</b>	<b>4</b>
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**UNIT I FUNDAMENTALS OF DATABASE 12 Hrs**

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

**UNIT II SQL 12Hrs**

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

**UNIT III FILE STRUCTURE, INDEXING & HASHING 12 Hrs**

File and system structure – overall system structure – file transaction – data dictionary – indexing and hashing basic concepts and B+ tree Indices - static and dynamic hash functions

**UNIT IV QUERY PROCESSING AND TRANSACTIONS 12 Hrs**

Overview - Measures of Query Cost - Selection Operation – Sorting - Join Operation- Transaction Concept - A Simple Transaction Model - Storage Structure – Serializability

**UNIT V CONCURRENCY CONTROL AND RECOVERY SYSTEM 12 Hrs**

Lock-Based Protocols - Deadlock Handling - Timestamp-Based Protocols - Validation-Based Protocols - Failures Classification – Storage - Recovery and Atomicity - Recovery Algorithm - Buffer Management

**Total Hours: 60**

**TEXT BOOKS:**

1. Abraham, Silberschatz. Henry, F. K..Sudharshan, S. (2013) Database System Concepts (6<sup>th</sup>ed.) Tata McGraw Hill, New Delhi

**REFERENCE BOOKS:**

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BEC18I01</b>	Subject Name :	<b>DIGITAL SYSTEMS</b>	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
	Prerequisite: BES18001		Ty	3	0/0	0/0	3

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

**OBJECTIVES :**

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

**COURSE OUTCOMES (COs) : ( 3- 5)**

<b>CO1</b>	Acquired knowledge about number systems and its conversions
<b>CO2</b>	Acquired knowledge about boolean algebra
<b>CO3</b>	Ability to identify, analyze & design combinational circuits
<b>CO4</b>	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			
		✓										



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BEC18I01</b>	<b>DIGITAL SYSTEMS</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**UNIT I NUMBER SYSTEMS 9 Hrs**

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

**UNIT II BOOLEAN ALGEBRA 9 Hrs**

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

**UNIT III COMBINATIONAL LOGIC 9 Hrs**

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

**UNIT IV SYNCHRONOUS SEQUENTIAL LOGIC 9 Hrs**

Latches-R-S- Flip Flop, S-R Flip Flop, D Flip Flop, JK Flip Flop, T Flip-Flop - Master slave Flip-Flop - Counters –Up Down counters- Binary counters-Ring counter- Shift Registers.

**UNIT V ASYNCHRONOUS SEQUENTIAL LOGIC 9 Hrs**

Asynchronous counters –Decade counters - State diagram - State Table – State Reduction – State Assignment- Excitation Table-Analysis of Asynchronous sequential circuits - Design of ASynchronous Sequential Circuits.

**Total Hours: 45**

**TEXT BOOKS**

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

**REFERENCE BOOKS**

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18002	<b>Subject Name :</b> <b>OBJECT ORIENTED PROGRAMMING WITH C++</b>	<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/SLr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BES18ET2	<b>Ty</b>	<b>3</b>	<b>0/1</b>	<b>0/0</b>	<b>4</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>The students will be able to distinguish OOP features with procedural Oriented and analyze these features to a real world object,</li> <li>To analyze generic data type for the data type independent programming which relate it to reusability.</li> <li>To understand the concepts of Java programs and develop basic networking programs using Java</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Object Oriented Programming and to analyze characteristics of OOP											
<b>CO2</b>	To implement OOP in various applications											
<b>CO3</b>	Files & I/O											
<b>CO4</b>	Exception Handling											
<b>CO5</b>	To develop an application using C++											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	H	M	H	M	H	H	M	H	H	H
<b>CO2</b>	H		M	L	H	H	H	H	M	M	H	H
<b>CO3</b>	H	H	M		H	H	M	M	H	H	H	H
<b>CO4</b>	H	H	M	L		H	H	M	H	H	M	M
<b>CO5</b>	H	M	L	M	H	H	H	H	M	L	H	H
<b>COs / PSO s</b>							<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>
<b>CO1</b>	H		H		M		H		H		H	
<b>CO2</b>	H		M		H		H		M		H	
<b>CO3</b>	M		H		M		L		M		H	
<b>CO4</b>	H		H		M		H		M		H	
<b>CO5</b>	H		M		M		H		H		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18002</b>	<b>OBJECT ORIENTED PROGRAMMING WITH C++</b>	Ty	3	0/1	0/0	4
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**UNIT I BASICS, TOKENS, EXPRESSIONS 12 Hrs**

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

**UNIT II FUNCTIONS, CLASSES AND OBJECTS 12 Hrs**

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

**UNIT III CONSTRUCTORS AND DESTRUCTOR 12 Hrs**

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

**UNIT IV INHERITANCE 12 Hrs**

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

**UNIT V POINTERS, VIRTUAL FUNCTIONS AND POLYMORPHISM 12 Hrs**

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

**Total Hours: 60**

**TEXT BOOK:**

1. E.Balagurusamy, "Object Oriented Programming in C++", 6<sup>th</sup>ed.,Tata McGraw-Hill, 2013

**REFERENCE BOOKS:**

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BCS18L02</b>	Subject Name : <b>OBJECT ORIENTED PROGRAMMING WITH C++ LAB</b>	Ty/ Lb/ ET L	L	T/ SL r	P/R	C
	Prerequisite: BES18ET2	Lb	0	0/0	3/0	1

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

**OBJECTIVES :**

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

**COURSE OUTCOMES (COs) : ( 3- 5)**

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

**Mapping of Course Outcomes with Program Outcomes (POs)**

COs/POs	P O 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO 11	PO1 2
<b>CO1</b>	H	H	M	H	H	M	H	H	H	H	H	H
<b>CO2</b>	H	M	H	H		H	M	H	H	H	M	H
<b>CO3</b>	M	H	H	H	H	L	M	H	H	H	H	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
<b>CO1</b>	H		H		H		H		H		H	
<b>CO2</b>	H		M		H		M		H		H	
<b>CO3</b>	H		H		M		H		H		M	

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

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





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18L02</b>	<b>OBJECT ORIENTED PROGRAMMING WITH C++ LAB</b>	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/0</b>	<b>1</b>
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**LIST OF EXPERIMENTS**

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





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18ET1	<b>Subject Name :</b> <b>JAVA PROGRAMMING</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ SLr</b>	<b>P/R</b>	<b>C</b>
	Prerequisite: BCS18002	<b>ETL</b>	<b>1</b>	<b>0/1</b>	<b>3/0</b>	<b>3</b>

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

**OBJECTIVE :**

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

**COURSE OUTCOMES (COs) : ( 3- 5)**

<b>CO1</b>	To design, create, build, and debug Java applications and applets.
<b>CO2</b>	To write Java programs using object-oriented programming techniques including classes,objects, methods, instance variables, composition, inheritance, and polymorphism.
<b>CO3</b>	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
<b>CO1</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>H</b>
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
<b>CO1</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>M</b>		<b>H</b>	
<b>CO2</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>M</b>		<b>H</b>	
<b>CO3</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>M</b>		<b>H</b>	

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

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18ET1</b>	<b>JAVA PROGRAMMING</b>	<b>ETL</b>	<b>1</b>	<b>0/1</b>	<b>3/0</b>	<b>3</b>
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**UNIT I OVERVIEW OF JAVA LANGUAGE 9Hrs**

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, StringLiterals, Arrays(One dimensional, two-dimensional), Enumerated Data Types

**UNIT II CLASSES, OBJECTS AND METHODS: 9Hrs**

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 9Hrs**

Exception handling, Need for exceptions, API hierarchy 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 9Hrs**

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: 9Hrs**

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, 7<sup>th</sup> Ed., 2007.
2. Balagurusamy, “Programming with JAVA A primer 3<sup>rd</sup> 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, 2<sup>nd</sup> Edition, 2005



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**SEMESTER – II**

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

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

**OBJECTIVES :**

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

**COURSE OUTCOMES (COs) :**

Students completing the course were able to

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

**Mapping of Course Outcomes with Program Outcomes (POs)**

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

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

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BMA18016</b>	<b>STATISTICS FOR COMPUTER ENGINEERS</b>	<b>Ty</b>	<b>3</b>	<b>1/0</b>	<b>0/0</b>	<b>4</b>
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(Common to III yr. / V Sem. B.Tech (Full Time), I yr. / II Sem. B.Tech (Part Time) – CSE,IT)

**UNIT I BASICS OF STATISTICS 12 hrs**

Variables – Uni-variate Data – Frequency Distribution – Measures of Central Tendency – Mean –Median –Mode – Quartiles – Measures of Dispersion – The Range – Quartile Deviation –Standard Deviation – Relative Measures of Dispersion – Coefficient of Variation – Quartile Coefficient of Variation.

**UNIT II PROBABILITY AND RANDOM VARIABLE 12 hrs**

Axioms of Probability – Conditional probability – Total probability – Baye’s Theorem – Random variable – Probability mass function – Probability density function – Properties – Moments (Definition and simple problems).

**UNIT III CORRELATION & REGRESSION 12 hrs**

Measures of Skewness & Kurtosis – Bi-variate data – Applications of Correlation: Karl Pearson’s Coefficient of Correlation – Rank Correlation: Spearman’s Rank Correlation – Linear Regression.

**UNIT IV STANDARD DISTRIBUTIONS 12 hrs**

Binomial – Poisson – Geometric –Uniform – Exponential –Normal distributions.

**UNIT V TESTING OF HYPOTHESIS 12 hrs**

Tests of Significance – Large Sample Tests – Mean – Proportions – Small Sample Tests – t, F, Chi-square Tests: Independence of Attributes, Goodness of Fit.

**Total no. of hrs: 60**

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Singaravelu, *Probability and Random Processes*, Meenakshi Agency, (2017).
2. Richard Johnson A., *Miller & Freund’s Probability and statistics for Engineers (9<sup>th</sup>ed)*, Prentice Hall of India, (2016).



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18003	<b>Subject Name :</b> <b>COMPUTER ORGANIZATION AND ARCHITECTURE</b>	<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/S.Lr</b>	<b>P/R</b>	<b>C</b>
	Prerequisite: BEC18I02	<b>Ty</b>	<b>3</b>	<b>1/0</b>	<b>0/0</b>	<b>4</b>

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

**OBJECTIVES :**

- To understand the 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)**

<b>CO1</b>	Students will understand how computer hardware has evolved to meet the needs of multi-processing systems.
<b>CO2</b>	Students will understand the basic structure and operation of digital computer
<b>CO3</b>	Students will understand a wide variety of memory technologies both internal and external.
<b>CO4</b>	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			
				✓								



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18003</b>	<b>COMPUTER ORGANIZATION AND ARCHITECTURE</b>	<b>Ty</b>	<b>3</b>	<b>1/0</b>	<b>0/0</b>	<b>4</b>
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**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, ZvonkoVranesic, SafwatZaky and NaraigManjikian, “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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> <b>BCS18001</b>	<b>Subject Name :</b> <b>DATA STRUCTURES</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>
	Prerequisite: NIL	<b>Ty</b>	<b>3</b>	<b>1/0</b>	<b>0/0</b>	<b>4</b>

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

**OBJECTIVES :**

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

<b>CO1</b>	Student will be able to choose appropriate data structure as applied to specified problem definition
<b>CO2</b>	Student will be able to handle operations like searching, insertion, deletion, traversing mechanism on various data structures.
<b>CO3</b>	Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
<b>CO4</b>	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	
CO2	H		H		M		L		H		M	
CO3	H		M		L		L		H		M	
CO4	H		H		L		L		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			
					✓							





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18001</b>	<b>DATA STRUCTURES</b>	<b>Ty</b>	<b>3</b>	<b>1/0</b>	<b>0/0</b>	<b>4</b>
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**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. *YedidyahLangsam, MosheJAugenstein 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 – 2005,3<sup>rd</sup> Edition*
2. *SartazSahani McGraw – Hills.K. Srivatsava, DeepliSrivatsava. BPB Publications.*





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code</b> BCS18ET2	<b>Subject Name :</b> <b>COMPUTER GRAPHICS</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BES18ET2	<b>ETL</b>	<b>1</b>	<b>0/1</b>	<b>3/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b> <b>The student should be made to:</b> <ul style="list-style-type: none"> <li>Understand the output primitives, two dimensional graphics and their transformations.</li> <li>Understand the three dimensional graphics and their transformations.</li> <li>Understand illumination and color models</li> <li>Learn to create animations</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Transform geometrical structures, perform clipping on geometrical objects											
<b>CO2</b>	Analyze a 3D structure											
<b>CO3</b>	Create and evaluate graphic projects											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	M	H	M	M	M	L	M	M	L	L	L
<b>CO2</b>	H	M	H	L	H	M	L	M	M	L	L	L
<b>CO3</b>	H	M	H	M	H	M	L	M	M	L	L	L
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		L		L		L		L	
<b>CO2</b>	H		H		L		L		L		L	
<b>CO3</b>	H		H		L		M		L		M	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BCS18L01</b>	Subject Name : <b>DATA STRUCTURES LAB</b>	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C						
	Prerequisite: NIL	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/0</b>	<b>1</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>To strengthen their problem solving ability by applying the characteristics of an object-oriented approach.</li> <li>To introduce object oriented concepts in C++ and Java.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Explain what constitutes an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches											
<b>CO2</b>	Apply an object-oriented approach to developing applications of varying complexities											
<b>CO3</b>	Describe the basic operations on arrays, lists, stacks and queue data structures											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	L	M	L	M	L	L	M	M	M	M
<b>CO2</b>	H	H	L	M	L	M	H	L	M	L	H	M
<b>CO3</b>	H	M	L	M	L	M	L	L	M	M	M	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		L		L		M	L	H	M
<b>CO2</b>	H		L		M		L		H	L	L	M
<b>CO3</b>	M		M		L		H		L	M	H	L
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18L01</b>	<b>DATA STRUCTURES LAB</b>	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/0</b>	<b>1</b>
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**LIST OF EXPERIMENTS**

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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**SEMESTER – III**

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

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

**OBJECTIVES :**

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

**COURSE OUTCOMES (COs) : ( 3- 5)**

<b>CO1</b>	Have knowledge on functions of Network Devices & OSI Layers for Communication
<b>CO2</b>	Knowledge on IP addresses and protocols.
<b>CO3</b>	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			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18007</b>	<b>COMPUTER NETWORKS</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 “5<sup>th</sup> 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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b>	<b>Subject Name :</b>	<b>Ty/</b>	<b>L</b>	<b>T/</b>	<b>P/R</b>	<b>C</b>						
<b>BCS18005</b>	<b>DESIGN AND ANALYSIS OF ALGORITHMS</b>	<b>Lb/</b>		<b>S.Lr</b>								
	<b>Prerequisite: BCS18001</b>	<b>ETL</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>						
<b>L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits</b> <b>Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab</b>												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• To Learn the algorithm analysis techniques.</li> <li>• To understand the different algorithm design techniques.</li> <li>• To Understand Iterative algorithms</li> <li>• To Understand the limitations of Algorithm power.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Design algorithms for various computing problems											
<b>CO2</b>	Analyze the time and space complexity of algorithms.											
<b>CO3</b>	Critically analyze the different algorithm design techniques for a given problem. Modify existing algorithms to improve efficiency.											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO 1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	M	M	L	L	L	M	L	L	M	L
<b>CO2</b>	H	H	H	L	M	L	M	M	H	M	M	M
<b>CO3</b>	H	M	M	M	H	M	L	M	H	L	M	M
<b>COs / PSOs</b>	<b>PSO 1</b>	<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>		
<b>CO1</b>	H	H		M		L		H	H	M	L	
<b>CO2</b>	M	H		M		L		H	M	M	L	
<b>CO3</b>	M	M		L		L		H	M	M	L	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18005</b>	<b>DESIGN AND ANALYSIS OF ALGORITHMS</b>	Ty	3	0/0	0/0	3
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**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 – Maximmm 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/>





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BEC18I02</b>	Subject Name : <b>MICROPROCESSORS AND MICROCONTROLLERS</b>		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C					
	Prerequisite: BES18I01		Ty	3	0/0	0/0	3					
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• To study the basic architectures and operational features of the processors and controllers.</li> <li>• To learn the assembly language programming of 8086.</li> <li>• To design and understand the multiprocessor configurations.</li> <li>• To understand the interfacing concepts of the peripheral devices with processors.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
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											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
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	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✓										



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BEC18I02</b>	<b>MICROPROCESSORS AND MICROCONTROLLERS</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 (2<sup>nd</sup> 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", 3<sup>rd</sup> Edition, Thomas Delmar Learning.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18ET3	<b>Subject Name :</b> PHP / MYSQL	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BCS18L03	<b>ETL</b>	<b>1</b>	<b>0/1</b>	<b>3/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>The students will learn the technology about scripting languages basics.</li> <li>To learn install PHP and work on that.</li> <li>To learn the basic and advance concepts of PHP language.</li> <li>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.</li> <li>To learn design basic and advance applications using PHP and MySQL.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Learn the fundamentals of HTML, CSS and PHP											
<b>CO2</b>	Learn the fundamentals database concept and MySQL											
<b>CO3</b>	Able to develop the Application using PHP and MySQL											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>L</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>CO2</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>CO3</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18ET3</b>	<b>PHP / MYSQL</b>	<b>ETL</b>	<b>1</b>	<b>0/1</b>	<b>3/0</b>	<b>3</b>
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**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](http://www.spoken-tutorials.org)
2. Kevin Tatroe, Peter MacIntyre, etal “ Programming PHP” O REILLY 3<sup>rd</sup> Edition – 2013
3. Luke Welling, Laura Thomson “ PHP and MySQL Web Development” Person Education 5<sup>th</sup> Edition – 2016.

**REFERENCE BOOKS:**

1. Robin Nixon “Learning PHP, MySQL & JavaScript” O REILLY – 5<sup>th</sup> Edition - 2015.
2. Elizabeth Naramore, Jason Gerner, etal “Beginning PHP5, Apache, MySQL web development” Wrox Publishing – 2005.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18L05	<b>Subject Name :</b> <b>NETWORK PROGRAMMING LAB</b>	<b>Ty/</b>	<b>L</b>	<b>T/</b>	<b>P/</b>	<b>C</b>						
		<b>Lb/</b>		<b>S.L</b>	<b>R</b>							
		<b>ETL</b>		<b>r</b>								
	<b>Prerequisite: : BCS18ET2</b>	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/0</b>	<b>1</b>						
<b>L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits</b> <b>Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab</b>												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>Hands on Experience to design an application using TCP and UDP sockets.</li> <li>Hands on Experience to design an interface to transfer a file between two ends using FTP</li> <li>Hands on Experience to develop a RMI application for specific operation</li> <li>To have a knowledge to work with Network Simulators</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Ability to design a Socket Programing using TCP and UDP											
<b>CO2</b>	To design Client /Server Application Program											
<b>CO3</b>	Ability to create a Server based application using RMI and RPC concepts.											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>COs /</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>PSOs</b>												
<b>CO1</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>M</b>	
<b>CO2</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>M</b>	
<b>CO3</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>M</b>	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
				√								



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18L05</b>	<b>NETWORK PROGRAMMING LAB</b>	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/0</b>	<b>1</b>
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**EXPERIMENTS**

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**SEMESTER – IV**

Subject Code: <b>BCS18009</b>	Subject Name : <b>OBJECT ORIENTED SOFTWARE ENGINEERING</b>	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C						
	Prerequisite: BCS18002	<b>Ty</b>	<b>3</b>	<b>1/0</b>	<b>0/0</b>	<b>4</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>Understand the phases in a software development</li> <li>Understand fundamental concepts of requirements engineering and Analysis Modelling.</li> <li>Understand the different approach for Object Oriented Design</li> <li>Learn various testing and maintenance measures</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Identify the key activities in managing a software Development.											
<b>CO2</b>	Compare different process models.											
<b>CO3</b>	Concepts of requirements engineering and Analysis Modeling.											
<b>CO4</b>	Apply systematic procedure for software design and deployment.											
<b>CO5</b>	Compare and contrast the various testing and maintenance											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	M	H	M	L	L	H	H	H	M	H
<b>CO2</b>	H	H	H	H	H	M	M	H	H	M	L	M
<b>CO3</b>	H	H	H	M	M	M	M	M	H	M	L	M
<b>CO4</b>	H	H	H	H	H	M	M	H	H	H	M	H
<b>CO5</b>	H	H	H	H	H	M	M	H	H	H	M	H
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		H		H		H		H	
<b>CO2</b>	H		M		M		M		M		H	
<b>CO3</b>	H		H		H		H		M		H	
<b>CO4</b>	H		H		H		H		M		H	
<b>CO5</b>	H		H		M		H		M		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18009</b>	<b>OBJECT ORIENTED SOFTWARE ENGINEERING</b>	<b>Ty</b>	<b>3</b>	<b>1/0</b>	<b>0/0</b>	<b>4</b>
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**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 (9<sup>th</sup>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 (8<sup>th</sup>ed.)* McGraw hill Publications
4. Grady Booch (2009) *Object oriented Analysis & design* ,Pearson Education India





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BIT18003</b>	Subject Name  <b>WEB TECHNOLOGY AND WEB SERVICES</b>	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C						
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>The students will have knowledge about the HTML5 and CSS3</li> <li>To learn the concepts of XML and SOAP.</li> <li>To study about the JSP and understand to develop basic level application and advance application on web pages.</li> <li>To study about the concept of Web services.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>		Able to design the web page using HTML5 and CSS3										
<b>CO2</b>		Learn the fundamentals of XML , JSP and implement in the web service										
<b>CO3</b>		Understand the concept of Web service including SOAP, UDDI and WSDL										
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>P O 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO8</b>	<b>PO 9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	M	H	L	H	M	L	L	H	M	H	H
<b>CO2</b>	H	H	H	M	H	H	M	L	H	M	H	H
<b>CO3</b>	H	H	H	H	H	M	M	L	H	M	H	H
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		L		H		H		H	
<b>CO2</b>	H		H		L		H		H		H	
<b>CO3</b>	H		H		L		H		H		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
		✓										



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BIT18003</b>	<b>WEB TECHNOLOGY AND WEB SERVICES</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 DivyaManian, "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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> <b>BCS18012</b>	<b>Subject Name :</b> <b>OPEN SOURCE SCRIPTING LANGUAGES</b>	<b>Ty/</b>	<b>L</b>	<b>T/</b>	<b>P/R</b>	<b>C</b>						
		<b>Lb/</b>		<b>S.Lr</b>								
		<b>ETL</b>										
	Prerequisite: BCS18ET3	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• The students will have knowledge about the scripting languages</li> <li>• To learn the JavaScript language and ability to write program on it.</li> <li>• To learn the PERL language and ability to write program on it.</li> <li>• To study about the Python language and understand to write basic level program and advance program on networking, web scripting on web pages.</li> <li>• To study about RUBY language and have knowledge to write programs.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Ability to understood scripting languages concepts and technology for web site design											
<b>CO2</b>	Students have knowledge to develop an interactive web site using scripting languages.											
<b>CO3</b>	Have the knowledge have to design secured web pages											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>CO3</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>CO2</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>CO3</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18012</b>	<b>OPEN SOURCE SCRIPTING LANGUAGES</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 of Python: 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 DivyaManian, “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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BCS18L08</b>	Subject Name : <b>OBJECT ORIENTED SOFTWARE ENGINEERING LAB</b>	Ty /Lb /ETL	L	T/S.L r	P/ R	C
	Prerequisite: BCS18L02	Lb	0	0/0	3/ 0	1

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

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

**OBJECTIVES :**

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

**COURSE OUTCOMES (COs) : ( 3- 5)**

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

**Mapping of Course Outcomes with Program Outcomes (POs)**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	L	L	H	H	H	M	H
CO2	H	H	H	H	H	L	L	H	H	M	L	H
CO3	H	H	H	H	H	L	L	H	H	M	L	H
CO4	H	H	H	H	H	L	L	H	H	H	M	H
CO5	H	H	H	H	H	L	L	H	H	H	M	H
COs / PSO s	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		H		H		H		H		H	
CO2	H		H		H		H		M		H	
CO3	H		H		H		H		M		H	
CO4	H		H		H		H		M		H	
CO5	H		H		M		H		M		H	

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Category	Basic Sciences	Engineering	Humanities and Social	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills				
							✓						
<b>BCS18L08</b>	<b>OBJECT ORIENTED SOFTWARE ENGINEERING LAB</b>							<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/0</b>	<b>1</b>	

**LIST OF EXPERIMENTS**

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

**SOFTWARE REQUIRED:**

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**SEMESTER - V**

<b>Subject Code:</b> <b>BCS18008</b>	<b>Subject Name :</b> <b>SYSTEM SOFTWARE AND PRINCIPLES OF COMPILER DESIGN</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>							
	Prerequisite: BCS18003	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>							
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T / L/ ETL : Theory/Lab/Embedded Theory and Lab													
<b>OBJECTIVES :</b>													
<ul style="list-style-type: none"> <li>• To understand the role played by system softwares such as assembler, interpreter, linker, loader and compilers in the development of IT solutions.</li> <li>• 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.</li> </ul>													
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>													
<b>CO1</b>	Understand about the system softwares such as assembler, interpreter, linker, loader and compilers in the development of IT solutions.												
<b>CO2</b>	Describe the design of a Compiler including its Phases and Components.												
<b>CO3</b>	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.												
<b>CO4</b>	Identify the similarities and differences among various parsing techniques and grammar transformation techniques.												
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>													
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	
<b>CO1</b>	H	H	H	M	M	M	M	M	H	H	H	M	
<b>CO2</b>	H	H	H	M	H	M	L	M	M	M	H	M	
<b>CO3</b>	H	H	H	H	H	H	M	M	M	M	M	H	
<b>CO4</b>	H	H	H	M	M	M	L	M	M	L	M	M	
<b>Mapping of Course Outcomes with Program Specific Outcomes (PSOs)</b>													
<b>COs / PSOs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>							
<b>CO1</b>	H	H	M	M	H	H							
<b>CO2</b>	M	H	L	L	M	M							
<b>CO3</b>	H	H	M	M	H	H							
<b>CO4</b>	M	H	L	L	M	M							
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>													
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills				
				✓									





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18008</b>	<b>SYSTEM SOFTWARE AND PRINCIPLES OF COMPILER DESIGN</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 N DFA to DFA - Conversion of regular expression to DFA – Thompson’s construction- minimization of N DFA - 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 - S.LR 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.Dhamdhare (2009) *Systems Programming and Operating Systems*,(2nd ed.), Tata McGraw-Hill Publishing Company Ltd
2. John J Donovan (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 Loudon (2003) *Compiler Construction Principles & Practice* Thompson learning



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BCS18006</b>	Subject Name : <b>OPERATING SYSTEMS</b>	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C						
	Prerequisite: BCS18004	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>The students will understand the concepts of Operating System and process.</li> <li>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.</li> <li>To appreciate emerging trends in operating systems.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Master functions, structures and history of operating systems											
<b>CO2</b>	Master understanding of design issues associated with operating systems											
<b>CO3</b>	Master various process management concepts including scheduling, synchronization, deadlocks and multithreading											
<b>CO4</b>	Master concepts of memory management including virtual memory											
<b>CO5</b>	Master issues related to file system interface and implementation, disk management											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
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
CO3	H	H	M	L	M	M	M	M	L	L	L	M
CO4	H	H	M	L	L	L	L	M	M	H	M	M
CO5	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	
CO3	H		H		L		M		M		L	
CO4	H		H		M		M		M		L	
CO5	H		H		M		M		L		M	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18006</b>	<b>OPERATING SYSTEMS</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 Kernel 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 (9<sup>th</sup> ed.), John Wiley

**REFERENCE BOOKS:**

1. D.M.Dhamdhare. 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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b>  BCS18011	<b>Subject Name :</b>  <b>DOT NET FRAMEWORK</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/ R</b>	<b>C</b>						
	Prerequisite: BIT18I02	<b>Ty</b>	<b>3</b>	<b>1/0</b>	<b>0/0</b>	<b>4</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>To learn the concepts of C# Dot Net language and ability to write programs.</li> <li>To understand the concepts of VB Dot Net, ADO.NET language and learn to develop an application.</li> <li>To develop knowledge to design web based application using ASP.Net.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	To develop, implement and creating Applications with C#.											
<b>CO2</b>	Integrate selected advanced topics in a Visual Basic .NET project											
<b>CO3</b>	Create web forms with ASP.NET controls											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>
<b>CO2</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>M</b>		<b>M</b>	
<b>CO2</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>M</b>		<b>M</b>	
<b>CO3</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

BCS18011	<b>DOT NET FRAMEWORK</b>	Ty	3	1/0	0/0	4
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**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, (3<sup>rd</sup>ed.) O'reilly Media Inc.
2. Balagurusamy, E. (2010) Programming in C#(3<sup>rd</sup>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 (4<sup>th</sup>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>



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> <b>BCS18L06</b>	<b>Subject Name :</b> <b>OPERATING SYSTEMS LAB</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>
	Prerequisite: NIL	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/0</b>	<b>1</b>

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

**OBJECTIVES :**

- 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)**

<b>CO1</b>	Master functions, structures and history of operating systems
<b>CO2</b>	Master understanding of design issues associated with operating systems
<b>CO3</b>	Master various process management concepts including scheduling, synchronization, deadlocks and multithreading
<b>CO4</b>	Master concepts of memory management including virtual memory
<b>CO5</b>	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
<b>CO1</b>	H	H	M	M	M	L	L	L	M	M	H	M
<b>CO2</b>	H	H	M	L	L	H	M	M	M	M	M	M
<b>CO3</b>	H	H	M	M	M	M	M	M	L	L	L	M
<b>CO4</b>	H	H	M	L	L	L	L	H	H	H	M	M
<b>CO5</b>	H	H	M	M	M	M	M	L	L	M	M	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>			<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>
<b>CO1</b>	H		H			M		M		M		L
<b>CO2</b>	H		H			M		M		L		M
<b>CO3</b>	H		H			L		M		M		L
<b>CO4</b>	H		H			M		M		M		L
<b>CO5</b>	H		H			M		M		L		M

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

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



**Dr.M.G.R.**  
**Educational and Research Institute**  
**(DEEMED TO BE UNIVERSITY)**  
(An ISO Certified Institution)  
University with Graded Autonomy Status  
Maduravoyal , Chennai - 600 095



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18L06</b>	<b>OPERATING SYSTEMS LAB</b>	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/0</b>	<b>1</b>
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**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





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**SEMESTER - VI**

Subject Code: <b>BCS18010</b>	Subject Name : <b>DATA WAREHOUSING AND DATA MINING</b>						Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C	
	Prerequisite: BCS18004						Ty	3	0/0	0/3	4	
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• Provide an overview of the methodologies and approaches to data mining</li> <li>• Gain insight into the challenges and limitations of data mining techniques and data warehousing</li> <li>• Applying data mining solutions using common data mining tools</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Understand the difference between Data Warehousing and general databases											
<b>CO2</b>	Understand the different steps followed in Data mining and pre-processing techniques using tools											
<b>CO3</b>	Able to apply Association Rule mining and Clustering approaches											
<b>CO4</b>	Familiarize with multi-dimensional data cubes and related analysis											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	L	L	L	M	M	L	L	L	H	L
<b>CO2</b>	H	H	M	H	H	M	M	M	M	M	H	L
<b>CO3</b>	H	H	H	H	H	M	M	L	M	M	H	L
<b>CO4</b>	H	H	H	H	H	M	M	M	H	H	H	H
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		L		L		H		H	
<b>CO2</b>	H		H		L		H		H		H	
<b>CO3</b>	H		H		L		H		H		M	
<b>CO4</b>	H		H		M		M		H		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

BCS18010	<b>DATA WAREHOUSING AND DATA MINING</b>	Ty	3	0/0	0/3	4
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**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 4<sup>th</sup> 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*



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b>  BMG18002	<b>Subject Name :</b> <b>MANAGEMENT CONCEPTS AND ORGANIZATIONAL BEHAVIOR</b>	<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/S.Lr</b>	<b>P/R</b>	<b>C</b>						
	<u>Prerequisite:</u> BES18ET3 Basic Knowledge such as Statistical Techniques and Probability Theory	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial P : Project C: Credits												
<b>OBJECTIVES:</b>												
<ul style="list-style-type: none"> <li>This course is aimed at addressing the contemporary issues, which fall under the broad title of management, and its functions.</li> <li>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.</li> </ul>												
<b>COURSE OUTCOMES (COs) :</b>												
<b>CO1</b>	Effective leadership skills											
<b>CO2</b>	Accommodating with co workers and at Work environment											
<b>CO3</b>	Enhanced leadership skills											
<b>CO4</b>	Understanding and implementing good policies for the welfare of management and workers											
<b>Mapping of Course Outcomes (COs) with Program Outcomes (POs) &amp; Program Specific Outcomes (PSOs)</b>												
<i>COs/POs</i>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	<b>H</b>		<b>M</b>		<b>M</b>		<b>L</b>		<b>M</b>		<b>L</b>	
<b>CO2</b>	<b>M</b>	<b>M</b>				<b>M</b>		<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>H</b>
<b>CO3</b>	<b>L</b>		<b>H</b>	<b>H</b>	<b>M</b>		<b>M</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>M</b>	
<b>CO4</b>	<b>M</b>	<b>L</b>				<b>M</b>			<b>M</b>			<b>M</b>
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Management Science		
										✓		



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BMG18002</b>	<b>MANAGEMENT CONCEPTS AND ORGANIZATIONAL BEHAVIOR</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**UNIT I INTRODUCTION TO MANAGEMENT 9 Hrs**  
 Definition of Management – Science or Art or Profession – Manager vs 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 10<sup>th</sup> 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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18L13	<b>Subject Name :</b> <b>PROJECT PHASE - I</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: NIL	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/3</b>	<b>2</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>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.</li> <li>The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems.</li> <li>This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Apply the knowledge and skills acquired in the course of study addressing a specific problem or issue.											
<b>CO2</b>	To encourage students to think critically and creatively about societal issues and develop user friendly and reachable solutions											
<b>CO3</b>	To refine research skills and demonstrate their proficiency in communication skills.											
<b>CO4</b>	To take on the challenges of teamwork, prepare a presentation and demonstrate the innate talents.											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	H	H	M	H	H	L	M	M	H	H
<b>CO2</b>	H	H	H	H	H	H	H	M	M	M	H	H
<b>CO3</b>	H	H	H	H	H	H	H	M	M	H	H	M
<b>CO4</b>	H	M	H	H	H	H	M	H	H	H	H	H
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>			
<b>CO1</b>												
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18L13</b>	<b>PROJECT PHASE – I</b>	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/3</b>	<b>2</b>
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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 Feasibility study as a survey paper



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> <b>BCS18L11</b>	<b>Subject Name :</b> <b>DATA MINING LAB</b>	<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BCS18ET3	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/0</b>	<b>1</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• Identify and categories the various risks face by an organization;</li> <li>• Explain the various risk control measures available</li> <li>• Design a risk management program for a business organization.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	demonstrate knowledge of the range of financial and financial related risks facing organizations											
<b>CO2</b>	understand the approach to risk management through risk identification, risk measurement and risk management (or mitigation)											
<b>CO3</b>	understand operational risk and how to manage it.											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>L</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>L</b>	<b>M</b>	<b>M</b>
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	<b>H</b>		<b>M</b>		<b>M</b>		<b>M</b>		<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>
<b>CO2</b>	<b>M</b>		<b>M</b>		<b>M</b>		<b>L</b>		<b>M</b>	<b>H</b>	<b>L</b>	<b>L</b>
<b>CO3</b>	<b>H</b>		<b>L</b>		<b>L</b>		<b>M</b>		<b>M</b>	<b>M</b>	<b>M</b>	<b>M</b>
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					





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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18L11</b>	<b>DATA MINING LAB</b>	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>3/0</b>	<b>1</b>
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**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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**SEMESTER – VII**

<b>Subject Code:</b> BCS18L14	<b>Subject Name :</b> <b>PROJECT (PHASE – II)</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>
	Prerequisite: BCS18L13	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>12/12</b>	<b>8</b>

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

**OBJECTIVES :**

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

**COURSE OUTCOMES (COs) : ( 3- 5)**

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

**Mapping of Course Outcomes with Program Outcomes (POs)**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	CO1	H	CO1	H	CO1	H	CO1	H	CO1	H	CO1
CO2	H	CO2	H	CO2	H	CO2	H	CO2	H	CO2	H	CO2
CO3	H	CO3	H	CO3	H	CO3	H	CO3	H	CO3	H	CO3
CO4	H	CO4	H	CO4	H	CO4	H	CO4	H	CO4	H	CO4
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1												

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

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



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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18L14</b>	<b>PROJECT (PHASE – II)</b>	<b>Lb</b>	<b>0</b>	<b>0/0</b>	<b>12/12</b>	<b>8</b>
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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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E01	<b>Subject Name :</b> <b>IMAGE PROCESSING</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BCS18ET1	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• To Learn the image fundamentals and mathematical transforms necessary for image processing.</li> <li>• To Learn the image enhancement techniques</li> <li>• To Learn image restoration procedures.</li> <li>• To Learn the image compression procedures.</li> <li>• To Learn the image segmentation and representation techniques.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Discuss digital image fundamentals											
<b>CO2</b>	Apply image enhancement and restoration techniques											
<b>CO3</b>	Use image compression and segmentation techniques											
<b>CO4</b>	Represent features of images											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>P O 2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO 7 8</b>	<b>PO9</b>	<b>P O 1 0</b>	<b>PO11</b>	<b>PO12</b>	
<b>CO1</b>	H	L	M	M	M	L	M L	M	M	M	L	
<b>CO2</b>	H	H	H	H	H	L	M L	M	M	H	M	
<b>CO3</b>	H	H	H	H	H	M	M L	H	M	H	M	
<b>CO4</b>	M	M	M	L	M	M	M M	L	M	M	M	
<b>COs / PSO s</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		M		M		M		M		M	
<b>CO2</b>	H		H		L		H		H		H	
<b>CO3</b>	M		H		M		H		H		H	
<b>CO4</b>	M		H		L		M		M		M	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E01</b>	<b>IMAGE PROCESSING</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 dimensional 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 Analysis - 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.*



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E02	<b>Subject Name :</b> <b>GEOGRAPHICAL INFORMATION SYSTEMS</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>							
	Prerequisite: NIL	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>							
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab													
<b>OBJECTIVES :</b>													
<ul style="list-style-type: none"> <li>The students will be able to design, explore, interpolate and analyze GIS models</li> <li>To create a new geo coding technique and apply the learnt GIS modeling for a real time case study.</li> </ul>													
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>													
<b>CO1</b>	To design, explore, interpolate and analyze GIS models												
<b>CO2</b>	Create a new geo coding technique												
<b>CO3</b>	Apply the learnt GIS modeling for a real time case study												
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>													
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	
<b>CO1</b>	H	H	H	H	M	H	M	M	M	H	H	H	
<b>CO2</b>	H	H	H	M	M	H	M	M	L	M	M	L	
<b>CO3</b>	H	H	M	M	M	H	H	H	H	H	M	M	
<b>Mapping of Course Outcomes with Program Specific Outcomes (PSOs)</b>													
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>		
<b>CO1</b>	H		H		M		M		H		H		
<b>CO2</b>	H		H		L		M		H		H		
<b>CO3</b>	H		M		M		M		H		M		
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>													
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills				
					✓								



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E02</b>	<b>GEOGRAPHICAL INFORMATION SYSTEMS</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**UNIT I BASIC CONCEPTS 9 Hrs**

Introduction - Coordinate Systems - Vector Data Model - Raster Data Model.

**UNIT II DATA ACQUISITION & 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<sup>th</sup> 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





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BCS18E03</b>	Subject Name : <b>DATABASE TUNING</b>	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C						
	Prerequisite: BCS18004	Ty	3	0/0	0/0	3						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>The students will be able to tune the databases for different data base applications</li> <li>To develop case studies in data bases, and able to troubleshoot the data bases</li> <li>Identify the critical performance tuning steps</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Able to Tune the databases for different Data base Applications											
<b>CO2</b>	Able to Develop Case Studies in data bases.											
<b>CO3</b>	Able to Troubleshoot the data bases											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	M	H	M	H	H	M	H	H	H	M
<b>CO2</b>	H	H	H	H	L	H	M	H	M	H	H	M
<b>CO3</b>	M	H	H	M	H	M	H	H	M	H	H	H
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		M		H		H		M		H	
<b>CO2</b>	H		H		H		M		H		M	
<b>CO3</b>	H		H		M		H		M		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E03</b>	<b>DATABASE TUNING</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 Connolly and Carlolyn Begg (2009) Database Systems, A Practical Approach to Design, Implementation and Management, (4th ed.) Pearson Education



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E04	<b>Subject Name :</b> <b>COMPONENT BASED TECHNOLOGY</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/ R</b>	<b>C</b>						
	Prerequisite: BCS18ET2 & BCS18012	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>Show clear understanding of theoretical concepts of component based development and be able to apply the appropriate techniques of implementation using EJB 3 technology.</li> <li>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.</li> <li>Show detailed knowledge of aspects of EJB 3 technology that allow development of applications based on components and service oriented architecture.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Mastering the principles for building software systems from components.											
<b>CO2</b>	Familiarity with the technologies and standards for component models and service-oriented computing.											
<b>CO3</b>	Familiarity with the Java realization of components including Java Beans, JSP, Servlets, EJB, and Java RMI and how Web services are realized in Java.											
<b>CO4</b>	Familiarity with the CORBA realization of components (CCM).											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO1 0</b>	<b>PO11</b>	<b>PO1 2</b>
<b>CO1</b>	H	H	H	H	H	M	M	L	H	L	H	M
<b>CO2</b>	H	H	M	M	H	L	L	L	H	L	H	H
<b>CO3</b>	H	H	H	H	H	H	M	L	H	L	H	H
<b>CO4</b>	H	M	M	M	M	M	M	L	M	L	M	L
<b>COs / PSO s</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		L		H		H		M	
<b>CO2</b>	H		M		M		H		M		H	
<b>CO3</b>	H		H		M		H		M		H	
<b>CO4</b>	M		M		M		H		M		M	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
					✓							





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E05	<b>Subject Name :</b> E-COMMERCE	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BIT18I02	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• Understand the nature of e-Commerce</li> <li>• Recognize the business impact and potential of e-Commerce</li> <li>• Explain the technologies required to make e-Commerce viable</li> <li>• Discuss the current drivers and inhibitors facing the business world in adopting and using eCommerce;</li> <li>• Explain the economic consequences of e-Commerce;</li> <li>• Discuss the trends in e-Commerce and the use of the Internet.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Analyze the impact of E-commerce on business models and strategy											
<b>CO2</b>	Describe the infrastructure for E-commerce											
<b>CO3</b>	Assess electronic payment systems											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>P O 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO8</b>	<b>PO 9</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>
<b>CO1</b>	M	M	H	H	H	H	H	H	H	M	M	M
<b>CO2</b>	H	H	H	H	H	H	H	H	H	M	M	M
<b>CO3</b>	H	H	H	H	H	H	H	H	H	H	M	M
<b>COs / PSO s</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		H		H		M		H	
<b>CO2</b>	H		H		H		H		M		H	
<b>CO3</b>	H		H		H		H		M		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E05</b>	<b>E-COMMERCE</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 Behavior 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-payment System- 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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

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

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

**OBJECTIVES :**

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

**COURSE OUTCOMES (COs) : ( 3- 5)**

<b>CO1</b>	Understand different types of AI agents
<b>CO2</b>	Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms)
<b>CO3</b>	Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving
<b>CO4</b>	Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information
<b>CO5</b>	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	H	H	M	M	M	M	H	H	H	H
CO2	H	H	H	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	M	H	H	H	H	H	H	H
CO5	H	H	M	M	H	H	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			
						✓						





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E06</b>	<b>ARTIFICIAL INTELLIGENCE</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E07	<b>Subject Name :</b> <b>HUMAN COMPUTER INTERACTION</b>	<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: NIL	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• Learn the foundations of Human Computer Interaction</li> <li>• Be familiar with the design technologies for individuals and persons with disabilities</li> <li>• Manage HCI</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	To learn the basic terminologies of HCI											
<b>CO2</b>	Understand the design technologies for individuals and persons with disabilities											
<b>CO3</b>	Understand how to manage the emerging issues in HCI											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>L</b>
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	<b>H</b>		<b>H</b>		<b>M</b>		<b>M</b>		<b>H</b>		<b>H</b>	
<b>CO2</b>	<b>H</b>		<b>H</b>		<b>H</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>CO3</b>	<b>H</b>		<b>H</b>		<b>H</b>		<b>H</b>		<b>M</b>		<b>M</b>	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**Dr.M.G.R.**  
**Educational and Research Institute**  
**(DEEMED TO BE UNIVERSITY)**  
 (An ISO Certified Institution)  
**University with Graded Autonomy Status**  
 Maduravoyal , Chennai - 600 095



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E07</b>	<b>HUMAN COMPUTER INTERACTION</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 ,3<sup>rd</sup> edition,2012.

**REFERENCE BOOK:**

1. Alan Dix , Janet Finlay, Gregory D.Abowd, Russell Beale, “ Human Computer Interaction”, Third Edition, Pearson Education.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

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

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

**OBJECTIVE :**

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

**COURSE OUTCOMES (COs) : ( 3- 5)**

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

**Mapping of Course Outcomes with Program Outcomes (POs)**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M	M	L	H	L	H	M
CO2	H	H	M	M	H	L	L	L	H	L	H	H
CO3	H	H	H	H	H	H	M	L	H	L	H	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	H		H		L		H		H		M	
CO2	H		M		M		H		M		H	
CO3	H		H		M		H		M		H	

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

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E08</b>	<b>WIRELESS AND MOBILE NETWORKING</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**UNIT I WIRELESS COMMUNICATION 9 Hrs**  
Cellular systems- Frequency Management and Channel Assignment- dropped call rates & their evaluation - MAC–SDMA–FDMA–TDMA – CDMA – Cellular Wireless Networks.

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

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

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

**UNIT V APPLICATION LAYER 9 Hrs**  
WAP Model- Mobile Location based services -WAP Gateway –WAP protocols – WAP user agent profile- caching model-wireless bearers for WAP - WML – WMLScripts – WTA - iMode- SyncML.

**Total Hours: 45**

**TEXT BOOK:**

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

**REFERENCES BOOKS:**

1. Lenzini, L.; Luise, M.; Reggiannini, R. (June 2001). "CRDA: A Collision Resolution and Dynamic Allocation MAC Protocol to Integrate Data 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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**  
**6<sup>th</sup> SEMESTER ELECTIVES – E-II (Common to CSE&IT)**

Subject Code: <b>BCS18E09</b>	Subject Name : <b>WEB MINING</b>	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18011	Ty	3	0/0	0/0	3

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

**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

**COURSE OUTCOMES (COs) : ( 3- 5)**

<b>CO1</b>	• Develop semantic web related applications.
<b>CO2</b>	• Represent knowledge using ontology.
<b>CO3</b>	• Predict human behaviour in social web and related communities
<b>CO4</b>	• 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		
						✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E09</b>	<b>WEB MINING</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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.





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E10	<b>Subject Name :</b> <b>WEB DATA DESIGN &amp; MANAGEMENT</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BIT18I02	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• The students will be able to analysis and evaluate to propose a new web site based upon recent trend</li> <li>• To learn to develop a client-server based application using server and client side scripting languages like Java script, JSP, ASP and PHP.</li> <li>• To learn to develop a dynamic web site using scripting languages and the technologies like XML, AJAX.</li> <li>• The student will learn how to plan, design, testing and production and post- production process in a web site designing.</li> <li>• The student will have the ability to design a static and dynamic web site based upon the end user need.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Able to evaluate a web site											
<b>CO2</b>	Ability to make a well interactive online applications.											
<b>CO3</b>	Have knowledge to analysis and evaluate on web site and design a quality web site.											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>L</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>CO2</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>CO3</b>	<b>H</b>		<b>H</b>		<b>L</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	<b>Basic Sciences</b>	<b>Engineering Sciences</b>	<b>Humanities and Social Sciences</b>	<b>Program Core</b>	<b>Program Electives</b>	<b>Open Electives</b>	<b>Practical / Project</b>	<b>Internships / Technical Skill</b>	<b>Soft Skills</b>			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E10</b>	<b>WEB DATA DESIGN &amp; MANAGEMENT</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**UNIT I SITE ORGANIZATION AND NAVIGATION 9 Hrs**

User centered design – Web medium – Web design process – Evaluating process – Site types and architectures – Navigation theory – Basic navigation practices – Search – Site maps

**UNIT II ELEMENTS OF PAGE DESIGN 9 Hrs**

Browser compatible design issues - Pages and Layout – Templates – Text – Color – Images – Graphics and Multimedia - GUI Widgets and Forms – Web Design patterns.

**UNIT III SCRIPTING LANGUAGES 9 Hrs**

Client side scripting: XHTML – DHTML– JavaScript– XML Server side scripting: Perl – PHP – ASP/JSP Designing a Simple web application.

**UNIT IV PRE-PRODUCTION MANAGEMENT 9 Hrs**

Principles of Project Management – Web Project Method – Project Road Map – Project Clarification – Solution Definition – Project Specification – Content – Writing and Managing content.

**UNIT V PRODUCTION, MAINTENANCE AND EVALUATION 9 Hrs**

Design and Construction – Testing, Launch and Handover – Maintenance – Review and Evaluation – Case Study

**Total Hours: 45**

**TEXT BOOKS:**

1. Themas A. Powell (2003)*The Complete Reference – Web Design* (3<sup>rd</sup> 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*(3<sup>rd</sup> 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* (2<sup>nd</sup> edition.) Prentice Hall
3. Lynch, Horton and Rosenfeld (2002) *Web Style Guide: Basic Design Principles for Creating Web Sites* (2<sup>nd</sup> edition.) Yale University Press.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E11	<b>Subject Name :</b> <b>RISK MANAGEMENT</b>	<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: NIL	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b> <ul style="list-style-type: none"> <li>Identify and categories the various risks face by an organization</li> <li>Explain the various risk control measures available</li> <li>Design a risk management program for a business organization.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	demonstrate knowledge of the range of financial and financial related risks facing organizations											
<b>CO2</b>	understand the approach to risk management through risk identification, risk measurement and risk management (or mitigation)											
<b>CO3</b>	understand operational risk and how to manage it.											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	L	M	M	H	M	L	M	M	M	H	H
<b>CO2</b>	L	L	M	H	H	M	M	H	H	H	L	H
<b>CO3</b>	H	M	L	H	M	L	H	M	L	L	M	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		M		M		M		H	H	M	M
<b>CO2</b>	M		M		M		L		M	H	M	H
<b>CO3</b>	H		L		L		M		M	M	H	M
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E11</b>	<b>RISK MANAGEMENT</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**UNIT I THE RISK MANAGEMENT PROCESS 9 Hrs**

Introduction to software risk management, why do we need to manage risk in software development, Use, Objectives, Risk Management Paradigm, Risk management and litigation. Models for Risk Management.

**UNIT II DISCOVERING RISK IN SOFTWARE DEVELOPMENT 9 Hrs**

Risk attributes and Identification, Identifying software risk, Common software project risks, Risk Taxonomy, Risk Mapping, statements, reviews., Risk ownership and stakeholder management.

**UNIT III RISK ASSESSMENT 9 Hrs**

Objectives and goals. Approach to assessment, Risk assessment tools and techniques, presenting the risk findings.

**UNIT IV PLANNING RISK MITIGATION STRATEGIES 9 Hrs**

Risk Planning, Best practices in the risk planning, Risk management tools, Risk mitigation strategies, Formulating and Implementing risk management plans.

**UNIT V MONITORING RISK IN SOFTWARE PROJECTS 9 Hrs**

Developing a process for monitoring risk, formulating a project risk database, Managing and tracking risk, Risk support tools. Software Risk Metrics, organization, estimation, development methodology.

**Total Hours: 45**

**TEXT BOOKS:**

1. Yacov Y. Haimes, (2011) Risk Modeling, Assessment, and Management, Wiley
2. John Mcmanus,(2004) Risk Management in software development projects,Elsevier Butterworth-Heinemann

**REFERENCE BOOKS:**

1. Martin Loosemore, John Raftery, (2006) Risk management in projects,Taylor& Francis Ltd
2. Ravindranath P. C, (2007) Applied Software Risk Management, Auerbach,
3. Dale Walter Karolak,,(1995) Software engineering risk management, Wiley-Ieee Computer Society



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code:	Subject Name :	Ty/ Lb/ ET L	L	T/ S.Lr	P/R	C						
<b>BCS18E12</b>	<b>CRYPTOGRAPHY AND NETWORK SECURITY</b>											
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<b>The student will be able :</b>												
<ul style="list-style-type: none"> <li>Understand OSI security architecture and classical encryption techniques.</li> <li>gain basic knowledge on the number theory.</li> <li>Understand various block cipher modes.</li> <li>understands the principles of public key cryptosystems, and different message authentication and integrity techniques</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	To identify the major types of threats to Network security and the associated attacks											
<b>CO2</b>	To develop strategies to protect organization information assets from common attacks, understand how security policies, standards and practices are developed											
<b>CO3</b>	To design, analyse and implement different network security protocols											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	H	M	M	M	M	M	M	L	L	L
<b>CO2</b>	H	M	H	M	H	M	M	M	M	L	L	L
<b>CO3</b>	H	H	H	M	H	M	M	M	M	L	L	L
<b>COs / PSO</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		L		M		M		L		H	
<b>CO2</b>	H		L		M		M		L		H	
<b>CO3</b>	H		L		M		M		L		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E12</b>	<b>CRYPTOGRAPHY AND NETWORK SECURITY</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**UNIT I INTRODUCTION & NUMBER THEORY 9 Hrs**

OSI security architecture - Security attacks ,Services and Mechanisms - -Network security model- Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, stenography)- **NUMBER THEORY**: Modular arithmetic-Euclid’s algorithm- Fermat’s and Euler’s theorem- The Chinese remainder theorem- Discrete logarithms.

**UNIT II BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY 9 Hrs**

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES -RC5 algorithm. **Public key cryptography**: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange--Elliptic curve cryptography.

**UNIT III CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS 9 Hrs**

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols-DSS.

**UNIT IV NETWORK SECURITY PRACTICE 9 Hrs**

Authentication Applications – Kerberos – X.509 Authentication Service – Electronic mail Security – Pretty Good Privacy – S/MIME – IP Security – Web Security.

**UNIT V SYSTEM SECURITY 9 Hrs**

Intruders – Intrusion Detection – Password Management – Malicious Software – Viruses and Related Threats -Viruses Countermeasures – Distributed Denial of Service Attacks - Firewalls – Firewall Design Principles – Trusted Systems.

**Total Hours: 45**

**TEXT BOOK:**

1. William Stallings (2011) *Cryptography And Network Security – Principles and Practices*, (5th ed.) Pearson Education.

**REFERENCE BOOKS:**

1. Atul Kahate (2008) *Cryptography and Network Security Tata McGraw Hill*
2. Bruce Schneier (2007) *Applied Cryptography, John Wiley & Sons Inc.*
3. Charles B. Pfleeger, Shari Lawrence Pfleeger (2007) *Security in Computing (4th ed.)*, Pearson Education



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BCS18E13</b>	Subject Name : <b>MOBILE ADHOC NETWORKS</b>	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3

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

**OBJECTIVES :**

- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- knowledge of routing mechanisms
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.
- This includes their designs, operations, plus approaches to interoperability.

**COURSE OUTCOMES (COs) : ( 3- 5)**

<b>CO1</b>	Have gained an understanding of the current topics in MANETs and WSNs, both from an industry and research point of views.
<b>CO2</b>	Have an understanding of the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
<b>CO3</b>	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			
					✓							





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E13</b>	<b>MOBILE ADHOC NETWORKS</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 designing- 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 perspective. Integration 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*,



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> <b>BCS18E14</b>	<b>Subject Name :</b> <b>TCP/IP DESIGN AND IMPLEMENTATION</b>	<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BIT18I01	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• To learn the principles of TCP / IP and its Architecture</li> <li>• Understand the transport layer protocols</li> <li>• IP addressing and routing</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Understand IP Addressing schemes and TCP/IP Architecture											
<b>CO2</b>	Learn the fundamentals of network design and implementation											
<b>CO3</b>	Understand network management issues											
<b>CO4</b>	Learn and implement network applications											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	M	M	L	L	M	M	L	H	M	H	M
<b>CO2</b>	H	M	M	L	M	M	M	L	H	M	H	M
<b>CO3</b>	H	H	H	M	M	M	M	L	H	M	H	M
<b>CO4</b>	H	H	H	M	M	M	M	M	H	M	H	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		L		M		H		M	
<b>CO2</b>	H		H		M		H		H		H	
<b>CO3</b>	H		H		M		H		H		H	
<b>CO4</b>	H		H		L		H		H		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E14</b>	<b>TCP/IP DESIGN AND IMPLEMENTATION</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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. Douglas E. Comer,(2000) “Internetworking with TCP/IP–Principles, Protocols & Architecture”, 4th Edition,Pearson education.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E15	<b>Subject Name :</b> <b>CYBER FORENSICS AND INTERNET SECURITY</b>						<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/S.Lr</b>	<b>P/R</b>	<b>C</b>	
	Prerequisite:BCS18OE5						<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>	
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>To learn the computer forensic fundamentals</li> <li>To understand various types of cyber crime activities involved in the digital world</li> <li>To study various network security technologies to prevent the data from hacker or intruder</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Students understood how to protect the data or how to secure their personal and official data in their computer.											
<b>CO2</b>	The students have the awareness on digital forensics frauds											
<b>CO3</b>	The students have the knowledge on keep the data in secure manner in the network using network security technologies.											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	H	L	H	H	H	L	M	M	H	H
<b>CO2</b>	H	H	H	M	H	H	H	H	H	M	H	H
<b>CO3</b>	H	H	H	H	H	H	H	M	H	M	H	H
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		M		H		H		H	
<b>CO2</b>	H		H		M		H		H		H	
<b>CO3</b>	H		H		M		H		H		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E15</b>	<b>CYBER FORENSICS AND INTERNET SECURITY</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code:	Subject Name : <b>DATABASE SECURITY</b>	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
<b>BCS18E16</b>	Prerequisite: BCS18004	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>

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

**OBJECTIVES :**

- To provide 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	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
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		PSO 3	PSO4			PSO5		PSO6	
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			
						✓						





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E16</b>	<b>DATABASE SECURITY</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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:**

- Hassan A. Afyouni, 2009 “Database Security and Auditing”, Third Edition, Cengage Learning.

**REFERENCE BOOKS:**

- Charu C. Aggarwal, Philip S Yu, 2008, “Privacy Preserving Data Mining”: Models and Algorithms, Kluwer Academic Publishers.
- Ron Ben Natan, 2005, ”Implementing Database Security and Auditing”, Elsevier Digital Press.





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E17	<b>Subject Name :</b> <b>MANAGEMENT INFORMATION SYSTEMS</b>	<b>Ty/</b>	<b>L</b>	<b>T/</b>	<b>P/R</b>	<b>C</b>						
		<b>Lb/</b>		<b>S.L</b>								
		<b>ETL</b>		<b>r</b>								
	<b>Prerequisite: BCS18004</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
<b>L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits</b> <b>Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab</b>												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>Evaluate the role of the major types of information systems in a business environment and their relationship to each other;</li> <li>Assess the impact of the Internet and Internet technology on business electronic commerce and electronic business;</li> <li>Identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Describe the role of information technology and information systems in business											
<b>CO2</b>	Record the current issues of information technology and relate those issues to the firm											
<b>CO3</b>	Reproduce a working knowledge of concepts and terminology related to information technology											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>
<b>CO1</b>	H	M	M	L	L	L	L	M	L	M	L	L
<b>CO2</b>	H	H	L	H	M	L	L	M	L	M	L	L
<b>CO3</b>	H	M	M	L	L	L	L	M	L	M	L	L
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		M		L		M		L		L	
<b>CO2</b>	H		L		L		L		L		L	
<b>CO3</b>	H		M		L		M		L		L	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E17</b>	<b>MANAGEMENT INFORMATION SYSTEMS</b>	Ty	3	0/0	0/0	3
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**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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**  
**7<sup>th</sup> SEMESTER ELECTIVES E- III (Common to CSE&IT)**

<b>Subject Code:</b> BCS18E41	<b>Subject Name :</b> <b>MOBILE APPLICATION DEVELOPMENT</b>	<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BCS18ET2	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>Describe the limitations and challenges of working in a mobile and wireless environment</li> <li>Describe and apply the different types of application models/architectures used to develop mobile software applications.</li> <li>Describe the components and structure of a mobile development frameworks</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Able to understand the various Mobile Platforms and analyze its architectures											
<b>CO2</b>	Able to design and develop various Mobile Applications for Android and Apple											
<b>CO3</b>	Able to develop own mobile application											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>
<b>CO1</b>	H	L	L	M	M	L	M	L	L	H	L	L
<b>CO2</b>	M	H	H	M	H	L	L	M	M	M	M	H
<b>CO3</b>	M	H	H	M	H	L	L	M	H	M	H	H
<b>COs / PSO s</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	L		L		H		L		H		M	
<b>CO2</b>	M		H		L		M		M		H	
<b>CO3</b>	H		H		L		H		M		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Special Elective		
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E41</b>	<b>MOBILE APPLICATION DEVELOPMENT</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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- 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 hours: 45**

**TEXT BOOKS:**

1. Ed Burnette (2015) Hello, Android: Introducing Google's Mobile Development Platform, 4<sup>th</sup> 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*, 2<sup>nd</sup> edition, O'Reilly Media Publication.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BCS18E18</b>	Subject Name : <b>DATA SCIENCE AND BIG DATA ANALYTICS</b>	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C						
	Prerequisite: BCS18004	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>Deploying the Data Analytics Lifecycle to address big data analytics projects</li> <li>Reframing a business challenge as an analytics challenge</li> <li>Applying appropriate analytic techniques and tools to analyze big data, create statistical models, and identify insights that can lead to actionable result</li> <li>Using tools such as: R and RStudio, MapReduce/Hadoop, in-database analytics, Window and MADlib functions.</li> </ul>												
<b>COURSE OUTCOMES (Cos) : ( 3- 5)</b>												
<b>CO1</b>	Deploying the Data Analytics Lifecycle to address big data analytics projects											
<b>CO2</b>	Reframing a business challenge as an analytics challenge											
<b>CO3</b>	Applying appropriate analytic techniques and tools to analyze big data, create statistical models, and identify insights that can lead to actionable results											
<b>CO4</b>	To explore the next generation of big data tools and applications, and other advanced topics if time permits.											
<b>Mapping of Course Outcomes with Program Outcomes (Pos)</b>												
<b>Cos/Pos</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	H	M	H	H	H	M	H	M	H	H
<b>CO2</b>	H	H	M	H	H	H	H	L	H	M	H	M
<b>CO3</b>	H	H	H	H	M	M	H	M	H	L	H	H
<b>CO4</b>	H	H	H	H	M	H	L	H	H	H	H	H
<b>Cos / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		H		M		L		H	
<b>CO2</b>	H		H		H		M		H		H	
<b>CO3</b>	H		H		M		H		H		M	
<b>CO4</b>	H		H		H		M		H		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Special elective		
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E18</b>	<b>DATA SCIENCE AND BIG DATA ANALYTICS</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> <b>BIT18006</b>	Subject Name : <b>CLOUD TECHNOLOGY</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BCS17I01	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVE :</b>												
<ul style="list-style-type: none"> <li>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.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Understand the application of cloud computing											
<b>CO2</b>	Recognize the importance cloud security.											
<b>CO3</b>	Design the efficient flexible cloud applications											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	<b>H</b>		<b>H</b>		<b>M</b>		<b>H</b>		<b>M</b>		<b>M</b>	
<b>CO2</b>	<b>H</b>		<b>M</b>		<b>H</b>		<b>M</b>		<b>H</b>		<b>H</b>	
<b>CO3</b>	<b>H</b>		<b>M</b>		<b>H</b>		<b>M</b>		<b>H</b>		<b>M</b>	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BIT18006</b>	<b>CLOUD TECHNOLOGY</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**UNIT I CLOUD COMPUTING INTRODUCTION**

**9Hrs**

Characteristics – cloud models – cloud services – cloud based services and applications – virtualization – Load balancing – deployment – replication – monitoring – MapReduce – Identity and Access management.

**UNIT II CLOUD SERVICES AND PLATFORMS**

**9Hrs**

Compute services – storage services – database services – application services – content delivery services – analysis services – Deployment & management services – identity and Access management services – open source private cloud software – Hadoop MapReduce job execution – Hadoop schedulers – Hadoop cluster setup

**UNIT III CLOUD APPLICATION DESIGN & PYTHON**

**9Hrs**

Design consideration for cloud applications – reference architecture for cloud applications – cloud application design methodologies - data storage approaches – Python data types & data structures – control flow – functions – modules – packages – file handling – classes.

**UNIT IV CLOUD APPLICATION DEVELOPMENT**

**9Hrs**

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

**UNIT V ADVANCED APPICATIONS**

**9Hrs**

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

**Total Hours: 45**

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BCS18E19</b>	Subject Name : <b>NETWORK FORENSICS</b>	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C						
	Prerequisite: BIT18I01	Ty	3	0/0	0/0	3						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES:</b>												
<ul style="list-style-type: none"> <li>Provide a comprehensive understanding of network forensic analysis principles</li> <li>Understand the relationship between network forensic analysis and network security technologies.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Learn to identify network security incidents and potential sources of digital evidence.											
<b>CO2</b>	Demonstrate the ability to perform basic network data acquisition and analysis using computer based applications and utilities											
<b>CO3</b>	Identify potential applications for the integration of network forensic technologies											
<b>CO4</b>	Apply tools for network forensic investigation											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	L	H	L	H	H	M	H	M	H	M
<b>CO2</b>	H	H	H	H	H	M	M	M	H	M	H	M
<b>CO3</b>	H	H	H	H	H	M	M	M	H	M	H	L
<b>CO4</b>	H	H	H	H	H	M	M	H	M	M	H	H
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		L		M		H		H	
<b>CO2</b>	H		H		M		M		H		H	
<b>CO3</b>	H		H		L		M		H		H	
<b>CO4</b>	H		H		M		H		H		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E19</b>	<b>NETWORK FORENSICS</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 TUNNELING 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, 1<sup>st</sup> Edition* Eoghan Casey ed., Elsevier Academic Press, ISBN 13: 978-0-12-374267-4,.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E20	<b>Subject Name :</b> <b>INTERNET OF THINGS</b>	<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: NIL	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>Vision and introduction to IoT</li> <li>Data knowledge management and use of devices in IoT Technology</li> <li>Understand the state of Art – Iot Architecture</li> <li>Real world Iot Design constraints, industrial automation and commercial building automation in IoT</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Understand the vision of IoT from a global context.											
<b>CO2</b>	Determine the Market perspective of IoT.											
<b>CO3</b>	Use of Devices, Gateways and Data Management in IoT											
<b>CO4</b>	Understand the Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	M	M	M	M	M	M	L	L	H	M	H	H
<b>CO2</b>	M	M	H	H	H	L	H	L	H	M	H	H
<b>CO3</b>	H	H	H	H	H	H	H	M	H	M	H	M
<b>CO4</b>	H	H	H	H	H	H	H	M	H	H	H	H
<b>COs / PSO s</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		M		L		M		H		L	
<b>CO2</b>	H		H		M		H		M		H	
<b>CO3</b>	M		H		H		H		M		H	
<b>CO4</b>	H		H		L		H		H		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Special Elective		
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E20</b>	<b>INTERNET OF THINGS</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 Methodology – 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 Madiseti 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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E21	<b>Subject Name :</b> <b>SOCIAL COMPUTING</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: NIL	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>Understand important features of social computing.</li> <li>Design and prototype new social computing systems.</li> <li>Analyze data left behind in social media.</li> <li>Understand the research issues in this field.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Understand emerging themes in social and web based computing – focusing on current Research topics dominant in this area.											
<b>CO2</b>	Use specialist Application Programming Interfaces (APIs) for analysing social media data feeds											
<b>CO3</b>	Understand the use of graph theory in representing relationships in social networks and distributed systems											
<b>CO4</b>	Understand and make use of specialist technologies used to harvest, analyse and visualise “social data											
<b>CO5</b>	Demonstrate the use of specialist programming environments and tools for managing distributed social data.											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	M	L	M	M	M	M	L	L	M	M
<b>CO2</b>	H	H	M	M	L	L	M	M	L	M	M	M
<b>CO3</b>	H	H	M	M	L	L	L	L	M	L	M	M
<b>CO4</b>	H	H	L	M	M	M	M	L	L	L	M	M
<b>CO5</b>	H	H	M	M	M	L	L	L	M	M	M	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		M		M		L		M	
<b>CO2</b>	H		H		M		L		L		M	
<b>CO3</b>	H		H		M		M		M		L	
<b>CO4</b>	H		H		L		L		M		M	
<b>CO5</b>	H		H		M		M		M		L	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Special Elective		
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E21</b>	<b>SOCIAL COMPUTING</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 - 21<sup>st</sup> 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





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code:	Subject Name : <b>ENTERPRISE ARCHITECTURE</b>	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C						
<b>BCS18E22</b>	Prerequisite: NIL	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>To define and explain gaps</li> <li>Help to achieve the business strategy, vision and Target Operating Model</li> <li>Provide the flexibility to include new ideas in the future</li> <li>Enable faster decision making, avoiding the need for long studies</li> <li>Learn UML and BPMN Modeling.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Construct models for enterprise architecture definition which conform to industry standards and frameworks											
<b>CO2</b>	Analyze alternative models for enterprise architecture components and processes for different organizations											
<b>CO3</b>	Identify critical success factors for common enterprise architect approaches											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>L</b>	<b>H</b>	<b>L</b>	<b>M</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>M</b>
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	<b>H</b>		<b>H</b>		<b>M</b>		<b>H</b>		<b>M</b>		<b>M</b>	
<b>CO2</b>	<b>H</b>		<b>H</b>		<b>M</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>CO3</b>	<b>H</b>		<b>H</b>		<b>H</b>		<b>M</b>		<b>M</b>		<b>M</b>	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Special Elective		
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E22</b>	<b>ENTERPRISE ARCHITECTURE</b>	Ty	3	0/0	0/0	3
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**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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E23	<b>Subject Name :</b> <b>OPTIMIZATION TECHNIQUES</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>
	Prerequisite: NIL	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>

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

**OBJECTIVES :**

- To understand importance of optimization of industrial process management and apply basic concepts of mathematics to formulate an optimization problem.
- To analyse and appreciate variety of performance measures for various optimization problems

**COURSE OUTCOMES (COs) : ( 3- 5)**

<b>CO1</b>	Apply knowledge of optimization to formulate and solve engineering problems.
<b>CO2</b>	Understand the different methods of optimization and be able to suggest a technique for a specific problem.
<b>CO3</b>	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
<b>CO1</b>	H	H	M	L	L	L	L	M	M	L	M	L
<b>CO2</b>	H	H	M	L	L	L	L	M	M	L	M	L
<b>CO3</b>	H	M	M	L	L	L	L	M	M	L	M	L
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
<b>CO1</b>	H		H		L		M		L		L	
<b>CO2</b>	H		H		L		M		L		L	
<b>CO3</b>	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
					✓				



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E23</b>	<b>OPTIMIZATION TECHNIQUES</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**UNIT I INTRODUCTION TO OPERATION RESEARCH 9 Hrs**

Operation Research approach, scientific methods, introduction to models and modeling techniques, general methods for Operation Research models, methodology and advantages of Operation Research, history of Operation Research.

**UNIT II LINEAR PROGRAMMING (LP) 9 Hrs**

Introduction to LP and formulation of Linear Programming problems, Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using Big-M method, Two phase method, Duality in linear programming, Integer linear programming.

**UNIT III TRANSPORTATION & ASSIGNMENT PROBLEMS 9 Hrs**

Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem, introduction to Assignment problems, variations in Assignment problems

**UNIT IV NETWORK ANALYSIS 9 Hrs**

Network definition and Network diagram, probability in PERT analysis, project time cost trade off, introduction to resource smoothing and allocation.

**UNIT V SEQUENCING 9 Hrs**

Introduction, processing N jobs through two machines, processing N jobs through three machines, processing N jobs through m machines. **Inventory Model:** Introduction to inventory control, deterministic inventory model, EOQ model with quantity discount. **Queuing Models:** Concepts relating to queuing systems, basic elements of queuing model, role of Poison & exponential distribution, concepts of birth and death process.

**Total Hours: 45**

**REFERENCE BOOKS :**

1. J K Sharma, *Operations Research Theory and Applications*, MacMillan India Ltd.
2. N D Vohra, *Quantitative Techniques in management*, Tata McGraw Hill.
3. Handy A Taha, *Operations Research – An Introduction*, Prentice Hall of India, New Delhi.
4. Wagner H M, *Principles of Operations Research: With Applications to Management Decisions*, Prentice-Hall of India, New Delhi.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**8<sup>th</sup> SEMESTER ELECTIVES E-IV AND E-V (Common to CSE&IT)**

Subject Code: <b>BCS18E24</b>	Subject Name : <b>INFORMATION STORAGE MANAGEMENT</b>	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18004	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>

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

**OBJECTIVES :**

- Provides a comprehensive understanding of the various storage infrastructure components in data center environments.
- It enables participants to make informed decisions on storage-related technologies in an increasingly complex IT environment
- The adoption of software-defined infrastructure management and third platform technologies.
- It provides a strong understanding of storage technologies and prepares participants for advanced concepts, technologies, and processes.
- To learn the architectures, features, and benefits of intelligent storage systems
- Includes block-based, file-based, object-based, and unified storage; software-defined storage; storage networking technologies such as FC SAN, IP SAN, and FCoE SAN; business continuity solutions such as backup and replication; the highly-critical area of information security; and storage infrastructure management.

**COURSE OUTCOMES (COs) : ( 3- 5)**

<b>CO1</b>	Evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, CAS
<b>CO2</b>	Define backup, recovery, disaster recovery, business continuity, and replication
<b>CO3</b>	Understand logical and physical components of a storage infrastructure
<b>CO4</b>	Identify components of managing and monitoring the data center
<b>CO5</b>	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
<b>CO1</b>	H	H	H	H	H	H	H	H	H	H	H	H
<b>CO2</b>	H	H	M	H	H	H	M	H	H	H	H	H
<b>CO3</b>	H	H	H	H	H	H	M	M	H	M	H	M
<b>CO4</b>	H	H	H	H	H	M	M	M	H	H	H	H
<b>CO5</b>	H	H	H	H	H	H	M	M	H	M	H	M

COs / SOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
<b>CO1</b>	H	H	H	H	H	H
<b>CO2</b>	H	H	M	H	H	H
<b>CO3</b>	H	M	M	H	H	M
<b>CO4</b>	H	M	M	H	H	H
<b>CO5</b>	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			
						✓						



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E24</b>	<b>INFORMATION STORAGE MANAGEMENT</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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, 2<sup>nd</sup> 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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E25	<b>Subject Name :</b> <b>NETWORK INFRASTRUCTURE MANAGEMENT</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/ R</b>	<b>C</b>						
	Prerequisite: BIT18I01	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVE :</b>												
<ul style="list-style-type: none"> <li>• To learn Network Layers functionality, to acquire knowledge about and VLANs, and to test Network security and wireless security.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Understand the use of network infrastructure											
<b>CO2</b>	Recognize the importance and relevance of VLANs and EIGRP											
<b>CO3</b>	Troubleshoot the network infrastructure											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	M	H	H	H	M	M	M	M	M	H	H
<b>CO2</b>	H	H	M	H	M	H	M	H	H	H	M	H
<b>CO3</b>	H	H	M	H	H	M	H	M	H	M	H	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		M		H		M		M	
<b>CO2</b>	M		H		H		H		H		H	
<b>CO3</b>	H		H		H		H		M		M	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E25</b>	<b>NETWORK INFRASTRUCTURE MANAGEMENT</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code: <b>BCS18E26</b>	Subject Name : <b>FOUNDATIONS OF PARALLEL PROGRAMMING</b>	Ty/ Lb/ ET L	L	T/ S.L r	P/R	C						
	Prerequisite: BCS18007	Ty	3	0/0	0/0	3						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T / L/ ETL: Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>Fundamental concepts of Multi threaded, Parallel and Distributed Computing paradigms of parallel programs.</li> <li>Systematic methods for developing parallel programs.</li> <li>Techniques typical for parallel programming in Java.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Understanding of Concurrent Programming Concepts											
<b>CO2</b>	Understand and handle Semaphores and Monitors											
<b>CO3</b>	Learn the Message Passing methods and Process Interaction for Parallel Programming											
<b>CO4</b>	Understand the practical parallel programming scenarios and possibilities											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO 10	PO1 1	PO1 2
CO1	H	H	M	L	L	L	L	M	M	L	M	L
CO2	H	H	M	L	L	L	L	M	M	L	M	L
CO3	H	M	M	L	L	L	L	M	M	L	M	L
CO4	H	M	M	L	L	L	L	L	M	M	L	L
COs / PSO s	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	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E26</b>	<b>FOUNDATIONS OF PARALLEL PROGRAMMING</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b>	<b>Subject Name :</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
<b>BCS18E27</b>	<b>VIRTUALIZATION</b>											
	Prerequisite: BIT18007	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVE :</b>												
<ul style="list-style-type: none"> <li>• Candidates should know and understand the general concepts, theory and terminology of Virtualization.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Server virtualization and desktop virtualization											
<b>CO2</b>	Virtual machines installation, configuration and administration											
<b>CO3</b>	Introduction to networking fundamentals and layering structure											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	M	M	L	M	L	L	L	L	L	L	M
<b>CO2</b>	H	M	M	L	M	L	L	L	L	L	L	M
<b>CO3</b>	H	M	M	L	M	L	L	L	L	L	L	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		M		L		M		M		L	
<b>CO2</b>	H		M		L		M		M		L	
<b>CO3</b>	H		M		L		M		M		L	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E27</b>	<b>VIRTUALIZATION</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 - VFI's 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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E28	<b>Subject Name :</b> <b>HADOOP DISTRIBUTED FILE SYSTEM</b>	<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/S.Lr</b>	<b>P/R</b>	<b>C</b>
	Prerequisite: BCS18006	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>

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

**OBJECTIVE :**

- To understand the 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)**

<b>CO1</b>	Understand the application of distributed file system.
<b>CO2</b>	Recognize the importance and relevance of HDFS.
<b>CO3</b>	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	PO <sub>9</sub>	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			
						✓						





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E28</b>	<b>HADOOP DISTRIBUTED FILE SYSTEM</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 – optimize 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 4<sup>th</sup> 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.





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E29	<b>Subject Name :</b> <b>MOBILE DATABASES</b>	<b>Ty/</b> <b>Lb/</b> <b>ETL</b>	<b>L</b>	<b>T/</b> <b>S.L</b> <b>r</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BCS18004	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• To learn about the fundamentals of distributed databases</li> <li>• To understand Data Processing and mobility models</li> <li>• To learn about the Data Consistency and Concurrency Control mechanisms</li> <li>• To study mobile Database Recovery techniques and Wireless Information Broadcast schemes</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Design and implement a complete problem solution using current database technology											
<b>CO2</b>	Propose, implement and maintain database security mechanisms											
<b>CO3</b>	Become familiar with the expanding role of Mobile database technology.											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO10</b>	<b>PO1 1</b>	<b>PO1 2</b>
<b>CO1</b>	H	H	H	H	H	H	M	H	H	H	H	H
<b>CO2</b>	M	H	M	H	H	M		M	M	M	L	L
<b>CO3</b>	H	M	H	M	M	H	H	H		L	M	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	M				H		H		H		H	
<b>CO2</b>	H		H		M		L		H		L	
<b>CO3</b>	H		M		H		H		H		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E29</b>	<b>MOBILE DATABASES</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E30	<b>Subject Name :</b> <b>WEB ENGINEERING</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>
	Prerequisite: BIT18I02	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>

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

**OBJECTIVES:**

- To be able to analyze and design comprehensive systems for the creation, dissemination, storage, retrieval, and use of electronic records and documents
- To learn and use some of the client-side and server-side languages used to manipulate information on the World Wide Web – i.e. ASP.NET, and Javascript.
- To learn techniques and evaluation metrics for ensuring the proper operability, maintenance and security of a web application.

**COURSE OUTCOMES (COs) : ( 3- 5)**

<b>CO1</b>	Apply the web engineering methodologies for Web application development
<b>CO2</b>	Develop a component based web solution and use UML diagrams to describe such a solution.
<b>CO3</b>	Identify and discuss the security risk of a Web application.

**Mapping of Course Outcomes with Program Outcomes (POs)**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	H	M	M	H	M	M	L	L	M	M
CO2	M	M	M	H	M	M	M	M	H	M	M	M
CO3	H	L	M	H	H	L	L	L	M	H	L	L
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
CO1	M		M		M		H		H		H	
CO2	M		M		L		M		M		M	
CO3	L		L		M		M		L		L	

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

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E30</b>	<b>WEB ENGINEERING</b>	Ty	3	0/0	0/0	3
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**UNIT I      WEB-BASED SYSTEMS      9 Hrs**

The Web-Web Applications-Web Engineering-The Components of Web Engineering

**UNIT II      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 MODELING 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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E31	<b>Subject Name :</b> <b>4G NETWORKS</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BIT18I01	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T / L/ ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVE :</b>												
<ul style="list-style-type: none"> <li>To understand the latest technology in mobile communication and the high speed data communication through wireless network.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Able to develop new technology in wireless communication											
<b>CO2</b>	Capable to design new protocols for high speed mobile devices											
<b>CO3</b>	Able to design new air interface for effective communication in mobile technology											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	M	H	L	H	M	M	H	H	H	H	M
<b>CO2</b>	H	M	M	M	H	H	M	M	H	H	H	M
<b>CO3</b>	H	H	H	M	L	H	M	M	H	M	H	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		M		M		H		H		H	
<b>CO2</b>	H		H		M		M		H		M	
<b>CO3</b>	H		M		M		M		H		M	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences											
	Engineering Sciences											
Humanities and Social Sciences												
Program Core												
Program Electives					✓							
Open Electives												
Practical / Project												
Internships / Technical Skill												
Soft Skills												



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E31</b>	<b>4G NETWORKS</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**UNIT I      LTE NETWORK ARCHITECTURE AND PROTOCOLS      9 Hrs**

Evolution of 3GPP Standards-Radio Interface Techniques in 3GPP Systems-Radio Access Mode Operations-Spectrum Allocation in UMTS and LTE-EPS Interfaces-EPS Protocols and Planes-EPS Procedures.

**UNIT II      LTE AIR INTERFACE AND PROCEDURES      9 Hrs**

LTE Protocol Stack - SDU and PDU - LTE Radio Resource Control (RRC) - LTE Packet Data Convergence Protocol Layer (PDCP)- LTE Radio Link Control (RLC)- LTE Medium Access Control (MAC) - LTE Physical Layer (PHY)- Channel Mapping of Protocol Layers- LTE Air Interface

**UNIT III      ANALYSIS AND OPTIMIZATION OF LTE SYSTEM PERFORMANCE      9Hrs**

Deployment Optimization Processes - LTE Performance Analysis Based on Field Measurements - LTE Case Studies and Troubleshooting- LTE Inter-RAT Cell Reselection- Inter-RAT Cell Reselection Optimization Considerations- LTE to LTE Inter-frequency Cell Reselection- LTE Connected Mode Discontinuous Reception - Circuit Switch Fallback (CSFB) for LTE Voice Calls- Multiple-Input, Multiple-Output (MIMO) Techniques.

**UNIT IV      COVERAGE AND CAPACITY PLANNING OF 4G NETWORKS      9 Hrs**

LTE System Foundation- PCI and TA Planning- PRACH Planning- Coverage Planning- LTE Throughput and Capacity Analysis.

**UNIT V      VOICE EVOLUTION IN 4G NETWORKS      9 Hrs**

Voice over IP Basics- Voice Options for LTE- IMS Single Radio Voice Call Continuity- VoLTE Features- Deployment Considerations for VoLTE. Carrier Aggregation- Enhanced MIMO.

**Total Hours: 45**

**TEXT BOOK:**

1. Design, Deployment and Performance of 4G-LTE Networks- A Practical Approach- Ayman Elnashar Emirates Integrated Telecomms Co., UAE- Mohamed A. El-saidny QUALCOMM Technologies, Inc., USA- Mahmoud R. Sherif Emirates Integrated Telecomms Co., UAE. Wiley Publication.

**REFERENCE BOOK:**

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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b>	<b>Subject Name :</b> <b>ENTERPRISE RESOURCE PLANNING</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>
<b>BCS18E32</b>	Prerequisite: NIL	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>

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

**OBJECTIVES :**

- Know basic business functional areas and explains how they are related.
- Illustrate how an integrated information systems fail to support business decision and how integrated information systems can help a company prosper by providing business managers with accurate, consistent, and current data
- Understand how Enterprise Resource Planning software is used to optimize business processes  
 Acquire experience in using ERP software that can be applied in further coursework

**COURSE OUTCOMES (COs) : ( 3- 5)**

<b>CO1</b>	Able to integrate Business Enterprises, with web through Service Oriented Architecture
<b>CO2</b>	Understand how technology has evolved and the reason why existing systems are the way they are.
<b>CO3</b>	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
<b>CO1</b>	H	M	H	H	H	H	H	L	H	M	H	H
<b>CO2</b>	H	H	H	M	H	H	H	M	H	H	H	H
<b>CO3</b>	H	M	H	H	H	M	H	L	H	M	H	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
<b>CO1</b>	H		H		H		H		M		H	
<b>CO2</b>	H		H		M		H		M		M	
<b>CO3</b>	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			
						✓						





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E32</b>	<b>ENTERPRISE RESOURCE PLANNING</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E33	<b>Subject Name :</b> SUPPLY CHAIN MANAGEMENT							<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>
	Prerequisite: NIL							<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• For students to analytically solve problems related to inventory management, facility location, and supply chain optimization</li> <li>• To utilize computer resources to research and analyze supply chain operations.</li> <li>• To understand the global environment and strategic alliances in modern business and their impact on supply chain management</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Understand recent trends in green legislation with respect to supply chains.											
<b>CO2</b>	Understand the environmental impacts of supply chains and hence the need for green supply chains											
<b>CO3</b>	Integrate green practices, based on green legislation, into supply chain activities for sustainable development											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>P O9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	H	H	M	H	H	L	H	M	H	H
<b>CO2</b>	H	H	M	H	H	H	H	M	H	M	H	H
<b>CO3</b>	H	H	H	H	M	M	H	L	H	M	H	H
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>			<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>
<b>CO1</b>	H		H			H		H		L		M
<b>CO2</b>	H		H			M		H		H		M
<b>CO3</b>	H		H			M		H		H		H
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E33</b>	<b>SUPPLY CHAIN MANAGEMENT</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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. Altekhar Rahul V, 2005 Supply Chain Management-Concept and Cases, Prentice Hall India.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E34	<b>Subject Name :</b> MAIN FRAME COMPUTING	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
	Prerequisite: BCS18004	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>To understand the concepts of MVS, JCL, VSAM and IDCAMS</li> <li>To study the details of COBOL and DB2</li> <li>To understand CICS and supply transactions</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Understand the concepts of MVS, JCL, VSAM and IDCAMS											
<b>CO2</b>	Write moderately complex COBOL programs to process files.											
<b>CO3</b>	Understand CICS and supply transactions											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>H</b>
<b>CO2</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>H</b>
<b>CO3</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	<b>H</b>		<b>H</b>		<b>H</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>CO2</b>	<b>H</b>		<b>H</b>		<b>M</b>		<b>H</b>		<b>M</b>		<b>M</b>	
<b>CO3</b>	<b>H</b>		<b>H</b>		<b>M</b>		<b>H</b>		<b>H</b>		<b>H</b>	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E34</b>	<b>MAINFRAME COMPUTING</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**UNIT I MVS CONCEPTS**

**9 Hrs**

Main frame in Today's Business -Introduction to Z series H/W , Z/OS .- MVS overview-system initialization-storage management-job management ISPF Editor ISPF Data Utility Functions -managing work-data management-I/O processing-termination and recovery.TSO commands-general syntax of JCL statements

**UNIT II JCL AND VSAM**

**9 Hrs**

Explanation of job statements-explanation of EXEC statements-explanation of DD statements-additional parameters on JOB,EXEC,DD statements-classification-instream and catalog procedures-utilities-abend codes.VSAM data set organization structure-IDCAMS commands-JCL for VSAM-buffering-alternative index-repro-backup and recovery-export and import.

**UNIT III COBOL/370**

**9Hrs**

Structured programming constructs-fundamentals of COBOL-data definition-conditional statements-perform statements-compiler option-table definition-COBOL call and parameter passing-file handling.

**UNIT IV DB2**

**9Hrs**

RDBMS concepts-structural query language-normalisation-DB2 architecture-DB2 objects-locks-program preparation-cursors-null indicators-optimisation - utilities.

**UNIT V CICS**

**9Hrs**

CICS introduction-terminal control-application house keeping-EXEC,interface locks-supply transactions –CESM,CESF,CEMT,CEDF-NMDS-BMS-abend codes-file control-program control-TSQ-TDQ-pseudo conversation-recovery and roll back.

**Total Hours: 45**

**TEXT BOOKS:**

1. Mike Ebbers, John Kettner, Wayne O'Brien, Bill Ogden, (2011) Introduction to the New Mainframe: z/OS Basics, IBM Redbooks(SG24-6366-01)
2. Alexis Leon , IBM Mainframe Handbook, vikas Publishing, 2014

**REFERENCE 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, Chandan Ranade , (2007) MVS JCL Primer, McGrawhill



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E35	<b>Subject Name :</b> NEURO FUZZY COMPUTING	<b>Ty/ Lb/ ET L</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/ R</b>	<b>C</b>						
	Prerequisite: BCS18E06	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVE :</b>												
<ul style="list-style-type: none"> <li>The students will be able to design and develop neuro fuzzy modeling and will have the ability to understand Neural Network.</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	To know about the basics of soft computing techniques and also their use in some real life situations											
<b>CO2</b>	To solve the problems using neural networks techniques.											
<b>CO3</b>	To find the solution using different fuzzy logic techniques											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	H	M	H	H	M	H	H	M	L	H	H
<b>CO2</b>	H	H	M	H	H	M	H	H	M	M	H	H
<b>CO3</b>	H	H	M	H	M	M	M	H	M	L	H	H
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		H		M		H		H		H	
<b>CO2</b>	H		M		H		H		M		H	
<b>CO3</b>	H		M		H		H		H		H	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E35</b>	<b>NEURO FUZZY COMPUTING</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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 Anlysis.

**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*”, (3<sup>rd</sup> ed.)Wiley India,
2. S.Rajasekaran , G.A.Vijayalakshmi Pai , *Neural N/Ws, Fuzzy Logic and Genetic Algorithm Synthesis and Applications*, PHI (2004)





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b>	Subject Name : <b>WEB CONTENT MANAGEMENT</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>						
<b>BCS18E36</b>	Prerequisite: BCS18E09	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T / L/ ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>To Learn the basics of Content Management System</li> <li>To Learn the Tools and techniques</li> <li>To Learn the use of web browser,navigate to a web page</li> <li>To Learn the CMS tools for backup and customization</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Exploring CMS terminology, including open source, PHP, etc.,											
<b>CO2</b>	Capable of designing personalized template for content publishing.											
<b>CO3</b>	Implementing API code for text editor.											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	M	H	L	H	M	M	H	H	H	H	M
<b>CO2</b>	H	M	M	M	H	H	M	M	H	H	H	M
<b>CO3</b>	H	H	H	M	L	H	M	M	H	M	H	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		M		M		H		H		H	
<b>CO2</b>	H		H		M		M		H		M	
<b>CO3</b>	H		M		M		M		H		M	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E36</b>	<b>WEB CONTENT MANAGEMENT</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E37	<b>Subject Name :</b> MACHINE LEARNING						<b>Ty/Lb/ETL</b>	<b>L</b>	<b>T/S.Lr</b>	<b>P/R</b>	<b>C</b>	
	Prerequisite: BCS18E06						<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>	
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVE :</b> To learn machine learning techniques, to acquire knowledge about clustering and nonparametric methods and to design and analyze machine learning experiments.												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Understand the concept of Machine Learning											
<b>CO2</b>	Recognize the importance and relevance of Machine Learning Models											
<b>CO3</b>	Design the efficient Machine Learning Application .											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>
<b>CO1</b>	H	H	M	H	H	M	M	M	H	M	H	H
<b>CO2</b>	M	H	M	H	H	M	M	H	M	H	M	H
<b>CO3</b>	H	H	M	H	H	M	H	M	H	M	H	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>	<b>PSO5</b>			<b>PSO6</b>	
<b>CO1</b>	H		M		M		H	M			M	
<b>CO2</b>	M		M		H		M	H			H	
<b>CO3</b>	H		H		H		M	M			M	
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E37</b>	<b>MACHINE LEARNING</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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” 3<sup>rd</sup> 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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> BCS18E38	<b>Subject Name :</b>  <b>M - COMMERCE</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/R</b>	<b>C</b>
	Prerequisite: BIT18IO2	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>

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

**OBJECTIVES:**

- To understand the E – commerce strategies and value chains
- To understand the M-commerce services
- To understand M – commerce infrastructure and applications.
- To know the availability of latest technology and applications of M- commerce in various domains.
- To apply mobile commerce in business-to-business application

**COURSE OUTCOMES (COs) : ( 3- 5)**

<b>CO1</b>	Various forms of wireless communication and the standards and architecture of wireless LAN
<b>CO2</b>	Concepts of mobile communications, their architecture and procedures; and
<b>CO3</b>	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
<b>CO1</b>	H	H	H	H	H	H	H	M	H	M	H	M
<b>CO2</b>	H	H	H	H	H	H	H	M	H	H	M	M
<b>CO3</b>	H	H	H	H	H	M	M	M	M	M	M	M
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5		PSO6	
<b>CO1</b>	H		H		H		H		H		H	
<b>CO2</b>	H		H		H		H		H		H	
<b>CO3</b>	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			
						✓						



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E38</b>	<b>M- COMMERCE</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>Subject Code:</b> <b>BCS18E39</b>	<b>Subject Name :</b> <b>REAL TIME SYSTEMS</b>	<b>Ty/ Lb/ ETL</b>	<b>L</b>	<b>T/ S.Lr</b>	<b>P/ R</b>	<b>C</b>						
	Prerequisite:BCS18006	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/LbETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>• Real-time scheduling and schedulability analysis</li> <li>• Formal specification and verification of timing constraints and properties</li> <li>• Design methods for real-time systems</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	An ability to understand advanced concepts in theory of computer science											
<b>CO2</b>	An ability to understand advanced concepts in applications of computer science											
<b>CO3</b>	An ability to apply knowledge of advanced computer science to formulate the analyze problems in computing and solve them											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	M	M	M	H	M	L	M	M	M	H	H
<b>CO2</b>	L	M	M	H	H	M	M	H	H	H	L	H
<b>CO3</b>	H	M	L	H	M	L	H	M	L	L	M	M
<b>COs / PSOs</b>	<b>PSO1</b>		<b>PSO2</b>		<b>PSO3</b>		<b>PSO4</b>		<b>PSO5</b>		<b>PSO6</b>	
<b>CO1</b>	H		M		M		M		H	M	M	M
<b>CO2</b>	M		M		M		L		M	H	M	M
<b>CO3</b>	H		L		L		M		M	H	M	M
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							





**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E39</b>	<b>REAL TIME SYSTEMS</b>	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>
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**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.



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Subject Code:	Subject Name :	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C						
<b>BCS18E40</b>	<b>DISTRIBUTED COMPUTING</b>											
	Prerequisite: BIT18I01 & BCS18006	<b>Ty</b>	<b>3</b>	<b>0/0</b>	<b>0/0</b>	<b>3</b>						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab												
<b>OBJECTIVES :</b>												
<ul style="list-style-type: none"> <li>The students will be able to understand the design of distributed systems</li> <li>To understand communication concepts of distributed systems</li> <li>To apply the memory management design of distributed systems to design a new memory</li> </ul>												
<b>COURSE OUTCOMES (COs) : ( 3- 5)</b>												
<b>CO1</b>	Understand the design of distributed computing systems											
<b>CO2</b>	Understand the communication concepts of distributed systems											
<b>CO3</b>	Design a new memory by applying the memory management design of distributed systems											
<b>CO4</b>	Understand the distributed file system security											
<b>Mapping of Course Outcomes with Program Outcomes (POs)</b>												
<b>COs/POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	H	M	H	M	M	H	H	M	H	M	H	H
<b>CO2</b>	H	H	H	H	M	H	H	H	H	H	H	H
<b>CO3</b>	H	M	H	M	M	H	M	M	H	M	H	M
<b>CO4</b>	H	M	H	M	M	H	H	H	H	H	H	H
<b>Mapping of Course Outcomes with Program Specific Outcomes (PSOs)</b>												
<b>COs / PSOs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>						
<b>CO1</b>	H	H	M	H	M	M						
<b>CO2</b>	H	H	H	H	H	H						
<b>CO3</b>	H	H	M	M	M	M						
<b>CO4</b>	H	H	H	M	H	H						
<b>H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low</b>												
<b>Category</b>	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>BCS18E40</b>	<b>DISTRIBUTED COMPUTING</b>	Ty	3	0/0	0/0	3
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**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, Server 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 caching schemes, 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 Vansteem (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