S.R.M. UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

PROGRAMME: B.TECH (CSE) – PART TIME

CURRICULUM AND SYLLABI
2017

SCHOOL OF COMPUTING
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
S.R.M. UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY

SCHOOL OF COMPUTING
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B.TECH (CSE) – PART TIME
CURRICULUM & SYLLABUS

SEMESTER I

Subject Code	Category	Subject Name	L	T	P	C
Theory						
17MAP207	B	Probability and Queueing Theory	4	0	0	4
17PIT102	P	Program Design and Development	3	0	0	3
17PCS202	P	Digital System Design	3	0	0	3
17PCS201	P	Data Structures	3	0	0	3
Practical						
17PIT102L	P	Program Design and Development Laboratory	0	0	2	1
17PCS211L	P	Data Structures Laboratory	0	0	2	1
Total			**13**	**0**	**4**	**15**

SEMESTER II

Subject Code	Category	Subject Name	L	T	P	C
Theory						
17MAP302	B	Discrete Mathematics	4	0	0	4
17PSE201	P	Object Oriented Programming Using C++	3	0	0	3
17PCS204	P	Algorithm Design and Analysis	3	0	0	3
17PCS203	P	Computer System Architecture	3	0	0	3
Practical						
17PSE211L	P	Object Oriented Programming Using C++ Laboratory	0	0	2	1
17PCS214L	P	Algorithm Design and Analysis Laboratory	0	0	2	1
Total			**13**	**0**	**4**	**15**

SEMESTER III

Subject Code	Category	Subject Name	L	T	P	C
Theory						
17PCS205	P	Microprocessors and Microcontrollers	3	0	0	3
17PSE203	P	Object Oriented Analysis and Design	3	0	0	3
17PSE205	P	Programming in Java	3	0	0	3
17PCS301	P	Theory of Computation	3	0	0	3
Practical						
17PCS215L	P	Microprocessors and Microcontrollers Laboratory	0	0	2	1
17PSE215L	P	Java Programming Laboratory	0	0	2	1
Total			**12**	**2**	**4**	**14**

SEMESTER IV

Subject Code	Category	Subject Name	L	T	P	C
Theory						
17PCS302	P	Operating Systems	3	0	0	3
17PIT303	P	Computer Networks	3	0	0	3
17PCS401	P	Artificial Intelligence	3	0	0	3
17PSE202	P	Software Engineering Principles	3	0	0	3
Practical						
17PCS311L	P	Operating Systems Laboratory	0	0	2	1
17PIT312L	P	Computer Networks Laboratory	0	0	2	1
Total			**12**	**0**	**4**	**14**

SEMESTER V

Subject Code	Category	Subject Name	L	T	P	C
Theory						
17PCS314	P	Compiler Design	3	0	0	3
17PIT302	P	Database Management Systems	3	0	0	3
	P	Elective – I	3	0	0	3
	P	Elective - II	3	0	0	3
Practical						
17PCS312L	P	Compiler Design Laboratory	0	0	2	1
17PIT313L	P	Database Management Systems Laboratory	0	0	2	1
Total			**12**	**0**	**4**	**14**

SEMESTER VI

Subject Code	Category	Subject Name	L	T	P	C
Theory						
17PIT304	P	Web Programming	3	0	0	3
17PCS323	P	Distributed Computing	3	0	0	3
	P	Elective – III	3	0	0	3
	P	Elective – IV	3	0	0	3
17PCS375L	P	Minor Project	0	0	3	2
Practical						
17PIT314L	P	Web Programming Laboratory	0	0	2	1
Total			**12**	**0**	**5**	**15**

SEMESTER VII

Subject Code	Category	Subject Name	L	T	P	C
Theory						
17PSE427	P	Wireless and Mobile Communication	3	0	0	3
	P	Elective – V	3	0	0	3
	P	Elective - VI	3	0	0	3
Practical						
17PCS496L	P	Major Project	0	0	24	12
Total			**9**	**0**	**24**	**21**

TOTAL CREDITS TO BE EARNED: 108

Summary Table

Semester	I	II	III	IV	V	VI	VII	Total	%
Total	**15**	**15**	**14**	**14**	**14**	**15**	**21**	**108**	**100**
B	**4**	**4**	**0**	**0**	**0**	**0**	**0**	**8**	**7.5**
P	**11**	**11**	**14**	**14**	**14**	**15**	**21**	**100**	**92.5**

Electives for Fifth Semester

Subject Code	Subject Name	L	T	P	C
17PSE322E	E-Commerce	3	0	0	3
17PCS325E	Digital Image Processing	3	0	0	3
17PIT345E	Linux Internals	3	0	0	3
17PIT324E	Mobile Application Development	3	0	0	3
17PSE334E	Advanced Java Programming	3	0	0	3

Electives for Sixth Semester

Subject Code	Subject Name	L	T	P	C
17PCS330E	Human Computer Interaction	3	0	0	3
17PIT326E	Cloud Computing	3	0	0	3
17PSE327E	Distributed Operating Systems	3	0	0	3
17PCS338E	Database Security and Privacy	3	0	0	3
17PCS331E	Data Mining and Analytics	3	0	0	3
17PIT362E	Information Storage and Management	3	0	0	3

Electives for Seventh Semester

Subject Code	Subject Name	L	T	P	C
17PIT422E	Internet of Things	3	0	0	3
17PCS423E	Software Defined Networks	3	0	0	3
17PCS425E	Service Oriented Architecture	3	0	0	3
17PCS434E	Network Security	3	0	0	3
17PCS424E	Semantic Web	3	0	0	3
17PCS426E	Pattern Recognition Techniques	3	0	0	3

SEMESTER I

17MAP207	PROBABILITY AND QUEUEING THEORY	L	T	P	C
		4	0	0	4
Co-requisite:	NOT APPLICABLE				
Prerequisite:	Nil				
Data Book / Codes/Standards	STATISTICAL TABLES				
Course Category	B CORE	MATHEMATICS			
Course designed by	Department of Mathematics				
Approval	Academic Council Meeting , 2017				

PURPOSE	To acquire analytical ability in solving mathematical problems as applied to the respective branches of engineering		
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**	
At the end of the course, student will be able to			
1.	Be through with probability concepts	a	e
2.	To acquire knowledge on Probability Distributions	a	e
3.	Get exposed to the testing of hypothesis using distributions	a	e
4.	Gain strong knowledge inn principles of Queuing theory	a	e
5.	Get exposed to Discrete time Markov chain	a	e

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT I: RANDOM VARIABLES		**14**			
1.	Review of probability concepts, Types of Events, Axioms, Conditional probability, Multiplication theorem, Applications.	2	C,I	1	1-5
2.	Discrete and continuous Random Variables – Discrete case, Probability Mass function, Cumulative distribution function, Applications	2	C,I	1	1-5
3.	Characteristics of random variables – Continuous case, Probability density function, Cumulative distribution function, Applications	2	C,I	1	1-5
4.	Expectation, Variance.	2	C,I	1	1-5
5.	Higher Order Moments	2	C,I	1	1-5
6.	Moment Generating Function, Functions of Random Variable (One dimensional only)	2	C,I	1	1-5
7.	Chebychev's Inequality (Statement only). Applications of Chebychev's Inequality	2	C,I	1	1-5

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT II: THEORETICAL DISTRIBUTIONS		**12**			
8.	Discrete Probability distribution: Binomial distribution – MGF, Mean, Variance, Applications of Binomial distribution, Fitting a Binomial distribution	2	C,I	2	1-5
9.	Poisson distribution – MGF, Mean, Variance, Applications of Poisson distribution, Fitting a Poisson distribution	2	C,I	2	1-5
10.	Geometric distribution – MGF, Mean, Variance, Memoryless Property , Applications of Geometric distribution	2	C,I	2	1-5
11.	Continuous Probability Distributions: Uniform distribution – MGF, Mean, Variance & Applications	1	C,I	2	1-5
12.	Exponential Distribution - MGF, Mean, Variance, Memory less Property Applications of Exponential distribution	2	C,I	2	1-5
13.	Normal distribution – Mean, Variance	1	C,I	2	1-5
14.	Standard Normal distribution and Applications of Normal distribution	2	C,I	2	1-5
UNIT-III - TESTING OF HYPOTHESIS		**14**			
15.	Introduction to Sampling Distributions, Population and Sample, Null Hypothesis and Alternative Hypothesis, Single and Two Tailed Test.	2	C,I	3	1-5
16.	Testing of Hypothesis, Level of Significance, Critical Region, Procedure for Testing of Hypothesis	1	C,I	3	1-5
17.	Large Sample Test- Test For Single Proportion, Two Sample Proportions	2	C,I	3	1-5
18.	Large Sample Test- Test For Single Mean, Two Sample Means	2	C,I	3	1-5
19.	Small Sample Tests – 't' Test For a Single Mean	1	C,I	3	1-5
20.	't' Test For The Difference Of Means, Paired 't' Test	2	C,I	3	1-5
21.	F Test – Test of Significance of The Difference Between Two Population Variances	2	C,I	3	1-5

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
22.	Chi Square Test For Goodness of Fit, Independence of Attributes	2	C,I	3	1-5
UNIT-IV : QUEUEING THEORY		**10**			
23.	Introduction to Markovian queuing models	2	C,I	4	1-5
24.	Single Server Model with Infinite system capacity, Characteristics of the Model (M/M/1) : (∞/FIFO)	2	C,I	4	1-5
25.	Problems on Model (M/M/1) : (∞/FIFO)	2	C,I	4	1-5
26.	Single Server Model with Finite System Capacity, Characteristics of the Model (M/M/1) : (K/FIFO)	2	C,I	4	1-5
27.	Problems on Model (M/M/1) : (K/FIFO)	2	C,I	4	1-5
UNIT-V : MARKOV CHAINS		**10**			
28.	Introduction to Stochastic process, Markov process, Markov chain one step & n-step Transition Probability.	2	C,I	5	1-5
29.	TPM and Applications	1	C,I	5	1-5
30.	Chapman Kolmogorov theorem (Statement only), Applications on Chapman Kolmogorov theorem	1	C,I	5	1-5
31.	Transition probability	2	C,I	5	1-5
32.	Transition probability - Applications	1	C,I	5	1-5
33.	Classification of states of a Markov chain	2	C,I	5	1-5
34.	Classification of states of a Markov chain – Applications	1	C,I	5	1-5
Total contact hours		**60**			

LEARNING RESOURCES	
Sl. No.	**TEXT BOOKS**
1.	Veerarajan T., Probability, Statistics and Random Processes, Tata McGraw Hill, 1st Reprint 2004.
2.	S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 9th extensively revised edition, Sultan Chand & Sons, 1999.
REFERENCE BOOKS/OTHER READING MATERIAL	
3.	Trivedi K S, " Probability and Statistics with reliability, Queueing and Computer Science Applications", Prentice Hall of India, New Delhi, 1984
4.	Gross.D and Harris.C.M. "Fundamentals of Queuing theory", John Wiley and Sons, 1985.
5.	Allen.A.O., "Probability Statistics and Queuing theory", Academic Press, 1981.

17PITI02	**PROGRAM DESIGN AND DEVELOPMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book / Codes/Standards	NIL				
Course Category	PROFESSIONAL CORE				
Course designed by	Department of Information Technology				
Approval	32nd Academic Council Meeting , 2017				

PURPOSE	Knowledge of problem solving and programming concepts are essential for those who develop applications for users. Hence, to provide the required knowledge, this course imparts basic knowledge in C Programming along with the concepts of design and development of programs using C.								
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**							
At the end of the course, student will be able to									
1.	Apply logic and solve problems using computers	a							
2.	Understand the basic components and structure of a C program	c							
3.	Develop proficiency in basic programming skills	i							

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I : INTRODUCTION TO PROBLEM SOLVING AND PROGRAMMING		**6**			
1.	Creative thinking and problem solving skills ;Visualization and Memory	1	C	1	1
2.	Problem Solving Concepts ; Problem Solving in everyday life; Types of Problems	1	C	1	1
3.	Problem solving Concept for Computers; Algorithms and Flowcharts	2	C,D	1	1
4.	Programming Concepts; Preprocessing, Compilation, Assembling and Linking	2	C	1	1
UNIT II : OVERVIEW OF C		**9**			
5.	Structure of C program, constants, variables, Data types	1	C	2	2
6.	Operators ; Evaluation of Expressions; Precedence of Operators and associativity	1	C	2	2
7.	Mathematical Functions and Managing I/O operations	2	C	2	2
8.	Decision making and branching structures ;IF statement and its variants, Switch statement ;break statement	2	C,I	3	2
9.	Decision making and Looping structures ; For loop, While statement, do while statement; Continue statement	3	C,I	3	2
UNIT III : FUNCTIONS		**9**			
10.	User defined functions and its elements; Function call ; Function definition	2	C,I	3	2
11.	Return values and its types	1	C,I	3	2
12.	Types of functions	2	C,I	3	2
13.	Scope and Visibility of variables in functions	2	C,I	3	2
14.	Calling functions within other functions ; Recursion	2	C,I	3	2
UNIT IV : ARRAYS, STRUCTURES AND UNIONS		**10**			
15.	Arrays: Single Dimension , Multi-dimension, Dynamic Arrays	2	C,I	3	2
16.	Character arrays and strings	2	C,I	3	2

17.	String handling functions	1	C,I	3	2
18.	Structures and Unions ; Defining a Structure, Declaring Structure Objects, Array of Structures, Nested Structures	3	C,I	3	2
19.	Functions and Structures	2	C,I	3	2
UNIT V : POINTERS		**11**			
20.	Pointers and Indirection, Defining a Pointer Variable, Pointers in Expressions	2	C,I	3	2
21.	Operations Pointers : Arithmetic Operations , Relational Operations	2	C,I	3	2
22.	Array of Pointers : character strings	2	C,I	3	2
23.	Passing Pointers to functions	2	C,I	3	2
24.	Pointers to structures	2	C,I	3	2
25.	Shell Programming : Basics	1	C,I		
TOTAL CONTACT HOURS		**45***			

LEARNING RESOURCES	
1.	Maureen Sprankle, "Problem Solving and Programming Concepts", 7th Edition, Pearson, 2011, ISBN-10: 0-13-249264-4, ISBN-13: 978-0-13-249264-5
2.	E.Balagurusamy, "Programming in ANSI C", 5th Edition, Tata McGrawHill, 2011, ISBN-13: 978-0-07-068182-8, ISBN-10: 0-07-068182-1
3.	Y.P. Kanetkar, "Let us C", 8th Edition, BPB Publications, 2008, ISBN-13: 978-1934015254, ISBN-10:1934015253
4.	Steve Oualline, " Practical C Programming", O'Reilly Publishers, 2011, ISBN-13: 978-1-565-92306-5
5.	Byron Gottfried, "Programming with C", 2nd Edition, Schaum's Outline Series, 2000, ISBN -10: 0071367993, ISBN-13: 9780071367998

17PCS202	DIGITAL SYSTEM DESIGN	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Core				
Course designed by	Department of Computer Science and Engineering				
Approval	32nd Academic Council Meeting, 23rd July 2016				

PURPOSE	To underst and the basics of Boolean algebra and the operation ofl ogic components, combinational, sequential circuits and VHDL.							
INSTRUCTIONAL OBJECTIVES		**STUDENTOUT COMES**						
At the end of the course, student will be able to								
1.	Apply the principles of Boolean algebra to manipulate and minimize logic expressions.	a						
2.	Apply two-level logic functions with AND, OR, NAND, NOR and XOR gates	a						
3.	Use K-maps and table method to minimize and optimize two-level logic functions up to 5 variables.	a	b					
4.	Design combinational circuits using decoders, ROM and transmission gates.	a	b					
5.	Design finite state machines using various types off lip-flops and combinational circuits with prescribed functionality	a	b					
6.	Use the VHDL language for representation of digital signals	a						

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT I:INTRODUCTION TO NUMBER SYSTEMS AND BOOLEAN ALGEBRA		**9**			
1.	Digital and Analog Basic Concepts, Some history of Digital Systems	1	C	1	1
2.	Introduction to number systems , Binary numbers , Number Base Conversion	1	C	1	1,2,3,4
3.	Complement Codes, Binary Arithmetic , Binary codes: BCD, Weighted codes -2421, 8421, graycode	3	C	1	1,2,3,4
4.	Binary Logic functions, Boolean Algebra, Theorems and Properties of Boolean Algebra	4	C	1,2	1,2,3,4

UNIT II: MINIMIZATION TECHNIQUES IN DIGITAL LOGIC		**9**			
5.	Canonical forms, Generation of Switching Equations from Truth Table	2	C	1,2	1,2,3,4
6.	K-map(Karnaughmap) 2 , 3, 4 and 5 variables, Kmap with Don't careterms	3	C	3	1,2
7.	Quine Mc-Cluskey minimization technique, Quine Mc-Cluskey using Don't CareTerms	3	C	3	1,2
8.	Mixed logic Combinational circuits	1	C,D	4	1,2
UNIT III : DESIGN OF COMBINATIONAL LOGIC CIRCUITS		**9**			
9.	Introduction to Combinational Circuits, Analysis and Design Procedure	1	C	4	1,2
10.	Binary Adder, Subtractor, Carry Look Ahead Generator, Decimal Adder, Binary Multiplier	4	C,D	4	1,2,3,4
11.	Decoder, Encoder, Priority Encoder, Digital Multiplexer, Magnitude Comparator	4	C,D	4	1,2,3,4
UNIT IV:SYNCHRONOUS SEQUENTIAL CIRCUITS		**10**			
12.	Flip-flops-SR, D, JK, T	2	C	5	1,2
13.	Analysis of Synchronous Sequential Circuit	1	C	5	1,2
14.	State Reduction and Assignment	1	D,I	5	1,2
15.	Design of Synchronous Sequential Circuit: Sequence Detector for D, JK, T flip-flops	2	D,I	5	1,2,3,4
16.	BCD Counter, Registers: Shift Registers, Analysis of Asynchronous Sequential Circuit: TransitionTable, Flow Table	4	D,I	5	1,2,3,4
UNIT V:HARDWARE DESCRIPTION LANGUAGE		**8**			
17.	Introduction to HDL: Module Declaration, Gatedelays, Boolean Expressions, User Defined Primitives	2	C	6	2,5,6
18.	HDL models for Combinational Circuits: Gate Level Modeling, DataFlow, Behavioral Modeling	3	D,I	6	2,5,6
19.	HDL flow Behavioral Sequential Circuits: HDL Models for Flip - Flopsa nd Latches	3	D,I	6	2,5,6
Total Contact Hours		45			
LEARNING RESOURCES					
Sl.No.	**TEXT BOOKS**				

1.	John .M. Yarbrough,"Digital Logic: Applications and Design", Cengage Learning, Reprint, 2009
2.	M.MorrisMano, MichaelD.Ciletti," Digital Design with an Introduction to the verilog HDL", Pearson Publications, Fifth edition,2014.
REFERENCE BOOKS / OTHER READING MATERIAL	
3.	Roth, Kinney, "Fundamentals of Logic Design",Cengage Learning, 7th edition, 2015
4.	Donald D.Givone," Digital Principles and Design", McGraw Hill Education (India) Pvt.Ltd, 2013
5.	RichardS.Sandige, MichaelL Sandige, " Fundamentals of Digital and Computer Design with VHDL", McGraw Hill, 2014
6.	StephenBrown, ZvonkoVranesic, "Fundamentals of Digital Logic with Verilog Design",Second Edition, McGraw Hill,2015.

17PCS201	**DATA STRUCTURES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Core				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	Data structure is a particular wayofstoring and organizing information in a computer so that it can be better processed.This course introduces different kind of data structures like stack, queue, linked list, tree and graphsuit able for different kinds of applications. Specific data structures are most important for many efficient algorithms.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Understand analysis of algorithm and its time complexity	a	b					
2.	Befamiliar with and implement the Linked list data structure	a	b	c				
3.	Befamiliar with and implement the Stack and Queue data structure	a	b	c				
4.	Have a comprehensive knowledge of Trees and their implementations	a	b	c				
5.	Learn advanced datastructures like Graphs and their implementation, hash tables and Hashing methods	a	b	c				

Session	Description ofTopic	Contact hours	C-D-I-O	IOs	Reference
UNIT I:INTRODUCTION TO DATA STRUCTURES		**6**			
1.	Introduction :Basicterminology -Data structures–Datastructureoperations	1	C	1	1
2.	ADT– Algorithms: Complexity,Time – Spacetrade off	1	C	1	1
3.	Mathematical notations and functions	1	C	1	1
4.	Asymptoticnotations – Linear and Binary search	1	C,I	1	1
5.	Asymptoticnotations – Bubblesort	1	C,I	1	1
6.	Asymptoticnotations-Insertionsort	1	C,I	1	1
UNIT II:ARRAYS AND LIST		**9**			
7.	Array:Operations on Arrays, Applications of Arrays	1	C,I	2	1,2,3
8.	Multi dimensional Arrays : Sparse Matrix	2	C	2	1,2,3
9.	Linked List: Insertion, Deletion and Search, Cursor based implementation	2	C,I	2	1,2
10.	Polynomial Arithmetic	1	C,I	2	1,2
11.	Circular Linked List– Applications –Josephus Problem	1	C,I	2	1,2
12.	Doubly linked list: Insertion, Deletion and Search	2	C,I	2	1,2
UNIT III: STACK AND QUEUE		**9**			
13.	Stack: Array implementation, Linked list implementation	1	C	3	1,2
14.	Applications of Stack– Infix to Postfix – Evaluation of Post fix	2	C,I	3	1,2
15.	Application of Stack– Balancing symbols – Nested function calls	1	C,I	3	1,2
16.	Recursion–Towers of Hanoi	1	C,I	3	1,2
17.	Queue – Array implementation, Linked List implementation	1	C,I	3	1,2
18.	Circular Queue	1	C	3	1,2
19.	Applications of Queue – Priorityqueue – Doubleended queue	2	C	3	1
UNIT IV: TREES		**11**			
20.	General trees –Terminology– Representation of trees– Treetraversal	1	C,D,I	4	1,2
21.	Binary tree –Representation – Expression tree – Binary tree traversal, Threaded BinaryTree	1	C,D,I	4	1,2

22.	Binary SearchTree– Construction -Searching, Deletion	2	C,D,I	4	1,2
23.	AVL trees – Rotation, Insertion	2	C,D,I	4	1,2
24.	B-Trees, construction, searching, deletion	2	C,D,I	4	1,2
25.	Splay trees	1	C	4	1,2
26.	Red-Black Trees	2	C	4	1,2
UNIT V: GRAPHS AND HASH TABLES		**10**			
27.	Graph Terminology, Graph Traversal, Topologicals or ting	1	C,D,I	5	1,2,4
28.	Minimum spanning tree –Prims -Kruskals	2	C,D,I	5	1,2,3
29.	Network flow problem	1	C	5	1,2,4
30.	Shortest Path Algorithm: Dijkstra	2	C,D,I	5	1,2,3
31.	Graph Search:Depth First Search, Breadth First Search	1	C,D,I	5	1,2
32.	Hashing: Hash functions, Collision avoidance, Separate chaining	1	C,D,I	5	1,2
33.	Open addressing: Linearprobing, Quadratic Probing, Double hashing, Rehashing, Extensible Hashing	2	C	5	1,2
Total contact hours		**45***			

LEARNING RESOURCES	
Sl.No.	**TEXT BOOKS**
1.	Seymour Lipschutz, “Data Structures with C”, McGraw Hill Education, SpecialIndian Edition, 2014.
2.	R.F.Gilberg, B.A.Forouzan, “Data Structures”, Second Edition,Thomson India Edition, 2005.
REFERENCE BOOKS/OTHER READING MATERIAL	
3.	A.V.Aho, J.EHopcroft and J.D.Ullman, “Data structures and Algorithms”, Pearson Education, First Edition Reprint 2003.
4.	Mark Allen Weiss, "Data Structures and Algorithm Analysisin C", 2nd Edition, Pearson Education, 2011.
5.	ReemaThareja,“Data Structures UsingC”, Oxford Higher Education , FirstEdition, 2011

17PIT102L	PROGRAM DESIGN AND DEVELOPMENT LABORATORY	L	T	P	C
		0	0	2	1
Co-requisite:	15IT102 - Program Design and Development				
Prerequisite:	NIL				
Data Book / Codes/Standards	NIL				
Course Category	PROFESSIONAL CORE				
Course designed by	Department of Information Technology				
Approval	Academic CouncilMeeting, 2017				

PURPOSE	To develop skills in designing and developing programs using C language								
INSTRUCTIONAL OBJECTIVES		STUDENT OUTCOMES							
At the end of the course, student will be able to									
1.	Apply problem solving skills and logic to solve problems using computers	a							
2.	Understand the basic components and structure of a C program	c							
3.	Develop proficiency in basic programming skills	i							

Sl. No	Description of experiments	Contact Hours	C-D-I-O	IOs	Reference
1.	Study of Unix commands	2	C	1	1
2.	Programs using I/O functions	2	C,I	2	1
3.	Programs using decision making and branching statements	2	C,I	3	1
4.	Programs using decision making and looping statements	2	C,I	3	1
5.	Programs with arrays : Single dimensional, Multidimensional	2	C,I	3	1
6.	Programs using user-defined functions , Definition of arguments	2	C,I	3	1
7.	Programs using recursions	2	C,I	3	1
8.	Programs with strings , Function with strings as arguments	2	C,I	3	1
9.	Programs using structures ,Unions and as arguments in functions	2	C,I	3	1
10.	Programs using pointers ; Simple Programs	2	C,I	3	1
11.	Programs using pointers as parameters to functions	2	C,I	3	1

12.	Programs using pointers and Arrays	2	C,I	3	1
13.	Programs using pointers and structures	3	C,I	3	1
14.	Programs with Function pointers	3	C,I	3	1
TOTAL CONTACT HOURS		**30***			
LEARNING RESOURCES					
1.	Laboratory Manual				

17PCS211L	**DATA STRUCTURES LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**0**	**0**	**2**	**1**

PURPOSE

This laboratory course gives a thorough understanding of the concepts of various Data Structures and its applications. It also gives a comprehensive understanding of the various algorithms.

INSTRUCTIONAL OBJECTIVES

1.	To implement Stack, Queue, Linked List, Binary Tree concepts
2.	To implement various Sorting and Searching Techniques
3.	To implement Tree Traversals

Session	**Description of the Experiments**	**Contact hours**	**C-D-I-O**	**IOs**	**Reference**
1.	Implementation of Sorting, searching	4	D,I	1	1,2,3, 4,5
2.	Implementation of Linked List (Singly , Doubly, Circular)	4	D,I	2	1,2,3, 4,5
3.	Implementation of stack using array, linked list	4	D,I	2	1,2,3, 4,5
4.	Implementation of queue using array, linked list	4	D,I	2	1,2,3, 4,5
5.	Applications of stack, queue	4	D,I	3	1,2,3, 4,5
6.	Binary Tree Traversal , Binary Search Tree Implementation	4	D,I	4	1,2,3, 4,5
7.	Minimum Spanning Tree	4	D,I	5	1,2,3, 4,5
8.	Shortest path algorithm using Dijkstra	3	D,I	5	1,2,3, 4,5
	TOTAL CONTACT HOURS	**30**			

LEARNING RESOURCES	
Sl. No.	**TEXT BOOKS**
1.	Seymour Lipschutz, “Data Structures with C”, McGraw Hill Education, Special Indian Edition, 2014.
2.	R.F.Gilberg, B.A.Forouzan, “Data Structures”, Second Edition, Thomson India Edition, 2005.
	REFERENCE BOOKS/OTHER READING MATERIAL
3.	A.V.Aho, J.E Hopcroft and J.D.Ullman, “Data structures and Algorithms”, Pearson Education, First Edition Reprint 2003.
4.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2011.
5.	ReemaThareja, “Data Structures Using C”, Oxford Higher Education , First Edition, 2011

SEMESTER II

17MAP302	DISCRETE MATHEMATICS	L	T	P	C
		4	0	0	4
Co-requisite:	NOT APPLICABLE				
Prerequisite:	Nil				
Data Book / Codes/Standards	NA				
Course Category	B CORE MATHEMATICS				
Course designed by	Department of Mathematics				
Approval	Academic Council Meeting, 2017				

PURPOSE	To acquire knowledge in discrete mathematical structures as applied to the respective branches of Engineering		
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**	
At the end of the course, student will be able to			
1.	To understand logic and mathematical reasoning to count or enumerate objects in systematic way.	a	e
2.	To understand set theory, relations and functions to read, understand and construct mathematical arguments.	a	e
3.	To understand recurrence relation, generating functions and algebraic systems.	a	e
4.	To understand how to apply the knowledge of graph theory to solve real world problems like minimum spanning tree - traversal of binary tree.	a	e
5.	To understand the concept of lattices and Boolean algebra.	a	e

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I – MATHEMATICAL LOGIC:		**12**			
1.	Propositions and Logical operators - Truth tables and propositions generated by a set	1	C,I	1	1,2,9
2.	Equivalence and Implications of statements	2	C,I	1	1,2,9
3.	Tautologies of statements	1	C,I	1	1,2,9
4.	Direct proofs - Conditional conclusions	2	C,I	1	1,2,9
5.	Indirect proofs	1	C,I	1	1,2,9

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
6.	Problems bases on Mathematical Induction	1	C,I	1	1,2,9
7.	The existential and universal quantifiers	2	C,I	1	1,2,9
8.	Predicate calculus including theory of inference	2	C,I	1	1,2,9
UNIT II – SET THEORY:		**12**			
9.	Laws of Set theory	1	C	2	1 ,2
10.	Partition of a set	1	C,I	2	1 ,2
11.	The duality principle	1	C,I	2	1 ,2
12.	Relations – Properties - Equivalence relation and partial order relation	2	C,I	2	1 ,2
13.	Poset - Graphs of relations - Hasse diagram	1	C,I	2	1 ,2
14.	Matrices of relations	2	C,I	2	1 ,2
15.	Closure operations on relations - Warshall's algorithm	2	C,I	2	1 ,2
16.	Functions, Combinatorics - Pigeonhole Principle – Generalized Pigeon hole principle	2	C,I	2	1 ,2
UNIT III – RECURRENCE RELATION & ALGEBRAIC SYSTEMS:		**12**			
17.	Recurrence relations - Solving a recurrence relation – Homogeneous and Non-homogeneous Recurrence relations	2	C,I	3	1,2,9
18.	Formation of Recurrence relations obtained from solutions	1	C,I	3	1,2,9
19.	Generating functions, Solution of a recurrence relation using generating functions	1	C,I	3	1,2,9
20.	Groups – Axioms of groups	2	C,I	3	1,2,9
21.	Cyclic groups and their axioms	2	C,I	3	1,2,9
22.	subgroups and their axioms	1	C,I	3	1,2,9
23.	Cosets – Lagrange's Theorem	2	C,I	3	1,2,9
24.	Normal subgroup, group homomorphism	1	C,I	3	1,2,9
UNIT IV – GRAPH THEORY:		**12**			
25.	Basic concepts - Basic Definitions – Some Special Graphs	2	C,I	4	1,2,7
26.	Matrix Representation of Graphs	1	C,I	4	1,2,7

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
27.	Paths and circuits	2	C,I	4	1,2,7
28.	Eulerian and Hamiltonian Graphs	1	C,I	4	1,2,7
29.	Connected graphs	2	C,I	4	1,2,7
30.	Trees - Spanning Trees - Rooted trees	2	C,I	4	1,2,7
31.	Binary Trees, Kruskal's algorithm - Traversals of Binary trees	2	C,I	4	1,2,7
UNIT V – LATTICES AND BOOLEAN ALGEBRA:		**12**			
32.	Lattices, properties of lattices	2	C,I	5	1,2,7
33.	Lattices as algebraic system	1	C,I	5	1,2,7
34.	Sub-lattices	1	C,I	5	1,2,7
35.	Lattices –Properties of Lattices	2	C,I	5	1,2,7
36.	Some special lattices	2	C,I	5	1,2,7
37.	Boolean algebra : Definition and Examples, Basic laws of Boolean Algebra	2	C,I	5	1,2,7
38.	Expression of Boolean function by algebraic method	2	C,I	5	1,2,7
Total Contact Hours		**60**			

LEARNING RESOURCES:	
Sl. No.	**TEXT BOOKS**
1.	Alan Doerr and Kenneth Levasseur, "Applied Discrete Structures for Computer Science", Galgotia Publications (P) Ltd, 1992.
2.	Tremblay J. P. and Manohar R., Discrete Mathematical Structures with applications to Computer Science, Tata Mc Graw Hill Publishing Co., 35th edition,2008.
REFERENCE BOOKS/OTHER READING MATERIAL	
3.	V. Sundaresan, K.S. Ganapathy Subramanian and K. Ganesan, Discrete Mathematics, New Revised Edition, A. R. Publications, 2001
4.	Kolman and Busby, Discrete Mathematical Structures for Computer Science, Prentice Hall, 3rd edition,1997.
5.	Kenneth H.Rosen, Discrete Mathematics and its Application, Fifth edition, Tata McGraw-Hill Publishing company PVT .Ltd., New Delhi, 2003
6.	Lipschutz Seymour, Marc Lars Lipson, Discrete Mathematics, Mc Graw Hill Inc., 1992
7.	Narsing Deo, Graph Theory with applications to Engineering and Computer science, Prentice-Hall of India pvt. Ltd., New Delhi, 1987.
8.	C.L. Liu, Elements of Discrete Mathematics, 2nd Edition, McGraw Hill Publications, 1985.

9.	T.Veerarajan, Discrete Mathematics with Graph Theory and Combinatorics, Tata McGraw Hill, 2009.

17PSE201	OBJECT ORIENTED PROGRAMMING USING C++	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book /	NIL				
Codes/Standards	NIL				
Course Category	PROFESSIONAL CORE				
Course designed by	Department of Software Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	Real world is full of objects and problems can be best solved using object oriented approach. The pioneer programming language to implement object oriented features is C++.This course aims at building object oriented skills through programming in C++.		
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**	
At the end of the course, student will be able to			
1.	Apply the basic object oriented features	a	c
2.	Develop Generic programming skills	a	c
3.	Apply appropriate data structures and solve complex problems by applying the skills acquired so far	a	b
4.	Design problem into classes and develop a full working code	a	c
5.	Develop programs using Streams, files, templates and handle exceptions	a	c

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I: INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING		**10**			
1.	Procedural programming andObject-Oriented Programming	1	C	1	1
2.	Characteristics of Object-Oriented Languages	1	C	1	1
3.	C++ Programming Basics: Basic Program Construction	1	C	1	1
4.	Data Types, Variables, Constants	1	C	1	1
5.	Type Conversion, Operators, Library Functions	1	C	1	1
6.	Loops and Decisions, Structures	2	C	1,2	1
7.	Functions – Simple Functions, Passing arguments, Returning values, Reference Arguments	1	C	1,2	1
8.	Recursion, Inline Functions, Default Arguments Storage Classes	1	C	1,2	1
9.	Arrays – Strings	1	C	1,2	1
UNIT II: FEATURES OF OBJECT-ORIENTED PROGRAMMING		**11**			
10.	Introduction to Classes and Objects	1	C	1	1,2,3
11.	Constructors and its types, Destructors	1	C,I	1,2	1,2,3
12.	Passing Objects as Function arguments and Returning Objects from Functions	1	C,I	1,3,4	1,2,3
13.	Operator Overloading	1	C,I	1,2	1,2,3
14.	Inheritance	2	C,I	1,3,4	1,2,3
15.	Overloading Member Functions	1	C,I	1,2	1,2,3
16.	Pointers	2	C,I	1,3,4	1,2,3
17.	Virtual Functions – Friend Functions, Static Functions	2	C,I	1,2	1,2
UNIT III: STREAMS AND FILES		**7**			
18.	Streams: Classes and Errors	1	C	5	1,3,4
19.	Disk File I/O with Streams	1	C,I	5	1,3,4
20.	Files: File Pointers, Error handling in File I/O, File I/O with member Functions	3	C,I	3,5	1,3,4
21.	Overloading the extraction and Insertion Operators	1	C,I	5	1,3,4
22.	Multi File Programs	1	C,I	5	1,3,4

UNIT IV: TEMPLATES, EXCEPTIONS		**7**			
23.	Templates – Function templates, Class templates	2	C	5	1,3,4
24.	Exceptions: Need of Exceptions, keywords, Simple and	3	C,I	5	1,3,4
25.	Re-throwing Exception and Exception Specifications, Custom Exceptio	2	C,I	5	1,3,4
UNIT V: STANDARD TEMPLATE LIBRARY		10			
26.	Introduction to STL: Containers, Algorithms, iterators - potential problems with STL	2	C,I	5	1
27.	Algorithms: find(), count(), sort(),search(),merge()	1	C,I	5	1
28.	Function Objects: for_each() , transform()	1	C,I	5	1
29.	Sequence Containers: vectors, Lists, Deques	2	C,I	3,5	1
30.	Iterators and specialized iterators	1	C,I	5	1
31.	Associative Containers: Sets and Multisets Maps and multimaps	2	C,I	3,5	1
32.	Storing User-Defined Objects – Function Objects	1	C	5	1
Total Contact Hours		**45**			

LEARNING RESOURCES:	
Sl. No.	**TEXT BOOKS**
1.	Robert Lafore, “Object-Oriented Programming in C++”, 4th edition, SAMS Publishing, 2008
2.	Deitel, “C++ How to Program”, 6th edition, PHI publication, 2008
3.	R. Subburaj, “Object Oriented Programming With C++”, Vikas Publishing House, New Delhi,Revised Edition, 2013.

REFERENCE BOOKS/OTHER READING MATERIAL	
4.	E.Balaguruswamy "Object Oriented Programming with C++", 6th edition, Tata McGraw Hill Education, 2015
5.	Joyce Farrell, "Object Oriented Programming", 4th edition, Cengage learning, 2009
6.	Nicolai M. Jossutis, "Object-Oriented Programming in C++", Wiley Publications, 2002
7.	BjarneStroustrup ,"The C++ Programming Language", 4th Edition, Addison Wesley, 2015
8.	Stanley Lippman, JoseeLajoie, Barbara E. Moo ,"C++ Primer", 5th Edition, Addison Wesley, 2015

17PCS203	**COMPUTER SYSTEM ARCHITECTURE**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book / Codes / Standards	Nil				
Course Category	Professional Core				
Course designed by	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	To study the basic structure of a digital computer and the organization of the Arithmetic and Logical unit, the Memory unit, Control unit and I / O unit.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
Attheend ofthecourse,studentwillbeableto								
1.	To study basic structures and functions of Control Unit, Memory unit, Storage devices and Input / out put organization in a computer system.	a						
2.	To understand the representations of signed and unsigned numbers and arithmetic algorithms such asaddition, subtraction, multiplication and division.	a	b					
3.	To learn the concepts of various instruction set architectures (ISA), addressing modes to understand the concepts of pipe lining and super scalar execution.	d						
4.	To understand the various classes of instruction types such as data movement, arithmetic, logical and flow control and to study the various control unit design.	a	b	c				

5.	To identify the various memory technologies and memory hierarchies found in a computer and to describe the various ways of organizing cache memory and appreciate the cost-perform ancetrade offs.	a	b					
6.	To understand how interrupts are used to implement I / O control and data transfers and to identify various types of buses in acomputer system and understand how devices compete for a bus and are granted access to the system bus.	a	b	c				

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT I:BASIC STRUCTURE OF COMPUTERS		**8**			
1.	ComputerTypes, Functional units, Basicoperational concepts , Bus structures	1	C	1,6	1,2,4
2.	Memory locations and addresses, Memory operations	1	C	1,5	1
3.	Instruction and instruction sequencing, Assembly language, Addressing modes, Basic I/O operations	3	C,D,I	3,4,6	1,2,4
4.	Evolution of Parallel computers, System Attributes to Performance	2	C	1	7
5.	Multi processors and Multicomputers	1	C	1	4,5,7
UNIT II: ARITHMETIC UNIT		**9**			
6.	Addition and subtraction of signed numbers, Design off a stadders	2	C,D,I	1,2	1,6
7.	Multiplication of positive numbers, Signed oper and multiplication	2	C,D,I	2	1,6
8.	Fast multiplication-Bit pair recoding of Multipliers, Carry Save Addition of summands	2	C,D,I	2	1,6
9.	Integer division-Restoring Division,Non Restoring Division	2	D,I	2	1,6
10.	Floating point numbers and its operations	1	D,I	2	1,4
UNIT III: BASIC PROCESSING UNIT		**11**			
11.	Fundamental concepts, Execution of a completeinstruction, Multiplebus organization	2	C	1,3	1,2,8
12.	Hardwired control	1	D,I	1,4	1,2,4,6
13.	Micro programmed control	2	D,I	1,4	1,2,4,6
14.	Pipelining-Basic concepts,Data hazards,Instruction hazards,	3	C,D,I	3,4	1,5,8
15.	Pipelining-Influence on Instructionsets,Data path and control considerations	2	C	3,6	1,9

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
16.	Superscalar Operation	1	C	3	1,7
UNIT IV:MEMORYUNIT		**8**			
17.	Basic concepts of memory system, Semi conductor RAMs, ROMs Speed, size and cost	3	C,D	1,5	1,2,9
18.	Cache memories, Performance consideration	2	C,D	5	1,3,4,5
19.	Virtual memory	1	C,D	1,5	1,3,5
20.	Memory Management requirements	1	C	5	1
21.	Secondary storage	1	C	5	1,2,4
UNIT V:INPUT – OUTPUT ORGANIZATION		**9**			
22.	Introduction to Data transfer techniques,BusInterface– UART,Interfacing UART to Microprocessor Unit	3	C,I	1,6	2
23.	Programmed IO, InterruptdrivenIO, Direct Memory Access	2	C	1,6	1,2,4
24.	I/O Interrupt,I/O channel/Processor	2	C,I	1,6	1,2
25.	Inter connection Standards– PCI Bus,SCSI,USB,Firewire,SATA,SAS, PCI Express	2	C	6	1,8
Total contact hours		**45***			

LEARNING RESOURCES	
Sl.No.	**TEXT BOOKS**
1.	CarlHamacher, Zvonko Vranesic, Safwat Zaky, “Computer Organization”, McGraw - Hill, Fifth Edition, Reprint,2015.
2.	Pal Chaudhuri,” Computer Organization and Design”, PHI Pvt, Third Edition, 2008.
REFERENCE BOOKS/OTHER READING MATERIAL	
3.	GhoshT.K., “Computer Organization and Architecture”, Tata McGraw-Hill, Third Edition,2011.
4.	William Stallings, “Computer Organization and Architecture – Designing for Performance”, Pearson Education, Tenth Edition, 2015.
5.	Behrooz Parahami, “Computer Architecture”, Oxford University Press, Eighth Impression, 2015.
6.	JohnP.Hayes, “Computer Architecture and Organization”, McGraw Hill, Third Edition, 2015.
7.	Kai Hwang & Naresh Jotwani, ”Advanced Computer Architecture”, McGraw Hill, Third Edition, 2016.

8.	Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", McGraw - Hill, Sixth Edition,2012.
9.	P.V.S.Rao, "Computer System Architecture", PHI Learning PvtLtd, 2011

17PCS204	ALGORITHM DESIGN AND ANALYSIS	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	P Professional Core				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	To acquire the ability of applying various algorithmic concepts for all domains and efficient interpretation of real life problems.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course,student will be able to								
1.	Apply Mathematical concepts and notations to definea problem	a						
2.	Apply divide and conquer method to solve a problem	b						
3.	Ability to solve are al life problems with these algorithmic techniques	j						
4.	Familiarize the concept of multidisciplinary functions	d						
5.	Interpret data using NP problems and applications of various algorithms to solver eallife problems	b	j					

Session	Description of Topic	Contact hours	C-D-I-O	IOs	References
UNIT I:INTRODUCTION TO ALGORITM DESIGN		**10**			
1.	Introduction,Fundamental s of algorithm (Linecount,operationcount)	1	C	1	2,3,6
2.	Algorithm Design Techniques (Approaches,Design Paradigms)	1	C	1	1,2,3,6
3.	Designing an algorithm and its Analysis (Best, Worst & Average case)	2	C,D	1,3	1,2,3,6
4.	Asymptotic Notations (◯,Ω, ⊙)basedon Orders of Growth	1	C,I	1	1,2,3,6
5.	Mathematical Analysis -Induction	1	C	1	3,4
6.	Recurrence Relation -Substitution method	1	C	1	3,2
7.	Recurrence Relation -Recursion method	2	C	1	2,3
8.	Recurrence Relation -Master's Theorem	1	C	1	2
UNIT II:DIVIDE AND CONQUER		**8**			
9.	Introduction, Binary Search	1	D,I	2	1,3
10.	Mergesort and its algorithm analysis	1	C,D	2	1,3
11.	Quicks ort and its algorithm analysis	2	D,I	2	1,3
12.	Strassen's Matrix multiplication	1	C	2	1,3
13.	Finding Maximum and minimum	1	D,I	2,3	1,3
14.	Algorithm for finding closest pair	1	C,I	2	3,5
15.	Convex Hull Problem	1	C	2	1,3
UNIT III: GREEDY AND DYNAMIC PROGRAMMING		**9**			
16.	Introduction -Greedy-Huffman Coding	1	C	3	1
17.	Greedy-Knapsack Problem	1	C,D,I	3	1,3
18.	Greedy-Minimum Spanning Tree (Kruskals Algorithm)	2	C,D,I	3	1,3
19.	Introduction -Dynamic Programming -0/1 Knapsack Problem	1	C,D	3	1,3
20.	Dynamic Programming -0/1 Knapsack Problem	1	C	3	1,3

Session	Description of Topic	Contact hours	C-D-I-O	IOs	References
21.	Dynamic Programming-Travelling Salesman Problem	1	C,D	3	1,3
22.	Dynamic Programming-Multistage Graph-Forward path and backward path	2	C,D,I	3	1
UNIT IV:BACK TRACKING		**9**			
23.	Introduction - NXN Queen's Problem	1	C	4	1,2
24.	NXN Queen's Problem	1	D,I	4	1,2
25.	Sum Of Subsets	1	D,I	4	1,3
26.	Graph Coloring	2	D,I	3,4	1
27.	Hamiltonian's Circuit	1	C	3,4	1
28.	Travelling Salesman Problem	2	C	3,4	1,3
29.	Generating Permutation	1	C	1	2,4
UNIT V: BRANCH BOUND AND RANDOMIZED ALGORITHM		**9**			
30.	Branch and bound - 0/1 Knapsack	1	D,I	4	1,3
31.	Branch and Bound - Travelling Sales man Problem	1	C,I	3,4	1,3
32.	Randomized algorithm- Hiring Problem	1	C,I	3,4	2
33.	Randomized algorithm- Matrix Chain Multiplication	1	C,I	3,4	1,2
34.	Randomized Quick Sort	1	C	4	2
35.	Introduction to PN problems	1	C	5	5
36.	Introduction to NP problems	1	C	5	5
37.	NP Complete	2	C	5	4,5
TOTAL CONTACT HOURS		**45**			

LEARNING RESOURCES	
Sl.No.	**TEXT BOOKS**
1.	Ellis Horowitz, Sartajsahni, Sanguthevar, Rajesekaran, *"Fundamentals of Compute rAlgorithms"*, Galgotia Publication Pvt. Ltd., Reprint,2010.
2.	Thomas H Cormen,Charles E Leiserson,RonaldL Revest, Clifford Stein, "*Introduction to Algorithms" 3rd Edition,* The MIT Press Cambridge,Massachu setts London, England, 2014
3.	S.Sridhar,"Design and Analysis of Algorithms",OxfordUniversityPress,2015
REFERENCE BOOKS/OTHER READING MATERIAL	
4.	Richard Johnson Baugh, Marcus Schaefer, *"Algorithms",* Pearson education, 2004
5.	Mark Allen Weiss,*"Data Structures and Algorithm Analysisin C"*,2nd Edition, Pearson Education, Inc., 2006
6.	Rajesh K Shukla,*"Analysis and Design of Algorithms-A Beginner's Approach",* Wileypublisher,2015

17PSE211L	**OBJECT ORIENTED PROGRAMMING USING C++ LABORATORY**	**L**	**T**	**P**	**C**
	Total contact hours - 30	**0**	**0**	**2**	**1**
PURPOSE					
This lab course will enable the students to implement the Object Oriented Programming concepts using C++					
INSTRUCTIONAL OBJECTIVES					
1.	To develop solutions to problems demonstrating usage of control structure, modularity, classes, I/O and the scope of the class members				
2.	To develop solutions to problems demonstrating usage of data abstraction, encapsulation and inheritance				
3.	To develop solutions to problems demonstrating usage of inheritance				

S. No.	Description of Experiments	Contact hours	C-D-I-O	IOs	Reference
	Each student is assigned with an application in Session 1. Students have to complete the below listed experiments with respect to the assigned application.				
1.	Identifying appropriate data types, variables and simple programs to understand the basic program structure	2	C,D,I	1	1-8
2.	Programs for control structures and loops	2	C,D,I	1	1-8
3.	Simple Programs to construct a class structure with methods and arguments	2	C,D,I	1,2	1-8
4.	Programs to develop their skills on Inheritance	2	C,D,I	1,4	1-8
5.	Programs to improve their skills on polymorphism	2	C,D,I	1,4	1-8
6.	Programs to construct Functions, Inline functions, and Virtual functions	4	C,D,I	1,4	1-8
7.	Develop a complete logic for the assigned application including all the concepts done so far	4	C,D,I	3,4	1-8
8.	Programs to improve the skills on reading and storing from and to files	2	C,D,I	5	1-8
9.	Programs for manipulating pointers	4	C,D,I	1,2,4	1-8
10.	Programs to construct templates and handle exceptions	2	C,D,I	5	1-8
11.	Programs to construct a STL for Sequential containers and iterators	2	C,D,I	5	1-8
12.	Programs to construct a STL for Associative containers	2	C,D,I	5	1-8
	Total Contact Hours	**30**			

LEARNING RESOURCES	
Sl. No.	**TEXT BOOKS**
1.	Robert Lafore, "*Object-Oriented Programming in C++*", 4th edition, SAMS Publishing, 2008
2.	Deitel, "*C++ How to Program*", 6th edition, PHI publication, 2008
3.	R. Subburaj, "Object Oriented Programming With C++ ", Vikas Publishing House, New Delhi, Revised Edition 2013.
	REFERENCE BOOKS/OTHER READING MATERIAL
4.	*E.Balaguruswamy "Object Oriented Programming with C++", 6th edition, Tata McGraw Hill Education, 2015*
5.	Joyce Farrell, "Object Oriented Programming", 4th edition, Cengage learning, 2009
6.	*Nicolai M. Jossutis, "Object-Oriented Programming in C++", Wiley Publications, 2002*
7.	Bjarne Stroustrup ,"The C++ Programming Language", 4th Edition, Addison Wesley, 2015
8.	Stanley Lippman, JoseeLajoie, Barbara E. Moo ,"C++ Primer", 5th Edition, Addison Wesley, 2015
9.	Bhusan Trivedi, "Programming with ANSI C++", 2nd edition, Oxford higher education,2014

17PCS214L	**ALGORITHM DESIGN AND ANALYSIS LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**0**	**0**	**2**	**1**
PURPOSE					
This laboratory course gives a thorough understanding of the concepts of various Data Structures and its various Algorithms					
INSTRUCTIONAL OBJECTIVES					
1.	To implement various Algorithm Design Techniques				
2.	To implement various Sorting and Searching Techniques				
3.	To implement Backtracking Technique				

Session	**Description of the Experiments**	**Contact hours**	**C-D-I-O**	**IOs**	**References**

Divide and conquer Technique					
1.	- Binary Search	2	I	2	1,3,6
2.	- Quick Sort	2	C,I	2	1,3,6
3.	- Merge sort	2	I	2	1,3,6
4.	- Min Max Problem	3	I	2	1,3,6
Greedy and Dynamic Programming Technique					
5.	Knapsack Problem	3	C	3	1,3,5,6
6.	- Huffman Coding	3	C,I	3	1,3,5,6
7.	- Minimum Spanning Tree(Kruskal Algorithm)	3	C,I	3	1,3,6
8.	- Multistage Graph (Forward path & Backward path)	3	C,I	3	1,6
Backtracking Technique					
9.	- NXN Queens problem	3	C,I	4	1
10.	- Graph Coloring	3	C,I	3, 4	1
	Randomized Algorithm				
11.	- Hiring Problem	3	I	5	2
TOTAL CONTACT HOURS		**30**			

SEMESTER III

17PCS205	MICROPROCESSORS AND MICRO CONTROLLERS	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Core				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic CouncilMeeting, 2017				

PURPOSE	The purpose of this courseis to develop Assembly Language Programs and build a Micro processor based system for various applications.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course,student will be able to								
1.	To learn the basics of8086 Microprocessor to Pentium-core Micro processor and their functions	a	b					
2.	To understandand implement the 8086 family Assembly Language Programming	a	c					
3.	Toe xplorethel/O interfacing and advanced Microprocessors	a	c					
4.	Expose to the functional architecture of 8051 and its basic programming using C	a	c					

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT I:INTRODUCTION TO MICRO PROCESSOR AND FAMILY		**8**			
1.	Introduction–Microprocessors and Microcontrollers-its computational functionality and importance-overview of syllabus	1	C	1,4	1-5
2.	8086 architecture and Historical background	2	C,D	1,2	1,2
3.	The Microprocessor–Based Personal Computer Systems	1	C	1	1
4.	InternalMicroprocessorArchitecture	2	C,D	1,2	1
5.	Real modememory Addressing–Protected mode MemoryAddressing	2	C	1,2	1
UNIT II:8086 FAMILY ASSEMBLY LANGUAGE PROGRAMMING		**10**			

6.	Machine language instruction format-Addressing modes-Data addressing	1	C	2	1,2
7.	Program memory and stack addressing modes	2	C	2	1
8.	Instruction Set:Data MovementInstructions	2	C	2	1
9.	Arithmetic and Logic Instructions	2	C	2	1
10.	Program control Instructions	2	C	2	1
11.	Assembler Directives of8086	1	C	2	1
UNIT III: PROGRAMMING CONCEPTS		**10**			
12.	Using Assembly Language withC/C++ for 16-Bit DOS Applications and 32-Bit Applications	4	C	2	1
13.	Modular Programming	2	C	2	1
14.	Using the Keyboard and Video Display	2	C,D	2,3	1
15.	Data Conversions–Example Programs: Binary to ASCII-ASCIItoBinary	2	C	2	1
UNIT IV: I/O INTERFACE & ADVANCED MICRO PROCESSORS		**9**			
16.	Introduction to I/O Interface	1	C	2,3	1
17.	Programmable Peripheral Interface architecture- modes	2	C	2,3	1
18.	Basic DMA Operations-8237 DMA Controller architecture-software commands	2	C,D	2,3	1,2
19.	Disk Memory Systems	1	C	2,3	1
20.	Introduction to Pentium- Pentium Pro Microprocessor-Pentium II- PentiumIII-Pentium-IV & Core2	3	C	1,2	1
UNIT V: ARCHITECTURE AND PROGRAMMING 8051		**8**			
21.	Architecture of 8051-Signal Descriptions-Registered-Program Status Word	2	C,D	4	2,3,5
22.	Memory and I/O Addressing-Addressing modes-Instruction set	2	C	4	2,3,5
23.	Timer/Counter-Serial-Interrupt	2	C	4	2,3,5
24.	Basic Programming	2	C	4	2,6
Total contac thours		**45***			

LEARNING RESOURCES	
Sl.No.	**TEXT BOOKS**
1.	Barry B.Brey,"THE *INTEL Microprocessors-Architecture,Programming and Interfacing*", 8th Edition,Pearson,2012.(UnitsI-IV)

2.	A.K.Ray and K.M. Bhurchandi, "*Advanced Micro processor and Peripherals*" Tata McGraw Hill, 3rd Edition, 2013 (Unit-5).
REFERENCE BOOKS/OTHER READING MATERIAL	
3.	N.Senthilkumar, M.Saravanan,S, Jeevanathan, "Microprocessors and Microcontrollers", Oxford University Press, 2011
4.	KennethJAyala,"The8086 Microprocessor:Programming and Interfacing the PC",CengageLearning,Reprint 2014
5.	Kenneth JAyala,"The 8051 Microcontroller",3rdedition, Cengage Learning, Reprint 2014..
6.	Muhammed Ali Mazidi, Janice Gillisple Maidi, Rolin.D.McKinlay, "The 8051 Microcontroller and Embedded Systems, Using Assembly and C", Second edition, Pearson Prentice Hall, 2015.

17PSE203	**OBJECT ORIENTED ANALYSIS AND DESIGN**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book /	NIL				
Codes/Standards					
Course Category	PROFESSIONAL CORE				
Course designed by	Department of Software Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	The purpose of the course is to practice popular technical approach for analyzing, designing an application, system, or business by applying the object-oriented paradigm and visual modeling throughout the development life cycles to foster better stakeholder communication and product quality			
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**		
At the end of the course, student will be able to				
1.	Understand the basics object model for System development.	j		
2.	Apply the various modeling techniques using UML approach.	b		
3.	About building high quality system for different real world issues.	c		

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
	UNIT I: INTRODUCTION	**9**			
1.	Complexity in Traditional Systems	2	C	1	1,3,4
2.	The Object Model	2	C	1	1,3,4
3.	Classes and Objects	3	C	1	1,3,4
4.	Classification	2	C	1	1,3,4
	UNIT II: STATIC MODELING	**9**			
5.	What is UML?	2	C	2	2,3,4
6.	Use Case Diagram	2	C,D	2,3	2,3,4
7.	Domain Models	2	C,D	2,3	2,3,4
8.	UML Class Diagram	3	C,D	2,3	1,3,4
	UNIT III: DYNAMIC MODELING	**9**			
9.	Interaction and Package Diagram	2	C,D	2,3	2,3,4
10.	Activity Diagrams and Modeling	1	C,D	2,3	1,3,4
11.	State Machine Diagram and Modeling	2	C,D	2,3	1,3,4
12.	UML Component Diagram	2	C,D	2,3	1,3,4
13.	UML Deployment Diagram	2	C,D	2,3	1,3,4
	UNIT IV: GoF DESIGN PATTERNS	**9**			
14.	Object Design	2	C	1	2
15.	What are Patterns?	2	C	1	2
16.	Applying GoF Design Patterns	3	C,D	2	2
17.	Design Persistence Framework	2	C	2,3	2
	UNIT V: APPLICATIONS	**9**			
18.	Satellite Based Navigation	2	D,I	2,3	1
19.	Traffic Management	1	D,I	2,3	1
20.	Crypt Analysis	2	D,I	2,3	1
21.	Weather Monitoring Station	2	D,I	2,3	1
22.	Vacation Tracking System	2	D,I	2,3	1
Total contact hours		**45**			

LEARNING RESOURCES:	
Sl. No.	**TEXT BOOKS**
1.	Grady Booch, Robert A. Maksimchuk, Michael W. Engle,"Object-Oriented Analysis and Design with Application ", Addision-Wesley Professional, 3 edition (April 30 2007) ISBN – 13:978-0201895513"
2.	Craig Larmen, "Applying UML and Patterns", Prentice Hall; 3 edition (October 30, 2004)ISBN-13:**978-0131489066**
REFERENCE BOOKS/OTHER READING MATERIAL	
3.	Brett McLaughlin,"Head First Object-Oriented Analysis and Design", O'Reilly Media; 1 edition, 2006 ISBN-13: 978-0596008673
4.	Ali Bahrami , "Object Oriented Systems Development", McGraw Hill Eduction, Indian Edition, 2004, ISBN-13: 978-0-07-026512-7

17PSE205	**PROGRAMMING IN JAVA**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book /					
Codes/Standards	NIL				
Course Category	PROFESSIONAL CORE				
Course designed by	Department of Software Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	Java is a mature and solidly engineered programming language that is extensively built on object oriented programming concepts. Its in-built security and safety features together support for advanced programming tasks like networking, database connectivity, rich web applications, and mobile applications. This course is designed around the fundamental concepts of Java that enable the students to design and build more complex Java applications		
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**	
At the end of the course, student will be able to			
1.	Acquaint themselves with the fundamental concepts and programming environment.	I	c
2.	Design classes and efficiently use the IO streams	c	c
3.	Implement object oriented concepts like inheritance, reusability, and encapsulation	i	b

4.	Apply custom exceptions and employ concurrency.	b	c
5.	Exploit the power of advanced data structures and basic GUI design.	i	c

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I: FUNDAMENTALS OF JAVA TECHNOLOGY AND PROGRAMMING		**6**			
1.	Java platform features, Java technologies-JSR, JCP.	1	C	1	1,2
2.	Data types, Key words, Scoping rules	2	C	1	1,2
3.	Automatic Type Conversion , Type Casting and Arrays	1	C	1	1,2
4.	Operators Precedence & Associativity, Expression. Flow control, new featuresfrom Java5 to Java 7	1	C	1	1,2
5.	Enhanced for loop, switch statements, handling Strings, Entry Point for Java Programs	1	C	1	1,2
UNIT II: CLASSES, OBJECTS AND STREAMS		**12**			
6.	Class fundamentals: Declaring objects, Assigning object, reference variable, Methods & Method Signatures, Method ,retuning Values, Method with parameters, Variable arguments in Java 5	2	D	2	1,2
7.	I/O Basics: Byte stream& Character Stream, Getting user input: Reading console input & Writing console output,Reading and Writing files-new file system API NIO2	2	C	2	3
8.	Constructors: Default Constructor, Parameterized constructor. this keyword, Garbage Collector, finalize() method, Overloading methods and constructors	2	C	2	3
9.	Using object as parameters, returning object in methods, recursion, Access control, static and final keyword	2	C	2	3
10.	Nested and Inner classes , Command Line argument	2	D	2	3
11.	String and String Buffer class, Java Bean standards, Naming conventions	2	D	2	3

UNIT III: INFORMATION HIDING & REUSABILITY		**9**			
12.	Inheritance basics. Using super, Method Overriding. Constructor call. Dynamic method dispatch	3	D	3	4
13.	Abstract class, Using final with inheritance, Default Package. Path & Class Path EnvironmentVariables	2	D	3	4
14.	Package level access ,Importing Packages, Interface: Multiple Inheritance in Java	2	D	3	4
15.	Extending interface, Wrapper Class, Auto Boxing	2	D	3	4
UNIT IV: EXCEPTION , CONCURRENCY, ENUMERATION AND ANNOTATIONS		**9**			
16.	Exception handling mechanism. new look try/catch mechanism in Java 7	2	C	4	3
17.	Thread class & Runnable Interface. Inter Thread Communication, Synchronization of threads using Synchronized keyword and lock method	2	I	4	3
18.	Thread pool and Executors framework, Futures and callable, Fork-Join in Java. Deadlock conditions	2	I	4	3
19.	Enumeration in Java 5 - usage. Annotations: basics of annotation	1	C	4	3
20.	The Annotated element Interface. Using Default Values, Marker Annotations. Single-Member Annotations. The Built-In Annotations-Some Restrictions.	2	I	4	3

UNIT V: GENERICS , COLLECTIONS FRAME WORK AND GUI PROGRAMMING		**9**			
21.	Generics: Basics , Generics and type safety	2	I	5	4
22.	Collections Interfaces – Collection, Set, List, Queue, Collections Classes – Array List, Hash Set, Tree Set. Accessing a Collection via Iterators. Map Interfaces. Map Classes – Abstract Map, Hash Map, Tree Map	2	I	5	4
23.	Introduction to Swing, MVC Connection, Containers – Jframe, JDialog, JPanel,JRootPane, JLayeredPane	2	I	5	4
24.	Placing components into containers, Event Handling, Components – Jbutton, JLabel, JTextField, JComboBox, JList, JTable, JTabbedPane	3	I	5	4
Total Contact Hours		**45**			

LEARNING RESOURCES:	
Sl. No.	**TEXT BOOKS**
1.	Herbert Schildt, “The Complete Reference (Fully updated for jdk7)”, Oracle press Ninth Edition,2014
REFERENCE BOOKS/OTHER READING MATERIAL	
2.	Cay S. Horstmann, “Core Java Volume –I Fundamentals”, Prentice Hall, 10th Edition, 2015.
3.	Deitel&Deitel, “Java How to Program”, Prentice Hall, 10th Edition, 2016
4.	Herbert Schildt ,“Java: A Beginner's Guide”, Sixth Edition, Oracle Press, 2014
5.	https://docs.oracle.com/javase/tutorial

17PCS301	THEORY OF COMPUTATION	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Core				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	The purpose of the course is to understand all basic concepts in the oretical Computer science.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course,student will be able to								
1.	To understand and design various Computing models like Finite State Machine, Push down Automata, and Turing Machine.	a						
2.	To understand the various types of grammar and the corresponding languages	a						
3.	To understand Decidability and Undecid ability of various problems	a						
4.	To understand the computational complexity of various problems	a						

Session	Description of Topic	Contact hours	C-D-I-O	I Os	Reference
UNIT I: FINITE AUTOMATA		**10**			
1.	Introduction:Basic Mathematical Notation and techniques	1	C	1	1,2,5
2.	Finite State systems, Basic Definitions, Finite Automaton :DFA	1	C,D	1	1,2
3.	Finite Automaton :NDFA,Finite Automaton with €-moves	1	C,D	1	1,5
4.	Regular Languages-Regular Expression	1	D	1,2	1,5
5.	Equivalence of NFA and DFA	1	C,D	1	1,2
6.	Equivalence of NDFA's with and without -moves	1	C,D	1	1,4

7.	Equivalence offinite Automaton and regular expressions	2	C,D	1,2	1,2,3
8.	Minimization of DFA	1	C,D	1	1,3
9.	Pumping Lemma for Regular sets, Problems based on Pumping Lemma	1	C	2	1
UNIT II: GRAMMARS		**8**			
10.	Grammar Introduction:Types of Grammar, Context Free Grammars and Languages	1	C	2	1
11.	Derivations,Ambiguity,Relationship between derivation and derivation trees	1	C	2	1,5
12.	Simplification of CFG:Elimination of Useless Symbols	1	C,D	2	1,5
13.	Simplification of CFG: Unit productions , Null productions	1	C,D	2	1,4
14.	Chomsky normal form	1	C	2	1,2,3
15.	Problem srelatedto CNF	1	C,D	2	1,2,3
16.	Grei back Normalform	1	C	2	1,4,5
17.	Problems related to GNF	1	C,D	2	1,4,5
UNIT III: PUSH DOWN AUTOMATA		**9**			
18.	Pushdown Automata:Definitions Moves, Instantaneous descriptions	1	C	1	1,4
19.	Deterministic pushdown automata	1	C,D	1	1,5
20.	Problems related to DPDA	2	C,D	1	1,5
21.	Non -Deterministic pushdown automata	1	C,D	1	1,5
22.	Equivalence: Pushdown automata to CFL	1	C,D	1,2	1,3
23.	Equivalence: CFL to Push down automata	1	C,D	1,2	1,3
24.	Problems related to PDA toCFG and CFG to PDA	1	C,D	1,2	1,3,4
25.	Pumping lemma forCFL,Problems based on pumping Lemma	1	C	2	1

UNIT IV:TURING MACHINE		**9**			
26.	Turing Machines:Introduction,Form al definition of Turing machines, Instant aneous descriptions	1	C	1	1,2
27.	Turing Machine as Acceptors	1	C,D	1	1,2
28.	Problems related toTuring Machineas Acceptors	2	C,D	1	1,3
29.	Turing Machine for computing functions (Transducer)	3	C,D	1	1,4
30.	Turing Machine constructions	1	C	1	1,3
31.	Modifications of Turing Machines	1	C	1	1,3
UNIT V:COMPUTATIONAL COMPLEXITY		**9**			
32.	Undecidability:Basic definitions, Decidable problems	1	C	3	1,2,4
33.	Examples of undecidable problems	1	C	3	1,2,4
34.	Rice's Theorem	1	C	3	2,3,5
35.	Undecidable problems about Turing Machine – Post's Correspondence Problem	2	C,D	3	1,2
36.	Properties of Recursive and Recursively enumer able languages	1	C	3	2
37.	Introduction to Computational Complexity:Definitions,Time and Space complexity of TMs	1	C	4	2
38.	Complexity classes:ClassP,ClassNP	1	C	4	2,3
39.	Complexity classes:Introduction to NP-HardnessandNP-Completeness	1	C	4	2,3
Total contac thours		**45***			

LEARNING RESOURCES	
Sl.No.	**TEXT BOOKS**
1.	HopcroftJ.E., MotwaniR.and UllmanJ.D, *"Introductionto Automata Theory ,Languages and Computations"*,SecondEdition,PearsonEducation,2008.
2.	MichaelSipser,"*Introduction tothe Theory of Computation"* Cengage Learning, 2012.
REFERENCE BOOKS/OTHER READING MATERIAL	
3.	John.C.Martin,*"Introduction to Languages and the Theory of Computation*" McGraw- Hill Education, 01-May-2010.
4.	Kamala Krithivasan, Rama.R, *" Introduction to Formal Languages, Automata Theory and Computation*", Pearson Education India,01-Sep-2009.

5.	PeterLinz, "*Anintroduction to formal languages and automata*", Jones & Bartlett Learning, 2001.

17PCS215L	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	L	T	P	C
	Total contact hours - 30	**0**	**0**	**2**	**1**

PURPOSE

This Lab Course will enable the students to implement assembly language programming using 8085 and 8086 Microprocessors.

INSTRUCTIONAL OBJECTIVES

1.	Expose to the functional architecture of 8051 and its basic programming using C
2.	To learn the Basic 8051 programming using C
3.	To learn Assembly Language Programs Using TASM/MASM

Sl. No.	Description of experiments	Contact hours	C-D-I-O	IOs	Reference
	Assembly Language Programs Using TASM/MASM				
1	Program involving Arithmetic Instructions on 16 bit data i. Addition & Subtraction ii. Multiplication & Division iii. Factorial of a given number	2	C, I	2	1-4
2	Program involving Data Transfer Instructions on 16 bit data i. Byte and Word data transfer in different addressing modes ii. Block Data Transfer	3	I	2	1-4
3	Program involving Bit Manipulation Instructions on 16 bit data -Given data is positive or negative	3	I	2	1-4
4	Implementation of Bubble Sort Algorithm	3	I	2	1-4
5	Program involving String Instructions on 16 bit data i. Reverse a given string and check whether it is a palindrome	3	I	2	1-4

	ii. String Display using Display Interrupt (Read your name from the keyboard and displays it at a specified location on the screen after the message "What is your name?" You must clear the entire screen before display)				
6.	Time display using Interrupt (Read the current time from the system and display it in the standard format on the screen)	3	C, I	2, 3	1-4
.	**Basic 8051 programming using C**				
7	Port Programming	3	C, I	4	2,6
8	Timer-Counter Programming	3	I	4	2,6
9	Serial Programming	3	I	4	2,6
10	Interrupt Programming	3	I	4	2,6
	Total contact hours	**30**			

LEARNING RESOURCES	
Sl. No.	**TEXT BOOKS**
1.	Barry B. Brey**, "**THE *INTEL Microprocessors-Architecture, Programming and Interfacing*", 8th Edition, Pearson, 2012.(Units I-IV)
2.	A.K.Ray and K.M. Bhurchandi, "*Advanced Microprocessor and Peripherals*" Tata McGraw Hill, 3rd Edition, 2013(Unit-5).
	REFERENCE BOOKS/OTHER READING MATERIAL
3.	N.Senthilkumar, M.Saravanan, S,Jeevanathan, "Microprocessors and Microcontrollers", Oxford University Press, 2011
4.	Kenneth J Ayala, "The 8086 Microprocessor: Programming and Interfacing the PC", Cengage Learning, Reprint 2014
5.	Kenneth J Ayala, "The 8051 Microcontroller", 3rd edition, Cengage Learning, Reprint 2014..
6.	Muhammed Ali Mazidi, Janice GillispleMaidi, Rolin.D. McKinlay, " The 8051 Microcontroller and Embedded Systems, Using Assembly and C", Second edition, Pearson Prentice Hall, 2015.

17PSE215L	JAVA PROGRAMMING LABORATORY	L	T	P	C
	Total contact hours - 30	0	0	2	1

PURPOSE

This lab course will enable the students to implement the Object Oriented Programming concepts using Java

INSTRUCTIONAL OBJECTIVES

1.	To develop solutions to problems demonstrating usage of control structure, modularity, classes, I/O and the scope of the class members
2.	To develop solutions to problems demonstrating usage of data abstraction, encapsulation.
3.	To develop solutions to problems demonstrating usage of inheritance
4	To implement solutions to various I/O operations,Threads,Exceptions and String manipulations
5	To learn and practice swing application in java

Sl. No.	Description of experiments	Contact hours	C-D-I-O	IOs	Reference
1.	Program to implement Operators,Flow Controls concepts	3	I	1	1-5
2.	Program to implement Classes, Constructors, Overloading and Access Control	3	I	2	1-5
3.	Program using Nested & Inner Classes, Static and Final	3	I	2	1-5
4.	Program using File Streams and IO Streams	3	I	2	1-5
5.	Program to implement Strings, String Buffer Concept	3	I	2	1-5
6.	Program using Interfaces, Abstract Classes	3	I	3	1-5
7.	Program to implements Exceptions Concepts	3	I	4	1-5
8.	Program using Threads	3	I	4	1-5
9.	Program using Collections, Generics concepts	3	I	5	1-5
10.	Program to implement Swing Application	3	I	5	1-5

	Total contact hours	**30**

LEARNING RESOURCES	
Sl. No.	**TEXT BOOKS**
1.	Herbert Schildt, “The Complete Reference (Fully updated for jdk7)”, Oracle press Ninth Edition,2014.
	REFERENCE BOOKS/OTHER READING MATERIAL
2.	Cay S. Horstmann, “Core Java Volume –I Fundamentals”, Prentice Hall , 10th Edition, 2015.
3.	Deite I& Deitel, “Java How to Program”, Prentice Hall, 10th Edition, 2016.
4.	Herbert Schildt ,“Java: A Beginner's Guide”, Sixth Edition, Oracle Press, 2014.
5.	https://docs.oracle.com/javase/tutorial

SEMESTER IV

17PCS302	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Core				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	To acquire analytical ability in solving mathematical problems as applied to the respective branches of Engineering.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course,student will be able to								
1.	Understand the structure and functions of OS	a						
2.	Learn about Processes and Threads	a	b					
3.	Understandand Implement the principles of concurrency Scheduling algorithms and Deadlocks and Implement them	a	b					
4.	Learn and Implement the different memory management schemes	a	b					
5.	Understand and Implement the different Input , Output and File management schemes	a	b					

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT I:INTRODUCTION		**9**			
1.	Computer System Overview - Basic Elements, Basic Linux Commands.	2	C,I	1	2,6
2.	Instruction Execution,Memory Hierarchy	2	C	1	2
3.	Interrupts, Cache Memory, Direct Memory Access	2	C,D	1	2
4.	Operating system overview - objectives and functions	1	C,D	1	1,2
5.	Evolution of Operating System.	2	C	1	1,2
UNIT II:PROCESSES AND THREADS		**9**			
6.	Definition of process and Process Control Block	1	C,D	2	1,2,3,5
7.	Process States-Two state,Five state, Suspended Processes	2	C,D	2	1,2,3,5

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
8.	Process Description and Process Control	2	C	2	1,2,3,5
9.	Processes and Threads	2	C,D	2	1,3,5
10.	Types of Threads	1	C,D	2	1,2
11.	Windows 7 -Thread and SMP Management.	1	C,D,I	2	1
UNIT III: CONCURRENCY AND SCHEDULING		**9**			
12.	Principles of Concurrency	1	C	3	1,3,5
13.	Mutual Exclusion, Semaphores	2	C,D,I	3	1,3,5
14.	Monitors, Readers / Writersproblem	1	C,D,I	3	1,3,5
15.	Principles of Deadlock	1	C	3	1,3,5
16.	Deadlocks – prevention - avoidance – detection	1	C,I	3	1,3,5
17.	Scheduling -Types ofScheduling	2	C,I	3	1,3,5
18.	Scheduling algorithms.	1	C,I	3	1,3,5
UNIT IV: MEMORY		**9**			
19.	Memory management requirements, Partitioning	1	C,D,I	4	1,3,5
20.	Paging and Segmentation	2	C,D,I	4	1,3,5
21.	Virtual memory -Hardware and control structures	1	C,D	4	1
22.	Operating system software	3	C	4	1
23.	Linux memory management,	1	D,I	4	1
24.	Windows memory management.	1	D,I	4	1
UNIT V: INPUT / OUTPUT AND FILE SYSTEMS		**9**			
25.	I/O management and disk scheduling– I/O devices, organization of I/O functions	2	C,D	5	1,3,5
26.	OS designissues,I/O buffering	1	C,D	5	1,3,5
27.	Diskscheduling,	1	D,I	5	1,3,5
28.	Diskcache	1	C	5	1,3,5
29.	File management-Overview,Organization and Access	2	C,D,I	5	1,3,5
30.	Directories, Filesharing	1	C	5	1,3,5
31.	Record Blocking, secondary storage management.	1	C,D	5	1,3,5
Total contact hours		**45***			

LEARNING RESOURCES	
Sl.No.	**TEXT BOOKS**
1.	William Stallings,"OperatingSystems – internal sand design principles",Prentice

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
	Hall,7thEdition,2011.(Ch1-9,11,12).				
2.	William Stallings"OperatingSystems – Internals and design principles", Pearson Education,5th Edition.				
REFERENCE BOOKS/OTHER READING MATERIAL					
3.	Andrew S. Tannenbaum & Albert S. Woodhull, "Operating System Design and Implementation", Prentice Hall , 3rd Edition, 2006.				
4.	Andrew S. Tannenbaum,"Modern Operating Systems", Prentice Hall, 3rd Edition, 2007.				
5.	Silberschatz, Peter Galvin, Greggagne "Operating System Principles", WileyIndia, 7th Edition, 2006.				
6.	Unix Command Reference Guide				

17PIT303	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book / Codes/Standards	NIL				
Course Category	PROESSIONAL CORE				
Course designed by	Department of Information Technology				
Approval	Academic CouncilMeeting, 2017				

PURPOSE	This course provides a foundation to understand computer networks using layered architectures. It also helps students to understand the various network models, addressing concept, routing protocols and design aspects of computer networks. .								
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**							
At the end of the course, student will be able to									
1.	Understand the evolution of computer networks using the layered network architecture.	b							
2.	Design computer networks using subnetting and routing concepts	c							
3.	Understand the various Medium Access Control techniques and also the characteristics of physical layer functionalities.	m							

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I : INTRODUCTION TO COMPUTER NETWORKS		**9**			
1.	Evolution of Computer Networks	1	C	1	1
2.	Classification of Computer Networks LAN,WAN,MAN	2	C	1	1
3.	Network Topology : BUS, STAR, RING, MESH -	2	C	1	1
4.	OSI Layered Architecture	2	C	1	1
5.	TCP/IP Model	2	C	1	1
UNIT II: IPV4 ADDRESSING ARCHITECTURE		**9**			
6.	IPv4 Public and Private Address	2	C	2	1
7.	Subnetting	3	C	2	1
8.	VLSM-CIDR	2	C	2	1
9.	Network Devices: Router, Switch, HUB, Bridge.	2	C	2	1
UNIT III: NETWORK LAYER PROTOCOLS		**9**			
10.	Static Routing	1	C	2	1
11.	Introduction to dynamic Routing Protocols	1	C	2	1
12.	RIP v1 and RIP v2,OSPF	3	C	2	1
13.	EIGRP	2	C	2	2
14.	BGP	2	C	2	1
UNIT IV: DATA LINK LAYER		**8**			
15.	Medium Access Control Techniques	1	C	3	1
16.	Random, Round Robin, Reservation, ALOHA	1	C	3	1
17.	Pure and Slotted, CSMA/CD	1	C	3	1
18.	CSMA/CA, Ethernet, Token Ring, Token Bus,	1	C	3	1
19.	ARQ 3 Types,	1	C	3	1
20.	Error Detection Codes, Parity Check, Checksum	2	C	3	1
21.	Error Correction Codes, Hamming codes	1	C	3	1
UNIT V: PHYSICAL LAYER CHARACTERISTICS		**10**			
22.	Physical Layer overview	2	C	3	1
23.	Latency, Bandwidth, Delay	1	C	3	1
24.	Wireless: 802.11	2	C	3	1
25.	Transmission Media : Twisted pair, Coaxial, Fibre	2	C	3	1
26.	802.15, 802.15.4	2	C	3	1

27.	802.16	1	C	3	1
TOTAL CONTACT HOURS		**45***			

Sl.No	Learning Resources
1.	Behrouz A. Forouzan, "Data Communications and Networking" 5th edition, July 1, 2010, ISBN: 9780073376226
2.	Todd Lammle, "CCNA Study Guide", Edition7, Publication Date: April 5, 2011 ISB: 10:0470901071 ISBN:13: 9780470901076
3.	William Stallings, "Data and Computer Communications", Edition 9, 2010.

17PCS401	**ARTIFICIAL INTELLIGENCE**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/ Standards	Nil				
CourseCategory	Professional Core				
Coursedesignedby	DepartmentofComputerScienceandEngineering				
Approval	Academic CouncilMeeting, 2017				

PURPOSE	Introduce the concepts of Artificial Intelligence;Learn the methods of solving problems using Artificial Intelligence in GraphPlaying,Natural Language Processing, Expert Systems and Machine Learning.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
Attheend of the course,student will be able to								
1.	Identify problems that are amenable to solution by AImethods.	a	b					
2.	Identify appropriate AImethod stosolve a given problem.	a	b					
3.	Formalize a given problem in the language / frame work of different AI methods	a	b					
4.	Design and carry out an empirical evaluation of different algorithms on a problem formalization,and state the conclusions that the evaluation supports	a	b	c				

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT I:INTRODUCTION		**9**			
1.	Introduction to Artificial Intelligence-History of AI-AITechniques	1	C	1	1,2,3,4

2.	Problem Solving with AI-AImodels-Data Acquisition and Learning Aspects in AI	3	C	1	1,2,3,4
3.	Problem-Solving Process– Formulating Problems-Problem Types and Characteristics -Problem Analysis and Representation	3	C,D	1	1,2,3,4
4.	Performance Measuring-Problem Space and Search-Toy Problems-Real-world problems- Problem Reduction Methods	2	C,D	1	1,2,3,4
UNIT II: HEURISTIC SEARCH TECHNIQUES		**9**			
5.	General Search algorithm– Uniformed Search Methods–BFS,Uniform Cost Search	2	C	2-4	1,2,3,4
6.	Depth First search , Depth Limited search (DLS), Iterative Deepening	2	C,D	2-4	1,2,3,4
7.	Informed Search-Introduction-Generate and Test, BFS,A* Search, Memory Bounded Heuristic Search.	3	C,D	2-4	1,2,3,4
8.	Local Search Algorithms and Optimization Problems–Hillclimbing and Simulated Annealing	2	D,I	2-4	1,2,3,4
UNIT III: KNOWLEDGE AND REASONING		**9**			
9.	Knowledge Representation-Knowledge based Agents-The Wumpus World	2	C	3	1,2,3,4
10.	Logic- Propositional Logic- Predicate Logic-Unification and Lifting	3	C,D,I	3	1,2,3,4
11.	Representing Knowledge using Rules-SemanticNetworks-Frame Systems	2	C,D	3	1,2,3,4
12.	Inference –Types of Reasoning	2	C	3	1,2,3,4

UNIT IV: PLANNING		**9**			
13.	Planning Problem– Simple Planningagent–Blocks world	2	C	4	1,2,3,4
14.	Goal Stack Planning-Means Ends Analysis-Planningasa State-space Search	2	D,I	4	1,2,3,4
15.	Partial Order Planning-PlanningGraphs-Hierarchical Planning-Non-linearPlanning-Conditional Planning-Reactive Planning	1	C,D,I	4	1,2,3,4

16.	Knowledge based Planning-Using Temporal Logic–Execution Monitoring and Re-planning-Continuous Planning-Multi-agent Planning-Job shop Scheduling Problem	2	C,D	4	1,2,3,4
17.	NLP-Introduction-LevelsofNLP-Syntactic and Semantic analysis-Discourse and Pragmatic Processing-Information Retrieval-Information Extraction-MachineTranslation-NLP and its Application	2	C,D,I	1-4	1,2,3,4,5
UNIT V: GAME PLAYING		**9**			
18.	Introduction-Important Concepts of GameTheory	1	C	3-4	1,2,3
19.	Game Playingand Knowledge Structure-Game as a Search Problem	2	C, D	3-4	1,2,3
20.	Alpha-betaPruning-Game Theory Problems Game Theory	3	C,D,I	3-4	1,2,3
21.	ExpertSystem-Architecture-Knowledge acquisition-Rulebased Expert System-Frame based and Fuzzy based expert system-Casestudyin AIApplications	3	C,D,I	1-4	1
Total contact hours		**45***			

LEARNING RESOURCES	
Sl.No.	
1.	Parag Kulkarni, PrachiJoshi,"Artificial Intelligence –Building Intelligent Systems" P HI learning privateLtd,2015
2.	Kevin Nightand Elaine Rich, NairB.,"Artificial Intelligence(SIE)",McGraw Hill-2008.
3.	Stuart Russeland Peter Norvig"AI– AModern Approach", 2nd Edition, Pearson Education2007.
4.	Deepak Khemani "Artificial Intelligence",Tata McGraw HillEducation2013.
5.	Akshar Bharati, Vineet Chaitanya, Rajeev Sangal, "Natural Language Processing: A Paninian Perspective", Prentice Hall India Ltd., New Delhi, 1996

17PSE202	**SOFTWARE ENGINEERING PRINCIPLES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book /Codes / Standards	NIL				
Course Category	PROFESSIONAL CORE				
Course designed by	Department of Software Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	The main purpose of this course is to impart knowledge on the basic principles of software engineering		
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**	
At the end of the course, student will be able to			
1.	Understand the software life cycle models and software development process	a	
2.	Elicit, analyze and specify software requirements through a productive working Relationship with project stake holders	a	g
3.	languages	c	g
4.	Develop correct and robust software products.	d	h
5.	Adaptation of Software maintenance and emerging trends in software engineering	d	j

Session	Description of Topic (Theory)	Contact Hours	C-D-I-O	IOs	Reference
	UNIT I: INTRODUCTION	9			
1.	Software Engineering-Software Process- Generic process	1	C	1	1
2.	Process models	4	C	1	1
3.	Agile development-Agile Process-Extreme Programming Other Agile process models	2	C	1	1
4.	Adaptive process models, Scrum, Dynamic Systems Development Method and Crystal	2	C	1	1
UNIT II: UNDERSTANDING REQUIREMENTS		**9**			
5.	Principles that guide practice – Understanding requirements	3	C	1,2	1,3
6.	Requirement Modeling : Scenarios, Information and Analysis classes	3	C,D	1,2,3	1,3
7.	Requirements Analysis-Requirements Modeling Strategies architecture	3	C	2,3,4	1,3
UNIT III: DESIGN		**9**			
8.	The design process - Design concepts	2	C,D	3	1
9.	The design model –Architectural design- Software	1	C	3	1
10.	Component level design-user interface design	2	C,D	3	1
11.	User Interface Design	2	C,D	3	1
12.	Pattern oriented design-Web application design	2	C,D	3	1
UNIT IV: SOFTWARE IMPLEMENTATION AND TESTING		**9**			
13.	Modern Programming Language Features – Implementation Issues and Solutions	1	C	4	4
14.	Structured coding Techniques-Coding Styles - Standards and Guidelines- Documentation Guidelines	2	C	4	4,2
15.	Software Testing strategies on Conventional software ,Object	3	C,D	4,5	1

	oriented software and Web applications				
16.	Validation Testing- System Testing- Art of Debugging.	3	C,D	4,5	1
UNIT V: SOFTWARE MAINTANENCE AND EMERGING TRENDS IN SOFTWARE ENGINEERING					**9**
17.	Software maintenance and Reengineering	4	C	4,5	1
18.	Latest Trends: Technology evolution - Identifying Soft trends	2	C	4,5	1
19.	Technology directions-Tools related trends	3	C	4,5	1
Total Contact Hours		**45**			

LEARNING RESOURCES:	
Sl. No.	**TEXT BOOKS**
1.	Roger S Pressman, "Software Engineering – A Practitioner's Approach", 7th edition, Tata McGraw Hill Education, 2014.
2.	Ian Somerville "Software Engineering", 9th edition, Pearson Education, 2010.
	REFERENCE BOOKS/OTHER READING MATERIAL
3.	Hans Van Vliet, "Software Engineering: Principles and Practices", Wiley 2008.
4.	Richard Fairley, "Software Engineering Concepts", Tata McGraw Hill Education, 2008.

17PCS311L	**OPERATING SYSTEMS LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact hours - 30	**0**	**0**	**2**	**1**
PURPOSE					
This laboratory course gives a complete understanding of the operating systems principles and its Implementations					
INSTRUCTIONAL OBJECTIVES					
1.	To implement Scheduling algorithms				
2.	To implement deadlock algorithms and page replacement algorithms				
3.	To simulate memory management schemes, Threads and synchronization				

Sl. No.	**Description of experiments**	**Contact hours**	**C-D-**	**IOs**	**Reference**

			I-O		
1.	Write programs using the following system calls of Linux operating system: Fork, exec, getpid, exit, wait, close, stat, opendir, readdir	2	D,I	1	6
2.	Write programs using the I/O system calls of Linux operating system (open, read, write,etc), ls, grep Commands	2	D,I	1	6
3.	Simulate the following CPU scheduling algorithms a. Round Robin b) SJF c) FCFS d) Priority	4	D,I	2	1,3,5
4.	Simulate file allocation strategies a. Sequential b) Indexed c) Linked	4	D,I	4	1
5.	Simulate Memory partitioning using MVT and MFT	4	D,I	4	1,3,5
6.	Implementation of Bankers Algorithm for Dead Lock Avoidance	2	D,I	3	1,3,5
7.	Simulate an Algorithm for Dead Lock Detection	2	D,I	3	1,3,5
8.	Simulate page replacement algorithms a. FIFO b) LRU c) LFU	4	D,I	4	1,3,5
9.	Simulate File Organization Techniques a) Single level directory b) Two level c) Hierarchical	2	D,I	5	1
10.	Simulate Paging Technique of memory management.	2	D,I	4	1,3,5
11.	Simulate Shared memory and IPC	2	D,I	4	1
12.	Implement Threading & Synchronization Applications	1	D,I	2	1
	Total contact hours	**30**			

LEARNING RESOURCES	
Sl. No.	**TEXT BOOKS**
1.	William Stallings, "Operating Systems – internals and design principles", Prentice Hall, 7thEdition, 2011.(Ch 1-9,11,12).
2.	William Stallings "Operating Systems – Internals and design principles", Pearson Education, 5th Edition.
	REFERENCE BOOKS/OTHER READING MATERIAL
3.	Andrew S. Tannenbaum & Albert S. Woodhull, "Operating System Design and Implementation", Prentice Hall , 3rd Edition, 2006.
4.	Andrew S. Tannenbaum, "Modern Operating Systems", Prentice Hall,3rd Edition,2007.
5.	Silberschatz, Peter Galvin, Greg gagne "Operating System Principles", Wiley India, 7th Edition, 2006.
6.	Unix Command Reference Guide

17PIT312L	COMPUTER NETWORKS LABORATORY	L	T	P	C
	Total Contact Hours - 30	**0**	**0**	**2**	**1**

PURPOSE

This laboratory course deals with the implementation aspects of Networking and their applications.

INSTRUCTIONAL OBJECTIVES

1.	To develop TCP Socket Programming, UDP applications and to implement File Transfer Protocols
2.	To utilize RMI and Routing Algorithms

Sl. No.	Description of Experiments	Contact Hours	C-D-I-O	IOs	Reference
1.	IP Addressing and subnetting (VLSM)	2	D,I	1-4	1,2
2.	LAN Configuration using straight through and cross over cables	2	D,I	3	2
3.	Basic Router Configuration (Creating Passwords, Configuring Interfaces)	2	I	1	2

4.	Static and Default Routing	4	I	1	2
5.	RIPv1	4	I	2	1,2
6.	RIPv2	2	I	2	1,2
7.	EIGRP Configuration, Bandwidth, and Adjacencies	4	I	2	2
8.	EIGRP Authentication and Timers	2	I	2	2
9.	Single-Area OSPF Link Costs and Interface	2	I	2	1,2
10.	Multi-Area OSPF with Stub Areas and Authentication	2	I	2	2
11.	Redistribution Between EIGRP and OSPF	2	I	2	2
12.	MODEL EXAMINATION	2			
	TOTAL CONTACT HOURS	30			

Sl.No	LEARNING RESOURCES
1.	Behrouz A. Forouzan, “Data Communications and Networking” 5th edition, July 1, 2010, ISBN: 9780073376226
2.	Todd Lammle, “CCNA Study Guide”, Edition7, Publication Date: April 5, 2011 ISB: 10:0470901071 ISBN:13: 9780470901076
3.	William Stallings, “Data and Computer Communications”, Edition 9, 2010.

SEMESTER V

17PCS314	COMPILER DESIGN	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Core				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	To acquire analytical ability in solving mathematical problems as applied to the respective branches of Engineering.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course,the students would be able to								
1.	Learn the fundamentals of the Design of Compilers by applying mathematics and engineering principles	a						
2.	Design a system for parsing the sentencesin a compiler grammar	c						
3.	Design a systemto translate intovarious intermediate codes	c						
4.	Analyze the methods of implementing a Code Generator for compilers	a	c					
5.	Analyze and Design the methods of developinga Code Optimizer	a	c					

Session	**Description of Topic**	**Contact hours**	**C-D-I-O**	**IOs**	**Reference**
UNIT I:INTRODUCTION TO COMPILER & AUTOMATA		**9**			
1.	Compilers – Analysis of the source program	1	C	1	1,2
2.	Phases of a compiler – Cousins ofthe Compiler	1	C	1	1
3.	Groupingof Phases – Compiler construction tools	1	C	1	1
4.	LexicalAnalysis – Role of Lexical Analyzer	1	C	1	1,2
5.	Input Buffering– Specification of Tokens-design of lexical analysis (LEX)	1	C,D	1	1
6.	Finite automation(deterministic &non deterministic) -Conversion of regular expression of NDFA – Thompson's	2	C,D	1	1,2,3,4,5
7.	Conversion of NDFA toDFA- minimization of NDFA	1	C,D	1	1,2,3,4,5

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
8.	Derivation -parsetree-ambiguity	1	C	1	1,2,3,4,5
UNIT II:SYNTAX ANALYSIS – PARSING		**10**			
9.	Definition - role ofparsers -top down parsing-bottom-upparsing	1	C	2	1,2
10.	Leftrecursion - leftfactoring-Handle pruning, Shift reduceparsing	1	C	2	1,2
11.	LEADING- TRAILING-Operator precedenceparsing	1	C,D	2	2
12.	FIRST- FOLLOW	1	C	2	1,2,3,4,5
13.	Predictive parsing	1	C,D	2	1,2,3,4,5
14.	Recursive descent parsing	1	C,D	2	1
15.	LR parsing–LR (0) items - SLR parsing	2	C,D	2	1,2,3,4,5
16.	CanonicalLR parsing	1	C,D	2	1,2
17.	LALR parsing	1	C,D	2	1,2
UNIT III:INTERMEDIATE CODE GENERATION		**9**			
18.	Intermediate Languages -prefix- postfix-Quadruple - triple -indirecttriples	1	C	3	1,2,3,4,5
19.	Syntaxtree- Evaluation of expression - three-addresscode	1	C	3	1,2
20.	Synthe sized attributes –Inherited attributes	1	C	3	1,2
21.	Intermediate languages –Declarations	1	C,D	3	1,2
22.	Assignment Statements	1	C,D	3	1,2,3,4,5
23.	Boolean Expressions	2	C,D	3	1,2,3,4,5
24.	Case Statements	1	C,D	3	1
25.	Back patching– Procedure calls.	1	C,D	3	1
UNIT IV:CODE GENERATION		**9**			
26.	Issues in the design ofcode generator.	1	C,D	4	1
27.	The target machine– Runtime Storage management	2	C,D	4	1
28.	Basic Blocksand Flow Graphs	1	C	4	1,2,3,4,5
29.	Next-use Information –Asimple Code generator	1	C,D	4	1
30.	DAG representation of Basic Blocks	1	C,D	4	1,2,3
31.	Peephole Optimization	1	C	4	1
32.	Cross Compiler – T diagrams	1	C,D	4	1
UNIT V:CODE OPTIMIZATION		**9**			
33.	Introduction–Principal Sources of Optimization	1	C	5	1
34.	Optimization of basic Blocks	1	C,D	5	1,2,3

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
35.	Loop Optimization	2	C,D	5	1,2,3
36.	Introduction to Global Data Flow Analysis –	1	C	5	1
37.	Runtime Environments – Source Language issues	1	C,D	5	1
38.	Storage Organization	1	C,D	5	1
39.	Storage Allocation strategies – Access to non-local names	1	C	5	1
40.	Parameter Passing.	1	C	5	1
Total contact hours		**45***			

LEARNING RESOURCES	
Sl.No.	**TEXT BOOKS**
1.	Alfred V Aho , Jeffery D Ullman , Ravi Sethi, "Compilers , Principles techniques and tools ",Pearson Education 2011
2.	S.Godfrey Winster, S.ArunaDevi, R.Sujatha, "Compiler Design", Yesdee Publishing Pvt.Ltd, 2016
REFERENCE BOOKS / OTHER READING MATERIAL	
3.	K.Muneeswaran , ,"Compiler Design", Oxford Higher Education, Fourth edition 2015
4.	David Galles, "Modern Compiler Design", Pearson Education, Reprint 2012.
5.	RaghavanV.,"Principles of Compiler Design", Tata McGraw Hill Education Pvt.Ltd., 2010.

17PIT302	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book / Codes/Standards	NIL				
Course Category	Professional Core				
Course designed by	Department of Information Technology				
Approval	Academic Council Meeting, 2017				

PURPOSE	Designing database for different applications is an important area to focus. This course helps students to understand the limitations of file processing system and how a database management system overcomes the same. Learning various design tools and design techniques, along with a query language, makes a course on Database Management Systems complete and effective.

INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Understand the fundamentals of Database Management Systems	c						
2.	Provide the proof for good database design after carefully eliminating certain problems inherent in Initial Database Design.	c						
3.	Design Logical Database Schema and Mapping it to implementation level schema through Database Language Features.	c	i					
4.	Understand the practical problems of Concurrency control and gain knowledge about failures and Recovery	c						
5.	Learn the different types of databases	c						

Session	Description of Topic (Theory)	Contact Hours	C-D-I-O	IOs	Reference
UNIT I : INTRODUCTION		**7**			
1.	File Processing System, Advantages of DBMS over File Processing System	1	C	1	1
2.	Data, Database, DBMS, Data model, Data Independence, Data Catalog	1	C	1	1
3.	DBMS Architecture and Data Abstraction, DBMS Languages	2	C	1	1
4.	DBMS System Structure	1	C	1	1
5.	ER Model: Objects, Attributes and its Type, Entity and Entity Set, Relationship & Relationship Set	2	C,D	1	1
UNIT II : DATABASE DESIGN AND QUERY PROCESSING		**9**			
6.	Design Issues in choosing attributes or entity set or relationship set	1	D	2	1
7.	Constraints	1	C	2	1
8.	Super Key, Candidate Keys, Primary Key	1	C	2	1
9.	ER Diagram Notations, Goals of ER Diagram, Weak Entity Set, ER Diagram Construction	2	C,D	2	1
10.	Tabular Representation of Various ER Schema	1	C,D	2	1,2
11.	Overview of Query Processing	1	C	2	1
12.	Relational Algebra: Fundamental operations; Views	2	C	2	1
UNIT III : STRUCTURED QUERY LANGUAGE		**11**			
13.	SQL: Overview, The Form of Basic SQL Query	1	C,I	3	1
14.	UNION, INTERSECT, and EXCEPT	2	C,I	3	1
15.	Nested Queries	2	C,I	3	1
16.	Aggregate Functions, Null Values	2	C,I	3	1
17.	Complex Integrity Constraints in SQL	2	C	3	1
18.	Embedded SQL, Integrity Constraints, Object Oriented Database, Object Relational Database	2	C	3	1,3

UNIT IV: FUNCTIONAL DEPENDENCIES AND NORMAL FORMS	**9**

19.	Pitfalls in relational database, Decomposing bad schema, Need for Decomposition, Desirable Properties of Decomposition	2	C	3	1
20.	1NF, Super Key	1	C	3	1
21.	Functional dependency: Closure of Functional Dependency Set, Closure of Attribute Set, Minimal Functional Dependency Set	2	C	3	1
22.	2NF, BCNF, 3 NF, Denormalization	3	C	3	1
23.	Practical Database Design & Alternative Design techniques	1	C	3	1
UNIT V: TRANSACTION PROCESSING AND RECOVERY		**9**			
24.	File Structure: Overview of Physical Storage Media, Magnetic Disks	1	C	4	1
25.	RAID	2	C	4	1
26.	Transactions: Concurrency Control: Lock Based Protocols,	2	C	4	1
27.	Recovery System	2	C	4	1
28.	Introduction to Parallel and Distributed Databases, Spatial and multimedia databases.	2	C	5	1, 3
Total contact hours		**45***			

Sl. No.	**Learning Resources**
1.	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 6th Edition , 2010, McGraw-Hill, ISBN:0-07-352332-1
2.	Raghu Ramakrishnan, Johannes Gehrke, "Database Management System", 3rd Edition, 2007, McGraw Hill, ISBN: 978-0072465631
3.	Elmasri and Navathe, "Fundamentals of Database System", 6th Edition, 2010, Addison-Wesley Publishing, ISBN: 978-0136086208
4.	Date C.J, "An Introduction to Database", 8th Edition , 2003, Addison-Wesley Pub Co, ISBN: 978-0321197849
5.	Peter rob, Carlos Coronel, "Database Systems – Design, Implementation, and Management", 9th Edition, 2009, Thomson Learning, ISBN: 978-0538469685

17PCS312L	COMPILER DESIGN LABORATORY	L	T	P	C
	Total Contact Hours - 30	0	0	2	1

PURPOSE

The purpose of this course is to design the different stages of a Compiler and other system software.

INSTRUCTIONAL OBJECTIVES

1.	To design system software like assembler and macro processor.
2.	To design different phases of a Compiler.
3.	To implement the different parsing techniques of compiler.

Session	Description of the Experiments	Contact hours	C-D-I-O	IOs	Reference
1.	Converting a regular expression to NFA	2	D,I	1	1,2,3
2.	Conversion of Regular Expression to NFA	3	D,I	1	1,2,3
3.	Conversion of an NFA to DFA	3	D,I	1	1,2,3
4.	Computation of FIRST and FOLLOW sets	2	D,I	2	1,2,3
5.	Computation of Leading and Trailing Sets	2	D,I	2	1,2,3
6.	Construction of Predictive Parsing Table	2	D,I	2	1,2,3
7.	Construction of Recursive Descent Parsing	2	D,I	2	1,2,3
8.	Implementation of Shift Reduce Parsing	2	D,I	2	1,2,3
9.	Computation of LR(0) items	4	D,I	2	1,2,3
10.	Construction of DAG	2	D,I	4	1,2,3
11.	Intermediate code generation – Three Address Codes	2	D,I	3	1,2,3
12.	Intermediate code generation – Postfix, Prefix	2	D,I	3	1,2,3
	TOTAL CONTACT HOURS	**30**			

LEARNING RESOURCES	
Sl. No.	**TEXT BOOKS**
1.	Alfred V Aho , Jeffery D Ullman , Ravi Sethi, " Compilers , Principles techniques and tools ", Pearson Education 2011
2.	S.Godfrey Winster,S.Aruna Devi,R.Sujatha,"Compiler Design",Yesdee Publishing Pvt.Ltd, 2016
	REFERENCE BOOKS/OTHER READING MATERIAL
3.	K.Muneeswaran , ,"Compiler Design", Oxford Higher Education,Fourth edition 2015
4.	David Galles, "Modern Compiler Design", Pearson Education, Reprint 2012.
5.	Raghavan V., "Principles of Compiler Design", Tata McGraw Hill Education Pvt. Ltd., 2010.

17PIT313L	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
	Total Contact hours - 30	**0**	**0**	**2**	**1**

PURPOSE

This laboratory course gives a thorough understanding of the concepts of database design model and it gives a comprehensive understanding of using a query language.

INSTRUCTIONAL OBJECTIVES

1.	To Design a database system
2.	To study the usage of DDL and DML commands
3.	To learn about file backup and recovery

Sl. No.	Description of experiments	Contact Hours	C-D-I-O	IOs	Reference
1.	Creating database, table	2	D,I	3	1,2,3,4,5
2.	Working with Data Manipulation commands	2	I	3	1,2,3,4,5
3.	Basic SELECT statements	2	I	3	1,2,3,4,5
4.	Advanced SELECT statements	2	I	3	1,2,3,4,5
5.	Integrity and Constraints	2	I	3	1,2,3,4,5
6.	Joining Tables	4	I	3	1,2,3,4,5

7.	SQL functions	2	I	3	1,2,3,4,5
8.	Sub queries	2	I	3	1,2,3,4,5
9.	Views	2	I	3	1,2,3,4,5
10.	Basics of PL/SQL	4	I	3	1,2,3,4,5
11.	Design and Develop applications	4	D,I	3	1,2,3,4,5
12.	MODEL EXAM	2			
	TOTAL CONTACT HOURS	**30**			

Sl. No.	**LEARNING RESOURCES**
1.	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 6th Edition , 2010, McGraw-Hill, ISBN: 0-07-352332-1
2.	Raghu Ramakrishnan, Johannes Gehrke, "Database Management System", 3rd Edition, 2007, McGraw Hill, ISBN: 978-0072465631
3.	Elmasri and Navathe, "Fundamentals of Database System", 6th Edition, 2010, Addison-Wesley Publishing, ISBN: 978-0136086208
4.	Date C.J, "An Introduction to Database", 8th Edition , 2003, Addison-Wesley Pub Co, ISBN: 978-0321197849
5.	Peter rob, Carlos Coronel, "Database Systems – Design, Implementation, and Management", 9th Edition, 2009, Thomson Learning, ISBN: 978-0538469685

SEMESTER VI

17PIT304	WEB PROGRAMMING	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	Nil				
Data Book / Codes/ Standards	NIL				
Course Category	PROFESSIONAL CORE				
Course designed by	Department of Information Technology				
Approval	Academic CouncilMeeting, 2017				

PURPOSE	Web has become ubiquitous in nature. Organizations have integrated the Internet "seamlessly" into their information systems and the Web offers endless opportunity to do so. This course provides the basic concepts and techniques used to design, develop, and deploy web applications satisfying the requirements in terms of flexibility, availability and scalability.

INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Understand different internet Technologies, web 2.0 and create a basic website using HTML and Cascading Style Sheets	m	i					
2.	Design a dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms	j						
3.	Design a server side program using Servlets and JSP	k	l					
4.	Design a simple web page in PHP, and to present data in XML format.	k	l					
5.	Get overviews of java specific web services architecture and to enable rich client presentation using AJAX?	j						

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I : WEBSITES BASICS, HTML 5, CSS 3, WEB 2.0		**9**			
1.	Understanding Internet , Difference between websites and web server, Internet technologies Overview	1	C	1	1,2
2.	Understanding websites and web servers: Understanding the difference between internet and intranet	1	C	1	1,2
3.	Web 2.0: Basics, RIA Rich Internet Applications , collaborations tools	1	C	1	1,2
4.	HTML and CSS: HTML 5.0	3	D,I	1	1,2
5.	XHTML, CSS 3	3	D,I	1	1,2
UNIT II : JAVASCRIPT		**9**			
6.	An introduction to JavaScript, JavaScript DOM Model	2	C	2	1,5
7.	Built-in objects, Date and Objects	3	D,I	2	1,5
8.	Regular Expressions , Exception Handling, Validation	2	I	2	1,5
9.	Event Handling , DHTML with JavaScript	2	D,I	2	1,5
UNIT III : SERVER SIDE PROGRAMMING		**9**			
10.	Java Servlet Architecture, Servlet Life Cycle , Form GET and POST actions, Session Handling , Understanding Cookies, Installing and Configuring Apache Tomcat Web Server	3	C,D,I	3	1
11.	Understanding Java Server Pages, JSP Standard Tag Library(JSTL)	3	C	3	1
12.	Creating HTML forms by embedding JSP code	3	D,I	3	1
UNIT IV : PHP and XML		**9**			
13.	An introduction to PHP, Using PHP, Variables, Program control	1	C	4	1,3,5
14.	Built-in functions, Connecting to Database , Using Cookies, Regular Expressions	2	D,I	4	1,3,5
15.	Basic XML, Document Type Definition, XML Schema	3	C	4	1,3,5
16.	DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT	3	I	4	1,3,5

	Transformation, News Feed (RSS and ATOM)				
UNIT V : INTRODUCTION TO AJAX and WEB SERVICES		**9**			
17.	Introduction to Ajax , Ajax Client Server Architecture, XMLhttpRequest Object , Call Back Methods	3	C,D,I	5	1
18.	Introduction to Web Services, Java web services Basics, SOAP	2	C	5	1
19.	Creating, Publishing ,Testing and Describing a Web services(WSDL) , Consuming a web service	2	I	5	1
20.	Database Driven web service from an application	2	D,I	5	1
Total contact hours		**45***			

Sl. No.	**Learning Resources**
1.	Deitel, Deiteland Nieto, Internet and World Wide Web : How to Program, 5thEdition, 2012, Prentice Hall,. ISBN-13: 978-0-13-215100-9
2.	Stephen Wynkoop, Running a perfect website, QUE, 2ndEdition, 2001. ISBN 13: 9780789709448
3.	Chris Bates, Web Programming: Building Intranet applications, 3rdEdition,2009, Wiley Publications,. ISBN 13: 9780470017753
4.	Jeffrey C. Jackson, "Web Technologies A computer Science Perspective", 2011, Pearson, ISBN 9780133001976.
5.	www.W3Schools.com as on date: 18/04/2016

17PCS323	DISTRIBUTED COMPUTING	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Core				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic CouncilMeeting, 2017				

PURPOSE	To provide knowledge on principles and practice under lying in the design of distributed systems.							
INSTRUCTIONAL OBJECTIVES		**STUDENTOUTCOMES**						
At the end of the course,student will be able to								
1.	Layout foundations of Distributed Systems.	a						
2.	Get familiar with the idea of middle ware and related issues	a						
3.	Understand in detail the system level and support required for distributed system	a						
4.	Understand the issues involved in studying data and crypto graphic algorithms	a	e					
5.	Expose to the concept of design and implementation of distributed file systems	a	c					

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT I:INTRODUCTION		**7**			
1.	Introduction -overview of syllabus-Applications	1	C	1-5	1-3
2.	Examples of Distributed Systems	2	C	1	1
3.	Trendsin Distributed Systems	2	C	1	1
4.	Focus on resource sharing	1	C	1	1
5.	Challenges	1	C	1	1
UNIT II:COMMUNICATION IN DISTRIBUTED SYSTEM		**9**			
6.	System Model– Physicalmodel	1	C,D	2	1
7.	Architectural Model	1		2	1,3
8.	Fundamental Model	2	C,D	2	1
9.	Interprocess Communication	1	C,D	2	1
10.	External data representation and Multi cast communication	1	C,D	2	1
11.	API for internet protocols	1	C,D	2	1
12.	Network Virtualization: Overlay Networks	1	C,D	2	1
13.	Case Study: MPI	1	C,D	2	1
UNIT III:REMOTE METHOD INVOCATION AND OBJECTS		**10**			
14.	Remote Invocation – Introduction	1	C	3	1
15.	Request-reply protocols	1	C	3	1
16.	Remote procedure call	1	C	3	1
17.	Remote method invocation	1	C	3	1,2
18.	Design Issues	2	C,D	3	1
19.	Group communication -Publish-subscribe systems	2	C,D	3	1,3
20.	Shared memory approaches-Distributed objects	1	C	3	1,3
21.	Casestudy: CORBA	1	C	3	1
UNIT IV:SECURITY		**10**			
22.	Introduction - Overview of security techniques	1	C	4	1
23.	Crypto graphic algorithms	3	C,I	4	1
24.	Digital Signatures	2	C,I	4	1
25.	Crypto graphy pragmatics	2	C	4	1
26.	Case study: Kerberos	2	I	4	1
		9			

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT V: DISTRIBUTED FILE SYSTEM AND NAME SERVICES					
27.	Distributed File Systems – Introduction	1	C	5	1
28.	File service architecture	2	C,D	5	1
29.	Case study: Andrew File system	2	C	5	1
30.	Name Services - Introduction	1	C	5	1
31.	Name Services and Domain Name System	1	C	5	1
32.	Directory Services	1	C	5	1
33.	Case study: The X.500 Directory Service	1	C	5	1
Total Contact Hours		**45***			

LEARNING RESOURCES	
Sl.No	**TEXT BOOKS**
1.	George Coulouris,Jean Dollimore,TimKindberg,"Distributed Systems Concepts and Design"Fifthedition –2011-Addison Wesley.
REFERENCE BOOKS/OTHER READING MATERIAL	
2.	TanenbaumA.S., Van Steen M., " Distributed Systems: Principles and Paradigms" , Pearson Education,2007.
3.	Liu M.L.,"Distributed Computing, Principles and Applications",Pearson and education, 2004.

17PIT314L	**WEB PROGRAMMIMG LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact hours - 30	**0**	**0**	**2**	**1**
PURPOSE					
The purpose of this lab is to impart knowledge on various web technologies.					
INSTRUCTIONAL OBJECTIVES					
1.	To develop web pages.				
2.	To program Client side scripting languages				
3.	To implement Java servlets in web technology				

Sl. No.	Description of experiments	Contact Hours	C-D-I-O	IOs	Reference

1.	Create a simple webpage using HTML5 Semantic and Structural Elements	4	D,I	1	1,3,5
2.	Create a webpage using HTML5 Media Elements	2	D,I	1	1,3,5
3.	Add a Cascading Style sheet for designing the web page	2	D,I	1	1,3,5,
4.	Design a dynamic web page with validation using JavaScript	4	D,I	2	1,5
5.	Simple applications to demonstrate Servlets	2	D,I	3	1
6.	Simple applications using JSP and AJAX	4	D,I	3,5	1
7.	Design a simple online test web page in PHP	4	D,I	4	1,2,4
8.	Design simple application for accessing the data using XML	2	D,I	4	1,2,4
9.	Application for web services	4	D,I	5	1
10.	Model Exam	2			
	TOTAL CONTACT HOURS	**30**			

Sl. No.	**LEARNING RESOURCES**
1.	Deitel, Deitel and Nieto, Internet and World Wide Web : How to Program, 5thEdition, 2012, Prentice Hall,. ISBN-13: 978-0-13-215100-9
2.	Stephen Wynkoop, Running a perfect website, QUE, 2ndEdition,2001. ISBN 13: 9780789709448
3.	Chris Bates, Web Programming : Building Intranet applications, 3rdEdition,2009, Wiley Publications,. ISBN 13: 9780470017753
4.	Jeffrey C. Jackson, "Web Technologies A computer Science Perspective", 2011, Pearson, ISBN 9780133001976.
5.	www.W3Schools.com as on date: 18/04/2016

17PCS375L	MINOR PROJECT	L	T	P	C
		0	0	3	2
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Core				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	To obtain a hands- on experience in converting a small novel idea /technique in to a working model / proto type involving multi- disciplinary skills and / or knowledge and workingin atteam.	
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**
At the end of the course, student will be able		
1.	To conceptualisea novelidea / technique into a product	c
2.	To think in terms of multi-disciplinary environment	d
3.	To understand the management techniques of implementing a project	k
4.	Totakeonthechallenges of team work, prepare a presentation in a professionalmanner, and documentallaspectsofdesignwork.	g

Session	**Description ofTopic**	**Contac thours**	**C-D-I-O**	**IOs**	**Reference**
1.	A Multi disciplinary project to betaken up by a team of maximum often students. Development of prototype product, a 3D model, simulation, blueprint for a larger project and any other development work are permitted. The contribution of the individuals in the project should be clearly brought out. A combined report is to be submitted. A presentationis to be made for the reviewers on the work done by the candidate.		C,D,I	1,2,3,4	
Total contact hours					

SEMESTER VII

17PSE427E	WIRELESS AND MOBILE COMMUNICATION	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book /Codes/Standards	NIL				
Course Category	PROFESSIONAL CORE				
Course designed by	Department of Software and Engineering				
Approval	Academic Council Meeting, 2016				

PURPOSE	The purpose of learning this course is to know about the fundamental concepts of mobile communications and wireless networks technologies.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Apply wireless technology concepts to Engineering problems related to communication	A						
2.	Improve their knowledge on digital and analog modulation techniques.	A	C					
3.	Equip themselves familiar with principles of mobile communication	A						
4.	Familiarize with the digital cellular standards.	A	C					
5.	Expose to the emerging wireless technologies	A	B					

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT I: INTRODUCTION TO ANALOG AND DIGITAL MODULATION SCHEMES					**9**
1.	Introduction to wireless communication and Elements of a wireless communication system, signal and noise	2	C	1-2	1,2,3,4,5
2.	The radio _frequency spectrum- Analog modulation schemes - Amplitude modulation- frequency and phase modulation	3	C	2	1,2,3,4

3.	Introduction to Digital modulation - Frequency shift keying- Phase shift keying	2	C,D	2	1,2,3,4
4.	Multiplexing and Multiple access- Spread spectrum systems.	2	C,D	2	1,2,3,4
UNIT II: PRINCIPLES OF MOBILE COMMUNICATION					**9**
5.	Cellular concept- Cell area-signal strength and cell parameter-capacity of cell	2	C	2	1,3,4,6
6.	Co channel interference-Frequency reuse concept- Cell splitting – cell sectoring-multiple radio access protocols	2	C,D	2	1,2,3
7.	Frequency division Multiple Access – Time Division Multiple Access- Space Division Multiple Access-Code Division Multiple Access	3	D	2	2
8.	OFDM-Comparison of multiple division techniques.	2	D,I	1,2	2
UNIT III: DIGITAL CELLULAR STANDARDS					**9**
9.	GSM -frequency bands and channels- frames in GSM – Interfaces ,planes and layers of GSM	2	C	4	2
10.	Handoff-short messaging service-GPRS-EDGE-	2	D	4	1,2 WEB
11.	3G CELLULAR SYSTEMS-MMS-UMTS-Satellite system infrastructure-GPS-Limitations of GPS-Beneficiaries of GPS-	3	C.D	4	2
12.	4G cellular systems - **4G – STANDARDS(LTE/wimax)**	2	C,D	4	WEB R5,R6

UNIT IV: MOBILE NETWORK AND TRANSPORT LAYER					**9**
13.	Mobile IP-goals-IP Packet delivery-Tunneling-Reverse tunneling	2	C,D	3	T3
14.	IPV6-Dynamic host routing protocol	1	D	3	R6
15.	Traditional TCP-Congestion control-classical TCP-Snooping-Mobile TCP	2	D	3	T3
16.	Transaction oriented TCP-TCP over 2.5/3G Wireless Networks	2	C	3	T3
17.	Wireless Application protocol-architecture-wireless transport layer security-wireless markup language-Push architecture.	2	C,D	3	T3
UNIT V:EMERGING WIRELESS TECHNOLOGIES					**9**
18.	IEEE 802.11-IEEE802.15, Mobile ad hoc networks – Characteristics	2	D,I	5	2
19.	Routing-AODV ,VANETS - wireless sensor networks – RFID technology	3	D,I	5	2
20.	Wi –Fi standards – Wimax standards	2	C,D	5	2
21.	Femtocell network – Push -to – talk technology for SMS.	2	D,I	5	2
Total contact hours		**45**			

LEARNING RESOURCES	
Sl. No	**TEXT BOOKS**
1.	Roy Blake, "Wireless communication technology" CENGAGE Learning, sixth Indian reprint 2013.
2.	Dharma PrakashAgrawal , Qing –An Zeng , " Introduction to wireless and mobile systems" CENGAGE Learning, first edition 2014.
3.	Jochen Schiller, "Mobile Communications", Addision Wesley, 2nd Edition, 2011.
4.	Singal T.L. , "Wireless communication" Tata McGraw Hill Education private limited , 2011.
	REFERENCE BOOKS/OTHER READING MATERIAL
5.	Wireless Networks by NICOPOLITIDIS, M.S.OBAIDAT, G.I.PAPADIMITRIOX, A.S.POMPORTSIS, John wiley and sons LTD, STUDENT EDITION
6.	WIRELESS TELECOMMUNICATIONS SYSTEMS AND NETWORKS BY Gray J.Mullet, Cengage Learning,Reprint 2014.
7.	UpenaDalal, "Wireless communication" Oxford University press, first edition 2009.
8.	KavehPahlavan & Prashant Krishnamurthy, "Wireless Networks" PHI.
9.	MartynMallick, "Mobile and Wireless Design Essentials", Wiley Dreamtech India Pvt. Ltd., 2004.

17PCS496L	**MAJOR PROJECT**	**L**	**T**	**P**	**C**
		0	**0**	**24**	**12**
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Core				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	The Major Project experience is the culminating academic endeavor of students who earn a degree in their Undergraduate Programs. The project provides students with the opportunity to explore a problem or issue of particular personal or professional interest and to address that problem or issue through focused study and applied research under the direction of a faculty member. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired in his / her academic program to real – world issues and problems. This final project affirms students ability to think critically and creatively, to solve practical problems, to make reasoned and ethical decisions, and to communicate effectively.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
Attheend ofthecourse,studentwillbeable								
1.	To provide students with the opportunity to apply the knowledge and skills acquired in their courses to a specific problem or issue.	a	c		e	f		i
2.	To allow students to extend their academic experience in to areas of personal interest, working with new ideas, issues, organizations, and individuals.	a	c		e	f		i
3.	To encourage students to think critically and creatively about academic, professional, or social issues and to further develop their analytical and ethical leadership skills necessary to address and help solve these issues.	a	c		e	f	h	i
4.	To provide students with the opportunity to refine research skills and demonstrate their proficiency in written and / or oral communication skills.	a	c		e	f	g	i
5.	To take on the challenge softeam work, prepare a presentation in a professional manner, and document all aspects of design work.			d			g	

Session	Description ofTopic	Contact hours	C-D-I-O	IOs	Reference
	i. The Major project is a major component of our engineering curriculum: it is the culmination of the program of study enabling the students to showcase the knowledge and the skills they have acquired during the previous four years, design a product / service of significance, and solve an open-ended problem in engineering. ii. Each student must register to the project course related to his or her program iii. MajorProjectcourseconsistsofonesemesteran d would be allowedto registeronlyduringthe finalyearofstudy. iv. The Major Project may be initiated during the pre-final semester but will be assessed and credits transferred only during the last semester of study, upon completion of all other degree requirements. Generally the under graduate major project is a team base done. v. Each team in the major project course will consist of maximum of 5 students. vi. Each project will be assigned a faculty, who will act as the supervisor. vii. The projects hall be driven by realistic constraints like that related to economic, environmental, social, political, ethical, health & safety, manufacturability and sustainability. viii. Each group must document and implement a management structure. Group leadership roles must be clearly identified including who has responsibility for monitoring project deliverables and group coordination. ix. A group project may be interdisciplinary, with students enrolled in different engineering degrees, or in Engineering plus other faculties such as Management, Medical and Health Sciences, Science and Humanities.		C,D,I, O	1,2, 3,4, 5	

	x. Each student team is expected to maintain a log book that would normally be used to serve as a record of the way in which the project progressed during the course of the session. xi. Salient points discussed at meetings with the supervisor (i.e.,suggestions for further meetings, changes to experimental procedures) should be recorded by the student in order to provide a basis for subsequent work. xii. The log book may be formally assessed; xiii. The contribution of each individual team member will be clearly identified and the weight age of this component will be explicitly considered while assessing the workdone. xiv. A project report is to be submitted on the topic which will be evaluated during the final review. xv. Assessment components will be as spelt out in the regulations. xvi. The department will announce a marking scheme for awarding marks for the different sections of the report. xvii. The project report must possess substantial technical depth and require the students to exercise analytical, evaluation and design skills at the appropriate level.				

ELECTIVES FOR FIFTH SEMESTER

17PCS325E	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Elective				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	To acquire knowledge about the procedure of digital image data acquisition, processing, analysis, and their application							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, students will be able to								
1.	Understand the digital image fundamentals.	a						
2.	Improve their ability in image enhancement and restoration	a	e					
3.	Equip themselves familiar with image segmentation and compression	a	e					
4.	Familiarize with the image representation and recognition	a	e					
5.	Develop codes for various image processing techniques / applications using MATLAB Image Processing Toolbox	a	b	e				

Session	**Description of Topic**	**Contact hours**	**C-D-I-O**	**IOS**	**Reference**
UNIT I : DIGITAL IMAGE FUNDAMENTALS		**8**			
1.	Introduction – Digital Image Processing and overview of syllabus	1	C	1	1-7
2.	Origin – Fundamental Steps in Digital Image Processing – Components – Elements of Visual Perception	2	C,D	1	1,3,4
3.	Image Sensing and Acquisition– Image Sampling and Quantization	2	C,D	1	1,3,4
4.	Relationships between pixels	1	C	1	1,3,4
5.	Introduction to Image processing toolbox in MATLAB	2	C,I	1,5	2
UNIT II: IMAGE ENHANCEMENT		**10**			
6.	**Spatial Domain:** Gray level transformations	3	C	2	1,3,4

	–Histogram processing				
7.	Basics of Spatial Filtering –Smoothing and Sharpening Spatial Filtering	3	C	2	1,3,4
8.	**Frequency Domain:** Basics of filtering **–** Smoothing and Sharpening frequency domain filters.	2	C	2	1,3,4
9.	MATLAB code for histogram equalization, spatial and frequency domain filter.	2	C,I	2,5	2,3,4
UNIT III:IMAGE RESTORATION AND SEGMENTATION		**10**			
10.	Noise models – Mean Filters – Order Statistics – Adaptive filters –Band reject Filters – Band pass Filters – Inverse Filtering – Wiener	3	C	2,3	1,3,4
11.	**Segmentation:** Point, Line, and Edge Detection -Marr – Hildreth & Canny edge detector	2	C	2,3	1,3,4
12.	–Edge Linking and Boundary detection Local & Regional processing – Region based segmentation	2	C	2,3	1,3,4
13.	Morphological processing – Water shed segmentation algorithm.	1	C	2,3	1,3,4
14.	MATLAB code for restoring an image after degradation using adaptive and wiener filter – Edge detection operators	2	C,I	2,3,5	2,3,4
UNIT IV:WAVELETS AND IMAGE COMPRESSION		**9**			
15.	Wavelets – Subband coding– Multi resolution expansions	2	C	3	1,3,4
16.	**Compression:** Fundamentals – Image Compression methods –Huffman ,Arithmetic coding	2	C,D	3	1,3,4
17.	LZWcoding, Run Length Encoding, Block Transform coding, Waveletcoding, JPEG standard.	3	C,D	3	1,3,4
18.	MATLAB code for image compression: Huffman coding, Arithmetic coding, wavelet coding	2	C,I	3,5	2,3,4
UNIT V:IMAGE REPRESENTATION AND RECOGNITION		**8**			
19.	Boundary representation– Chain Code – Polygonal approximation, signature,	2	C	4	1,3,4

	boundary segments				
20.	Boundary description –Shape number– Fourier Descriptor	2	C	4	1,3,4
21.	Patterns and Pattern classes – Recognition based on matching	2	C,D	4	1,3,4
22.	MATLAB code for image boundary segments, Fourier Descriptor, Recognition based on matching	2	C,I	4,5	2,3,4
Total contact hours		**45***			

LEARNING RESOURCES	
Sl.No.	**TEXT BOOKS**
1.	Rafael C. Gonzales, Richard E.Woods,"Digital Image Processing",ThirdEdition,PearsonEducation, 2014.
REFERENCE BOOKS/OTHER READING MATERIAL	
2.	Rafael C. Gonzalez, RichardE. Woods, StevenL.Eddins,"Digital Image Processing UsingMATLAB",Third EditionTata Mc Graw Hill Pvt.Ltd., 2011.
3.	Jayaraman S, Esaki Rajan S, T.VeeraKumar,"Digital Image Processing",Tata McGraw Hill Pvt.Ltd.,SeventhReprint, 2012.
4.	S.Sridhar,"Digital Image Processing",Oxford UniversityPress, 2015.
5.	Anil Jain K."Fundamentals of DigitalImage Processing",PHI LearningPvt.Ltd., 2015.
6.	Willliam K Pratt,"DigitalImage Processing", John Willey, 2014.
7.	http://eeweb.poly.edu/~onur/lectures/lectures.html.

17PIT324E	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	Nil				
Data Book / Codes/Standards	NIL				
Course Category	PROFESSIONAL ELECTIVE				
Course designed by	Department of Information Technology				
Approval	Academic Council Meeting, 2017				

PURPOSE	This course imparts the knowledge and skills necessary for developing mobile applications using the Android platform.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Understand the basics of Android devices and Platform.	i						
2.	Acquire knowledge on basic building blocks of Android programming required for App development.	k						
3.	Understand persistence Data storage mechanism in Android	j						
4.	Understand advanced application concepts like networking, Animations and Google Maps services etc.	j						
5.	Develop and publish Android applications in to Android Market	k						

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I: JAVA FX TECHNOLOGY FOR RICH CLIENT APPLICATIONS		**8**			
1.	Introduction: Introduction to mobile application development, trends, introduction to various platforms, introduction to smart phones	2	C	1	1,3,4
2.	Android platform: Android platform features and architecture, versions, comparison added features in each versions. ART(Android Runtime),ADB(Android Debug Bridge).	2	C	1	1,3,4

3.	Development environment/IDE: Android studio and its working environment, gradle build system, emulator setup	2	C	1	1,3,4
4.	Application anatomy: Application framework basics: resources layout, values, asset XML representation and generated R.Javafile, Android manifest file. Creating a simple application.	2	C	2	1,3,4
UNIT II : ANDROID UI DESIGN		**14**			
5.	GUI for Android: Introduction to activities, activities life-cycle, Android v7 support library form API21 for lower version support	2	C,I	1	1,3,4
6.	Intent :intent object, intent filters ,adding categories, linking activities, user interface design components	4	C,I	1	1,3,4
7.	Views and View Groups: Basic views, picker views, adapter views, Menu, App Bar etc, basics of screen design; different layouts. App widgets.Lollipop Material design: new themes, new widgets, Card layouts. Recycler View	4	C,I	1	1,3,4
8.	Fragments: Introduction to activities, activities life-cycle.	4	C,I	1	1,3,4
UNIT III: DATA PERSISTENCE		**10**			
9.	Different Data persistence schemes: Shared preferences, File Handling, Managing data using SQLite database	6	C,I	3	1,3,4
10.	Content providers: user content provider, Android in build content providers.	4	C,I	2	1,3,4
UNIT IV: BACK GROUND RUNNING PROCESS, NETWORKING AND TELEPHONY SERVICES		**14**			
11.	Services: introduction to services – local service, remote service and binding the service, the communication between service and activity, Intent Service.	2	C,I	3	1,3,4
12.	MultiThreading: Handlers ,AsyncTask	4	C,I	3	1,3,4
13.	Android network programming :HttpUrlConnection, Connecting to REST-based and SOAP based Web services	4	C,I	3	1,3,4

14.	Broad cast receivers: Local Broadcast Manager, Dynamic broadcast receiver, System Broadcast. Pending Intent, Notifications	2	C,I	3	1,3,4
15.	Telephony Manager:Sending SMS and making calls.	2	C,I	3	1,3,4
UNIT V: ADVANCED APPLICATIONS		**14**			
16.	Location based services: Google maps V2 services using Google API,	2	C,I	4	1,3,4
17.	Animations and Graphics: Property Animation ,View Animations, Drawable Animations	2	C,I	4	1,3,4
18.	Media and Camera API: Working with video and audio inputs, camera API	2	C,I		1,3,4
19.	Sensor programming: Motion sensors, Position sensors, Environmental sensors.	4	C,I	4	2
20.	Publishing Android Apps: Guide lines, policies and process of uploading Apps to Google play	4	O	5	1,3,4
Total contact hours		**45***			

Sl. No.	**LEARNING RESOURCES**
1.	Dawn Griffiths, David Griffiths,*"Head First: Android Development" ,OReilly2015,ISBN*: 9781449362188
2.	Greg Milette, Adam Stroud, "PROFESSIONAL Android™ Sensor Programming", John Wiley and Sons, Inc2012, ISBN /978111265055, 9781280678943, 978111227459
3.	Paul Deital, Harvey Deital, Alexander Wald, "Android 6 for Programmers ,App Driven approach", 2015, Prentice Hall ,*ISBN*: 9780134289366
4.	http://developer.android.com/training/index.htmlas on Date 21.4.2016

17PSE322E	E-COMMERCE	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book /Codes/Standards	NIL				
Course Category	PROFESSIONAL ELECTIVE				
Course designed by	Department of Software Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	Big corporations and financial institutions use the internet to exchange the financial data to facilitate domestic and international business. Data integrity and security are very hot and pressing issues for Electronic commerce. This course provides better understanding of the technical aspects and process of E-commerce.			
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**		
At the end of the course, student will be able to				
1.	Distinguish the E-Commerce framework and business model applications	a	g	h
2.	Outline the Infrastructure of E-commerce	g		
3.	Apply security algorithms	e	k	
4.	Identify and operate e-payment mechanisms	i		

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I: INTRODUCTION		**7**			
1.	Introduction to E- Commerce	1	C	1	1
2.	Generic Framework of E- Commerce	1	C	1	1
3.	Business Models	2	C	1	1
4.	Consumer Oriented E- Commerce Applications	2	C	1	1
5.	Mercantile Process Models	1	C	1	1
UNIT II: NETWORK INFRASTRUCTURE AND MOBILE COMMERCE		**9**			
6.	Network Infrastructure for E-Commerce	1	C	1,2	1,3
7.	Market forces behind I Way, Component of I way Access Equipment	2	C	1,2	1,3
8.	Global Information Distribution Network	1	C	2	2
9.	Broad band Telecommunication (ATM, ISDN, Frame Relay).	2	C	2	2

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
10.	Mobile Commerce, Mobile Computing Application	2	C	2	2
11.	Wireless Application Protocols, WAP Technology	1	C,D	2	2
UNIT III: WEB SECURITY		**10**			
12.	Security Issues on Web- World Wide Web & Security	2	C,D	2,3	1
13.	Importance of Firewall- Components of Firewall,	2	C,I	3	2
14.	Factors to consider in Firewall Design-Limitations of Firewalls	2	C,D	2,3	2
15.	Transaction Security- Client Server Network	2	C	3	2
16.	Emerging Client Server Security Threats-Network Security.	2	C	3	2
UNIT IV: SECURITY		**10**			
17.	Encryption Techniques	1	C	3	2
18.	Symmetric Encryption- Keys and Data Encryption standard, Triple encryption,	3	C,D	3	2
19.	Asymmetric encryption- Secret Key Encryption, Public and Private pair key encryption	3	C,D	3	2
20.	Digital Signatures-Virtual Private Network (VPN	3	C,D	2,3	2
UNIT V: ELECTRONIC PAYMENTS		**9**			
21.	Overview of Electronics payments, The SET Protocol, Payment Gateway, Certificates	2	C	4	1,4
22.	Digital Token, Smart Cards, Credit Cards, Magnetic Strip Cards, E-Checks, Credit/ Debit card EPS	2	C,D	4	1,4
23.	Mobile Payments, Online Banking, Home banking, Emerging financial Instruments,	2	C,D	4	1,4
24.	EDI Application in Business, E-commerce laws, Forms ofAgreement, Government Policies and Agenda	2	C,D	4	2,5
25.	E-Commerce Strategy in Business Models and InternetStart-ups: A Business Case Study.	1	O	4	2,5

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
Total Contact Hours		**45**			

LEARNING RESOURCES:	
Sl. No.	**TEXT BOOKS**
1.	Ravi Kalakota and Andrew B Whinston, "Frontiers of Electronic Commerce", Pearson Education, 2013
2.	Greenstein and Feinman, "E-Commerce", TMH,2001
REFERENCE BOOKS/OTHER READING MATERIAL	
3.	Denieal Amor, "The E-Business Revolution", Addison Wesley, Second edition 2002.
4.	Bajaj & Nag, "E-Commerce: The Cutting Edge of Business", TMH,Second Edition 2005
5.	DiwanParag / Sharma Sunil , "E-commerce :A Manager's Guide to E-Business"First edition 2000

17PIT345E	**LINUX INTERNALS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Co-requisite:	NIL				
Prerequisite:	Nil				
Data Book / Codes/Standards	NIL				
Course Category	PROFESSIONAL ELECTIVE				
Course designed by	Department of Information Technology				
Approval	Academic Council Meeting, 2017				

PURPOSE	This course enables the student to understand the kernel- buffers and file representation, process control and scheduling and memory management policies in Unix.

INSTRUCTIONAL OBJECTIVES		STUDENT OUTCOMES						
At the end of the course, student will be able to								
1.	Understand the kernel structure of Unix operating system	k						
2.	Understand the concepts of buffers and file system internal structures	j						
3.	Understand the concepts of process structure and process scheduling	j						
4.	Understand the concepts of kernel memory management policies	j						

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Text Books
UNIT I : INTRODUCTION TO UNIX KERNEL		**6**			
1.	History and system structure , user perspective and operating system services	2	C	1	1
2.	Kernel architecture of Unix	1	D	1	1
3.	Unix system concepts	2	D,I	1	1
4.	Kernel data structure and system administration	1	C	1	1
UNIT II : FILE REPRESENTATION INTERNALS AND SYSTEM CALLS		**11**			
5.	Introduction to file system algorithms and inodes	1	C	2	1
6.	Structure of a regular file: context of inode	1	C,D	2	1
7.	Directories and super blocks, path name to inode conversion	1	C	2	1
8.	Introduction to system calls and algorithms	2	C,D	2	1
9.	System calls: open and read, write and close.	3	C	2	1

10.	Mounting file systems, crossing mount point file paths, unmounting file systems and file system maintenance.	3	C	2	1
UNIT III : KERNEL BUFFER CACHE		**6**			
11.	Buffer headers	1	C	2	1
12.	Structure of buffer pool	1	I	2	1
13.	Buffer retrieval scenarios	1	C,D	2	1
14.	Reading and writing disk blocks	1	C	2	1
15.	Buffer cache implementations and analysis	2	C,I,O	2	1
UNIT IV: PROCESS STRUCTURE, SCHEDULING, CONTROL AND MEMORY MANAGEMENT		**13**			
16.	Structure of process**:** process states and transitions	1	C	3	1
17.	System memory layout	2	C,D,I	3	1
18.	Context of a process, introduction to process control and creation	2	C	3	1
19.	Signals	1	C,I	3	1
20.	System boot and init process, process scheduling	3	C	3	1
21.	Terminal drivers	1	C	3	1
22.	Memory management policies: swapping , memory management policies: demand paging	3	C,I	3	1
UNIT V: MULTI PROCESS AND DISTRIBUTED UNIX SYSTEM		**9**			
23.	Introduction to multi process systems, master and slave processors	2	C	3	1
24.	Tunis system and performance, distributed Unix system : satellite processors	3	C	3	1
25.	Newcastle connection	2	C	3	1
26.	Transparent distributed file system, distributed file system : stub process	2	C	3	1
Total contact hours		**45***			
Sl. No.	**LEARNING RESOURCES**				

1.	Maurice J.Bach, The Design of the UNIX Operating System, Pearson Education 1990. ISBN 13: 9780132017572.
2.	UreshVahalia, UNIX Internals: The New Frontiers, Pearson Education 2003, ISBN-13: 978-0131019089
3.	Behrouz A. Forouzan, UNIX and Shell Programming, Cengage Learning 2009, ISBN-13: 978-0534391553
4.	http://www.ee.surrey.ac.uk/Teaching/Unix/ as on Date 26 -04-2016
5.	http://www.cs.sfu.ca/~ggbaker/reference/unix/ as on Date 26 -04-2016
6.	http://www.tutorialspoint.com/unix/unix-getting-started.htm as on Date 26 -04-2016
7.	http://www.tutorialspoint.com/unix/unix-useful-commands.htm as on Date 26 -04-2016

17PSE334E	ADVANCED JAVA PROGRAMMING	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	Nil				
Data Book /					
Codes/Standards	NIL				
Course Category	PROFESSIONAL ELECTIVE				
Course designed by	Department of Software Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	Having a hands on core java programming concepts, this course reviews advanced concepts in programming that motivate the students to build innovative applications. This course explores the skills required to develop J2EE enterprise applications using the Java programming language.			
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**		
At the end of the course, student will be able to				
1.	Design interactive applications with GUI Components such asJava FX.	d		
2.	Make effective use of Java networking API to communicate between processes using network sockets	c		
3.	Develop database applications using JDBC	c		
4.	Designing Java Sever Pages and Java Servlet	i		

5.	Understand Java Reflection API and XML DOM Parser related toIndustry trends.	c		

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I: JAVA GUI PROGRAMMING USING JAVA FX		**9**			
1.	Basics of Java FX	1	C	1	1-4
2.	Java FX and Containers	2	C	1	1-4
3.	Frames, Layout Manager	1	C	1	1-4
4.	Menus and Toolbars	2	C	1	1-4
5.	Event Handling	2	C	1	1-4
6.	Review of Unit I	1			
UNIT II: JAVA DATABASE CONCEPTS(JDBC 4)		**9**			
7.	Database Architecture : Components of JDBC – Two Tier/Three Tier Architecture Processing SQL Statements	1	D	3	1-4
8.	Establish Connection : [Using Driver Manager class,Connection URLs], Types – Concurrency – Read columnvalues from rows – Updating rows in a result set	1	D	3	1-4
9.	Create a statement – Execute Query – Process Result Set,Reading from and modifying values in a Result Set	2	D	3	1-4
10.	Handling SQL Exceptions : Contents of SQLException object, Retrieving warnings using SQLWarning object	2	D	3	1-4
11.	Statements Creating Prepared Statement object – Assignvalues for Prepared Statement parameters	3	I	3	1-4
UNIT III: JAVA NETWORKING		**9**			
12.	URL: Creating and Parsing URL – URLConnection :Connecting to a URL	1	D	2	1-4
13.	Reading from and Writing to aURLConnection.	1	C	2	1-4
14.	Socket: Server Socket/Socket class	1	C	2	1-4
15.	InetAddress. Datagram's: Writing a datagram client andserver	2	C	2	1-4
16.	Datagram Socket, Datagram Packet – Broadcasting tomultiple recipients	2	D	2	1-4

17.	Multicast Socket-SSL and HTTPS in Java,RMI	2	D	2	1-4
UNIT IV: JAVA SERVER SIDE TECHNOLOGIES		**9**			
18.	Overview of JSP2.2 and Servlet 3.1	1	C	4	1-4
19.	Creating dynamic WebPages using JSP and Servlet- Standard Tag Library	2	I	4	1-4
20.	Database Access- XML Data	2	I	4	1-4
21.	Java Beans - Custom Tags - Expression Language – Annotations	2	C	4	1-4
22.	Debugging - Security – Internationalization	2	C	4	1-4
UNIT V: REFLEXTION API & JAVA XML		**9**			
23.	Introduction to Java Reflextions API	1	I	5	1-4
24.	Introspection	1	I	5	1-4
25.	Dynamic Proxies	1	I	5	1-4
26.	Dynamic class loading and reloading	2	I	5	1-4
27.	Java XML: XML Processing	2	I	5	1-4
28.	SAX and DOM Parser	2	I	5	1-4
Total Hours		**45**			

LEARNING RESOURCES:	
Sl. No.	**TEXT BOOKS**
1.	Carl Dea, Mark Heckler, GerritGrunwald, José Pereda, Sean Phillips *"Java FX8: Introduction by Example" Apress 2nd Edition 2014*
2.	Kogent Learning Solutions Inc, "Java Server Programming Java EE 7 (J2EE 1.7), Black Book", dreamtechpress 2015
3.	Elliotte Rusty Harold,"Java Network Programming, 4th Edition "O'Reilly Media, Final Release Date: October 2013Developing Networked Applications
4.	Paul Deital, HarveyDeital," Java How to Program. "10th Edition,2015
5.	http://pdf.coreservlets.com/
6.	https://docs.oracle.com/javase/tutorial

ELECTIVES FOR SIXTH SEMESTER

17PCS330E	HUMAN COMPUTER INTERACTION	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Elective				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	The purpose of this course is to make the students knowledge able in the area of designing, implementing and using interactive computer systems and how effective design of human computer interfaces influence individuals and organizations.

INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**							
At the end of the course, student will be able to									
1.	Understand the basic HCI concepts and various design process, standards and guidelines	a							
2.	Perform implementation support and evaluation of their design	k							
3.	Learn various models like Brain computing	a							
4.	Learn various dialogue notations and importance of group ware	a							

Session	**Description of Topic**	**Contact hours**	**C-D-I- O**	**IOs**	**Reference**
UNIT I : FOUNDATIONS		**9**			
1.	The Human – Input – output channels – Human Memory	2	C	1	1
2.	Thinking – emotions – Psychology & design of inter active systems	1	C	1	1
3.	Computer–Textentry devices	1	C	1	1
4.	Positioning, Pointing & drawing	1	C	1	1
5.	Display devices for Virtual reality,3D	1	D	1	1
6.	Interaction – models– Frame works & HCI	1	C	1	1
7.	Ergonomics – Interaction style	1	C	1	1
8.	WIMP Interfaces –context	1	C	1	1
9.	Paradigms for Interaction	1	C	1	1

UNIT II : SOFTWARE PROCESS & DESIGN RULES		**9**			
10.	Interaction design basics –user focus – scenarios	1	C	2	1,3
11.	Navigation – screen design & layout	1	C	2	1
12.	HCI in software process – life cycle	1	C	1	1
13.	Usability engineering	1	C	1	1,3
14.	Interactive design & proto typing	1	C	2	1,2
15.	Design rules –Principles for usability– standards	1	C	1	1
16.	Guide lines	1	C	1	1
17.	Golden rules	1	C	1	1
18.	HCI patterns	1	C	1	1
UNITIII: IMPLEMENTATION & USER SUPPORT		**9**			
19.	Implementation support–Windowing system elements	1	C	2	1,2
20.	Using tool kits –user interface management	1	C	2	1,2
21. .	Evaluation techniques – goals	1	C	2	1
22.	Expert analysis – choosing a method	1	C	2	1
23.	Universal design principles	1	C	2	1
24.	Multimodal interaction,user support	1	C	2	1
25. .	Usersupport–requirements	1	C	2	1
26.	Approaches –adaptive helpsystems	1	C	2	1
27.	Designing user support system	1	C	2	1
UNIT IV: COGNITIVE,COMMUNICATION & COLLABORATIVE MODELS		**9**			
28.	Cognitive models – Goal & task hierarchies	1	D	3	1,4
29.	Linguistic models – Physical & device models – architectures	1	C	3	1,4
30.	Communication & collaboration models	1	C	3	1
31.	Face-to-face communication	1	C	3	1
32.	Conversation –text based	1	C	3	1
33.	Group working	1	C	3	1,4
34.	Brain computing Interface concepts	1	C	3	1,4
35.	Brain Signals-EEG	1	C	3	1,4
36.	BCIApplication – caseStudy	1	D	3	4

UNIT V : UBIQUITOUS COMPUTING, HYPER TEXT, WWW		9			
37.	Ubiquitous computing application research	1	C	4	1
38.	Virtual & augmented reality–	1	C	4	1
39.	Information & data visualization	1	C	4	1
40.	Understanding hyper text	1	C	4	1
41.	Finding things, WebTechnology & issues	1	C	4	1
42.	Static Web content and Dynamic Web content	1	C	4	1
43.	Group ware systems	1	C	4	1
44.	Computer mediated communication	1	C	4	1
45.	Frameworks for group ware	1	C	4	1
Total contact hours		**45***			

LEARNING RESOURCES	
Sl.No.	**TEXT BOOKS**
1.	AlanDix-JanetFinlay-GregoryD.Abowd and Russel Beale-*Human – Computer Interaction*,(3rdEdition),PearsonEducation,2004.
2.	BenShneiderman and Catherine Plaisant, *Designing the User Interface : Strategies for Effective Human-Computer Interaction* ,(5thEdition), Pearson Addison-Wesley, 2009.
REFERENCE BOOKS/OTHER READING MATERIAL	
3.	JohnM.Carrol,"*Human Computer Interactionin the New Millenium*", Pearson Education,2002
4.	Jonathan Worlpaw and Elizabeth Winter Wolpaw, "Brain – Computer Interfaces"Oxford University Press 2012.

17PIT326E	CLOUD COMPUTING	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book / Codes/Standards	NIL				
Course Category	PROFESSIONAL ELECTIVE				
Course designed by	Department of Information Technology				
Approval	Academic Council Meeting, 2017				

PURPOSE	To introduce emerging cloud computing and its techniques, its services and security concerns that will lead to design and development of various cloud service models

INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Understand the current trend and basics of cloud computing	i	j					
2.	Learn cloud enabling technologies and its applications	i	j					
3.	Explore different cloud mechanisms and get exposure to advanced clouds	j	l					
4.	Analyze the cost metrics, handle the security threats and construct different cloud delivery design models	k						

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I : CLOUD COMPUTING FUNDAMENTALS AND MODELS					**8**
1.	Introduction to Networking, Data communication, Cloud Computing, Origin of Cloud Computing, Basic Concepts and Terminology	3	C	1	1,2
2.	Goals and Benefits, Risks and Challenges, Roles and Boundaries, Cloud Characteristics	3	C	1,2	1,2

3.	Cloud Delivery Models, Cloud Deployment Models	2	C	1,2	1,2
UNIT II : CLOUD:ENABLING TECHNOLOGY AND APPLICATIONS					**7**
4.	Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology	2	C	2	1
5.	Web Technology, Multitenant Technology, Service Technology	2	C	2	1
6.	Applications, Cloud computing for Healthcare, Energy Systems, Transportation Systems, Manufacturing Industry, Government, Education and Mobile Communication	3	C	2	1,2
UNIT III : CLOUD COMPUTING MECHANISMS					**8**
7.	Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server: Cloud Storage Device, Cloud Usage Monitor, Resource Replication, Ready-Made Environment	3	C	2.3	1
8.	Specialized Cloud Mechanisms: Automated Scaling Listener, Load Balancer, SLA Monitor, Pay Per Use Monitor: Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi:Device Broker	3	C	2,3	1
9.	Cloud Management Mechanisms: Remote Administration System, Resource Management System, SLA Management System, Billing Management System	2	C	2,3	1
UNIT IV: COST METRICS AND CLOUD COMPUTING ARCHITECTURAL MODEL					**12**
10.	Cost Metrics and Pricing Models: Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management Considerations	2	C	4	1,2

11.	Service Quality Metrics and SLAs: Service Quality Metrics, SLA Guidelines	2	C	4	1,2
12.	Fundamental Cloud Architectures: Illustration with Case Study	2	C	1,2,3,4	1,2
13.	Design approaches with Case Study, Design methodology for IaaS Service Model, Google API	3	C,D,I	1,2,3,4	2,4
14.	Design methodology for PaaS Service Model, Study of SaaS Service Model	3	C,D,I	1,2,3,4	2,4
UNIT V: CLOUD SECURITY AND ADVANCED CLOUD CONCEPTS					**10**
15.	Fundamental Cloud Security: Basic Terms and Concepts, Threat Agents, Cloud Security Threats	2	C	4	1,2
16.	Cloud Security Mechanisms: Encryption, Hashing: Digital Signature, Public Key Infrastructure, Identity and Access Management	3	C,I	2,3,4	1,2
17.	Single Sign-On: Kerberos authentication, One-time password, Basic cloud data security mechanisms	3	C,I	2,3,4	1,2
18.	Advanced Clouds, Mobile Cloud, Media Cloud, Green Cloud	2	C	3	1,2
Total contact hours		**45***			

Sl. No.	LEARNING RESOURCES
1.	Thomas Erl, Zaigham Mahmood, Richardo Puttini, "Cloud Computing:Concepts, Technology and Architecture", Fourth Printing, 2014, Prentice Hall/PearsonPTR, ISBN: 9780133387520.
2.	ArshdeepBahga, Vijay Madisetti, "Cloud Computing: A Hands-On Approach", 2016, University Press, ISBN: 9780996025508.
3.	K.Chandrasekaran, "Essentials of Cloud Computing", 2014, Chapman and Hall/CRC Press, ISBN 9781482205435.

4.	Thomas Erl, Robert Cope, Amin Naserpour, "Cloud Computing Design Patterns", 2015, Prentice Hall/Service Tech Press, Pearson, ISBN: 978-0133858563.

17PSE327E	DISTRIBUTED OPERATING SYSTEMS	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book /Codes/Standards	NIL				
Course Category	PROFESSIONAL ELECTIVE				
Course designed by	Department of Software Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	Provides essential concepts of the principles of distributed systems and the functionalities of distributed operating system.			
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**		
At the end of the course, student will be able to				
1.	Recognize the essential concepts of distributed system.	a	e	
2.	Comprehend about the communication that takes place in Distributed systems	a	b	e
3.	Realize the necessity of synchronization, consistency and Fault tolerance in a Distributed System.	a	e	
4.	Value the Process management ,File systems, Shared memory	a	b	e
5.	Acquire apparent scheme regarding distributed object oriented based systems	a	e	

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I:FUNDAMENTALS OF DISTRIBUTED SYSTEMS					**8**
1.	Introduction to distributed systems, Goals of Distributed Systems	2	C	1	1,2
2.	Hardware Concepts-Bus-based, switched multiprocessors, Bus-based ,Switched microcomputers Software	2	C	1	1

	Concepts-Network Operating Systems, True				
3.	Distributed System and Time sharing Multiprocessor Operating System	2	C	1	1,2
4.	Design issues of distributed systems	2	C	1	1,2
UNIT II:COMMUNICATION IN DISTRIBUTED SYSTEMS					**9**
5.	Fundamentals of Communication systems, Layered Protocols	2	C	1,2	1
6.	ATM networks	1	C	1,2	1,2
7.	Client Server model - Blocking Primitives and Non-Blocking Primitives,	1	C	1,2	1
8.	Buffered Primitives and Un buffered Primitives	1	C	1,2	1,2
9.	Reliable and Un reliable primitives	1	C	1,2	1,2
10.	Message Passing	2	C,I	1,2	2
11.	Remote Procedure Call	1	C,I	1,2	1
UNIT III: SYNCHRONIZATION IN DISTRIBUTED SYSTEMS					**9**
12.	Clock Synchronization - Logical, Physical clocks, clock synchronization algorithms	2	C,I	1,3	1,4,5
13.	Mutual Exclusion – Centralized, Distributed,Token ring algorithms, comparison of three algorithms	2	C,I	1	1
14.	Election Algorithms – The Bully algorithm, ring algorithm	2	C,I	1	1,4
15.	Atomic transactions	1	C,I	1	1
16.	Deadlock prevention and detection in distributed systems	2	C,I	1	1
UNIT IV: PROCESSES ,FAULT TOLERANCE,DISTRIBUTED SHARED MEMORY					**12**
17.	Threads, System models Processor Allocation-Allocation models, Design issues for	1	C	1	1,2
18.	processor allocation algorithm, Processor allocation algorithms	4	C,D, I	1,4	1,3
19.	Scheduling in Distributed systems Fault tolerance- Component faults, system failures,	2	C,D, I	1,4	1,2,3
20.	synchronous versus asynchronous systems, fault tolerance using active replication and primary backup	3	C,D	1,3	1,2,4

21.	Consistency protocols, Page based distributed shared memory	2	C,D	1,3	1,2
UNIT V: DISTRIBUTED OBJECT BASED SYSTEMS, CASE STUDY					7
22.	Distributed object based systems- DOO Architecture, DOO Process, DOO Communication, Synchronization in Object Based Systems	4	C	1,5	1,2
23.	Distributed File Systems	1	C	1,4	1,2
24.	Case Study: Ameoba, MachOS, chorus, V-System	2	C	3,4,5	1,2
Total contact hours		**45**			

LEARNING RESOURCES:	
Sl. No.	**TEXT BOOKS**
1.	Andrew S. Tanenbaum, "*Distributed Operating Systems*", PearsonEducation, Reprint , 2011
2.	Pradeep K. Sinha, "*Distributed Operating Systems Concepts and Design*",PHI, 2012.
REFERENCE BOOKS/OTHER READING MATERIAL	
3.	MukeshSinghal, Niranjan G Shivratri "Advanced Concepts in Operating Systems", McGraw Hill International 2011.
4.	http://www.seas.gwu.edu/~jstanton/courses/cs251/
5.	http://cse.yeditepe.edu.tr/~sbaydere/courses_new/cse532/

17PCS338E	DATABASE SECURITY AND PRIVACY	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Elective				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	The course provides afoundation in database security and privacy.To design and implement security profiles, password policies, privileges and roles.Also to handle the issues in privacy.							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
Attheend of the course, student will be able								
1.	To understand the fundamentals of security, and how it relates to information systems	a	b					
2.	To learn good pass word policies, and techniques to secure passwords in anorganization	a	b	k				
3.	To handleprivacyissues	a	b	k				

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT I : SECURITY ARCHITECTURE & OPERATINGS YSTEMSECURITY FUNDAMENTALS		**8**			
1.	**Security Architecture**: Introduction-Information Systems - Database Management Systems	2	C	1	1,3
2.	Information Security Architecture - Database Security–Asset Types and value - Security Methods	2	C, D	1	1,3
3.	**Operating System Security Fundamentals**: Introduction – Operating System Overview-Security Environment –Components- Authentication Methods	2	C	1	1,3,5
4.	User Administration – Password Policies – Vulnerabilities – E – mail Security	2	D,I	1	1,3,5
UNIT II : ADMINISTRATION OF USERS & PROFILES,PASSWORD POLICIES,PRIVILEGES AND ROLES		**10**			
5.	**Administration of Users**- Introduction - Authentication -CreatingUsers	2	C, D	1	1,3
6.	SQLServer User-Removing, Modifying Users-Default	2	D,I	1	1,3
7.	Remote Users-Database Links-Linked Servers-Remote Servers-Practicesfor Administrators and Managers-BestPractices	2	C	1	1,3
8.	Profiles, Password Policies, Privileges and Roles: Introduction -Defining and Using Profiles-Designing and Implementing Password Policies	2	C, D,I	2	1,3
9.	Granting and Revoking User Privileges-Creating, Assigning and RevokingUser Roles-Best Practices	2	I	2	1,3
UNIT III : DATABASE APPLICATION SECURITY MODELS & VIRTUAL PRIVATE DATABASES		**9**			
10.	Database Application Security Models: Introduction-Types of Users-Security Models	2	C	2	1,3,5
11.	ApplicationTypes-Application Security Models-Data Encryption	2	C	2	1,3,5
12.	Virtual Private Databases:Introduction-Overview of VPD- Implementation of VPD using Views, Application Context in Oracle	2	C, D,I	2	1,3,5
13.	Implementing Oracle VPD- Viewing VPD Policies and Application contexts using Data Dictionary	2	D,I	2	1,3,5

14.	Policy Manager Implementing Row and Column level Security with SQL Server	1	D,I	2	1,3,5
UNIT IV :AUDITING DATABASE ACTIVITIES		**9**			
15.	Auditing Database Activities: Using Oracle Database Activities- Creating DLL Triggers with Oracle	3	D,I	2	1,3
16.	Auditing Database Activities with Oracle -Auditing Server Activity with SQL Server 2000	3	D,I	2	1,3
17.	Security and Auditing Project Case Study strategy	3	C	2	1,3
UNIT V : PRIVACY PRESERVING DATA MINING TECHNIQUES		**9**			
18.	Privacy Preserving Data Mining Techniques: Introduction - Privacy Preserving Data Mining Algorithms	2	C, D	3	2,4
19.	General Survey – Randomization Methods-Group Based Anonymization	3	C	3	2,4
20.	Distributed Privacy Preserving Data Mining-Curse of Dimensionality	3	C, D	3	2,4
21.	Application of Privacy Preserving Data Mining	1	C	3	2,4
Total contact hours		**45***			

LEARNING RESOURCES	
1.	.HassanA. Afyouni, “Database Security and Auditing”, Third Edition, Cengage Learning, 2009. (UNIT 1 toIV)
2.	Charu C. Aggarwal, Philip S Yu, “Privacy Preserving Data Mining”: Models andAlgorithms,Kluwer Academic Publishers, 2008.(UNIT V).
3.	Ron Ben Natan, ”Implementing Database Security and Auditing”, Elsevier Digital Press, 2005.
4.	http://charuaggarwal.net/toc.pdf
5.	http://adrem.ua.ac.be/sites/adrem.ua.ac.be/files/securitybook.pdf

17PCS331E	DATA MINING AND ANALYTICS	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
Course Category	Professional Elective				
Course designed by	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	To acquire knowledge of Datamining techniques							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, students will be able to								
1.	Understand the concepts of Data Mining	a						
2.	Familiarize with association rule mining	a						
3.	Familiarize various classification algorithms	a						
4.	Understand the concepts of Cluster analysis	a						
5.	Implement the Datamining concepts with various domains	a	k					

Session	Description ofTopic	Contact hours	C-D-I- O	IOs	Reference
UNIT I:INTRODUCTION		**9**			
1.	Introduction to Data Mining– Kinds ofData	2	C	1-4	1-3
2.	Data mining Functionalities –InterestingPatterns	2	C	1	1-3
3.	TaskPrimitives	1	C	1	1
4.	Issues in Data Mining	1	C	1	1
5.	Data Preprocessing	3	C	1	1,2,4
UNIT II: ASSOCIATION RULES		**8**			
6.	Basic Concepts	1	C	2	1,2
7.	FrequentItem Set Mining Methods	3	C	2	1,3
8.	Association Rules	2	C,I	2	1,3,4
9.	Correlation analysis	2	C	2	1,3
UNIT III: CLASSIFICATION AND PREDICTION		**9**			
10.	Issues Regarding Classification and Prediction	1	C	3	1,2,3
11.	Decision Tree Induction Classification	2	C,I	3	1,2,4
12.	Bayesian and Rule Based Classification	3	C,I	3	1,4
13.	Support Vector Machine	2	C,I	3	1,2,4
14.	Prediction	1	C	3	1,2
UNIT IV: CLUSTER ANALYSIS		**9**			

15.	What is Cluster Analysis	1	C	4	1
16.	Typesof Datain Cluster Analysis	2	C	4	1
17.	Categorization of Clustering Methods	3	C,I	4	1,2,4
18.	Hierarchical Methods	3	C,I	4	1,2
UNIT V: PLASTIC ANALYSIS		**10**			
19.	Applications and Trendsin Data Mining	3	C	5	1,2
20.	Machine learning	3	C,I	5	4
21.	Bigdata	2	C,I	5	5
22.	Cloud computing	2	C,I	5	6
Total contact hours		**45***			

LEARNING RESOURCES	
Sl.No.	**TEXT BOOKS**
1.	Jiawei Han and Micheline Kamber, "Data Mining – Concepts and Techniques", Second Edition, Morgan Kaufmann Publishers, 2006.
REFERENCE BOOKS/OTHER READING MATERIAL	
2.	M. H.Dunham,"Data Mining:Introductory and Advanced Topics", Pearson Education. 2001.
3.	D.Hand,H.MannilaandP. Smyth,"Principlesof Data Mining",PrenticeHall. 2001.
4.	I H. Witten and E.Frank,"Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann. 2000.
5.	Nathan Marz, James Warren, "BigData-Principles and best practices of scalable real-time data systems",Dream Tech Press,2015
6.	Arshdeep Bahga, Vijay Madisetti,"Cloud Computing:A Hands-On Approach", University Press ,2016

17PIT362E	INFORMATION STORAGE AND MANAGEMENT	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book / Codes/Standards	NIL				
Course Category	PROFESSIONAL ELECTIVE				
Course designed by	Department of Information Technology				
Approval	Academic Council Meeting, 2017				

PURPOSE	The main objective of this course is to demonstrate how the storage technology is evolving to meet the ever increasing demand for space from variety of information sources and the sheer volume. The course discusses the techniques available for effective management of storage and retrieval of data and also the backup and recovery techniques.

INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**							
At the end of the course, student will be able to									
1.	Identify the components of managing the data center and understand logical and physical components of a storage infrastructure	k							
2.	Evaluate storage architectures including storage subsystems	l							
3.	Understand the business continuity, backup and recovery methods.	k							
4.	Monitor the storage infrastructure and management activities	m							
5.	Understand the cloud computing services and models	l							

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNIT I : INTRODUCTION		**9**			
1.	Introduction to Information Storage Management, Evolution of Storage Technology	1	C	1	1
2.	Data Centre Infrastructure, Key challenges in managing information.	2	C	1	1
3.	Data Center Environment: Application, Database Management System (DBMS) - Host : Connectivity, Storage, Disk Drive Components	2	C	1	1
4.	Intelligent Storage System: Components of an Intelligent Storage System	2	C	1	1
5.	Storage Provisioning, Types of Intelligent Storage Systems.	2	C	1	1
UNIT II : STORAGE NETWORKING TECHNOLOGIES		**10**			
6.	Fiber Channel: Overview ,SAN and its Evolution, Components of FC SAN, FC Connectivity	2	C	2	1,3,5
7.	FC Architecture, IPSAN-iSCSI components, iSCSI Topologies, iSCSI Protocol Stack,iSCSI Names	2	C	2	1,2,5
8.	NAS: General Purpose Servers versus NAS Devices ,Benefits of NAS- File Systems and Network File Sharing, Components of NAS, NAS I/O Operation	2	C	2	1,3,5
9.	NAS Implementations, NAS File Sharing Protocols	2	C	2	1,3,5
10.	Object Based Storage Devices , Content addressed Storage	2	C	2	1
UNIT III : BUSINESS CONTINUITY AND BACK UP RECOVERY		**9**			
11.	Business Continuity: Information Availability ,BC Terminology, BC Planning life cycle.	2	C	3	1
12.	Failure Analysis, Business Impact Analysis	2	C	3	1

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
13.	Backup and Archive: Backup Purpose ,Backup Considerations, Backup Granularity	2	C	3	1
14.	Recovery Considerations, Backup Methods	1	C	3	1
15.	Backup Architecture, Backup and Restore Operations	2	C	3	1
UNIT IV : STORAGE SECURITY AND MANAGEMENT		**10**			
16.	Storage Security Framework and Domain	3	C	4	1
17.	Monitoring the Storage Infrastructure: Monitoring Parameters , Components Monitored	2	C	4	1
18.	Monitoring examples	2	C	4	1
19.	Storage Infrastructure Management Activities	1	C	4	1
20.	Storage Management Examples: Storage Allocation to a New Server /Host , File System Space Management	2	C	4	1
UNIT V : CLOUD COMPUTING		**7**			
21.	Cloud Enabling Technologies : Characteristics of Cloud Computing , Benefits of Cloud Computing	2	C	5	1,6
22.	Cloud Service Models, Cloud Deployment models	3	C	5	1,6
23.	Cloud computing Infrastructure, Cloud Challenges.	2	C	5	1,6
Total Contact Hours		**45***			

Sl. No.	LEARNING RESOURCES
1.	'EMC Corporation, "Information Storage and Management",2nd edition Wiley India, ISBN13: 978-1118094839
2.	UifTroppen Rainer Wolfgang Muller,"Storage Networks Explained", India, Wiley, 2010, ISBN13: 978-0470741436
3.	Robert Spalding,Storage Networks: The Complete Reference, Osborne, Tata McGraw Hill, 2003, ISBN-13: 978-0072224764
4.	Farley,'Building Storage Networks", Osborne, Tata McGraw Hill, 2009, ISBN-13: 978-0072130720
5.	Meeta Gupta, Storage Area network Fundamentals, Pearson Education Limited,2002, ISBN13: 978-1587050657
6.	Anthony T .Velte, Toby J.Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Fourth Reprint, Tata McGraw Hill Edition, 2010, ISBN-13: 978-0071626941

17PIT422E	INTERNET OF THINGS	L	T	P	C
		3	0	0	3
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book / Codes/Standards	NIL				
Course Category	PROFESSIONAL ELECTIVE				
Course designed by	Department of Information Technology				
Approval	Academic Council Meeting, 2017				

PURPOSE	We are surrounded by millions of things and devices. Internet of Things (IoT) is a technological need to interconnect all such devices, things with us anywhere, anytime. This course attempts to address the paradigm shift in technologies, standards and tools needed to achieve the interoperability and thereby develop applications							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Understand the basics of IoT and its application sectors	a						
2.	Understand M2M and IoT	a						
3.	Understand and become proficient in IoT platforms	a	i					
4.	Understand and apply IoT protocols appropriately	a	i					
5.	Design and develop IoT based applications	c	l					

Session	Description of Topic	Contact Hours	C-D-I-O	IOs	Reference
UNITI : INTRODUCTION AND CONCEPTS OF IOT					**8**
1.	Introduction to IOT, definition and characteristics of IOT, Overview of the syllabus	2	C	1	1
2.	Architecture of Internet of Things, Physical and logical design of IOT, IOT enabling technologies, IOT levels and deployment templates	3	C	1	1
3.	Domain specific IOTs, home automation, cities, environment, Domain specific IOTs, Energy, retail, agriculture, industry, health and lifestyle	3	C	1	1
UNIT II : IOT AND M2M COMMUNICATION		**12**			
4.	M2M, difference between IOT and M2M, ETSI M2M Architecture, system architecture	3	C	2	1
5.	ETSI M2M SCL resource structure, Security in ETSI M2M framework, SDN and NFV for IOT, IOT system management, need for IOT system management	5	C	2	1
6.	SNMP, Network operator requirements, NETCONF-YANG, IOT system management with NETCONF-YANG, IoT Design methodology-case study on IOT system for Weather Monitoring	4	C,I	2	1
UNIT III : IoT PLATFORMS		**9**			
7.	Introduction to Hardware used for IoT: Microcontrollers, Microprocessors, SoC, Sensors	4	C,I	3	1
8.	Introduction to Arduino, Pi, Spark, Intel Galileo	5	C,I	3	1

UNIT IV: IoT TECHNICAL STANDARDS AND PROTOCOLS					8
9.	RF Protocols: RFID, NFC;IEEE 802.15.4: ZigBee, Z-WAVE, THREAD; Bluetooth Low Energy (BLE), IPv6 for Low Power and Lossy Networks (6LoWPAN) and Routing Protocol for Low power and lossy networks (RPL)	3	C	4	1,2
10.	CoAP ,XMPP, Web Socket, AMQP, MQTT, WebRTC, PuSH	3	C	4	1,2
11.	Architectural Considerations in Smart Object Networking	2	C	4	5
UNIT V: DEVELOPING INTERNET OF THINGS		**8**			
12.	IoT platforms design methodology, IoT Physical devices and endpoints,	4	C	5	1
13.	IoT Systems: Logical design using Python, IoT physical servers and cloud offerings (Cloud computing for IoT)	4	C,I	5	1
Total contact hours		**45***			

Sl. No.	LEARNING RESOURCES
1.	Arshdeep Bahga, Vijay Madisetti, "Internet of Things, A Hands -on Approach", 1st Edition 2015, University Press, ISBN: 978-81-7371- 954-7
2.	Oliver Hersent, David Boswarthick, Omar Elloumy, "The Internet of Things",1st Edition ,2015,ISBN: 978-81-265-5686-1
3.	Michael Miller, "The Internet of Things, How Smart TVs, Smart Cars, Smart Homes, and Smart Cities are changing the World", First edition ,2015, Pearson , ISBN:978-93-325-5245-6
4.	https://thingsee.com/blog/quality-hardware-list-for-your-iot-projects, as on date: 25/04/16
5.	https://tools.ietf.org/html/rfc7452, as on date: 25/04/2016
6.	http://dret.net/lectures/iot-spring15/protocols, as on date: 25/04/2016
7.	http://iot.intersog.com/blog/overview-of-iot-development-standards-and-frameworks, as on date: 25/04/2016

17PCS423E	SOFTWARE DEFINED NETWORKS	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	NIL				
CourseCategory	Professional Elective				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	This course introduces software defined networking, an emerging paradigm in computer networking that allows a logically centralized software program to control the behavior of an entire network.

INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Differentiate betweent aditional networks and software defined networks	a						
2.	Understand advanced and emerging networking technologies	a	b	c				
3.	Obtain skills to do advanced networking research and programming	a	b	c				k
4.	Learn how to use software programs to perform varying and complex networking tasks	a	b	c				k
5.	Expand up on the knowledge learned and applyit to solve real world problems	a	b	g				

Session	**Description of Topic**	**Contacthours**	**C-D-I-O**	**IOs**	**Reference**
UNIT I: INTRODUCING SDN		**9**			
1.	SDN Origins and Evolution– Introduction – WhySDN?	1	C	1	1,4,5
2.	Centralized and Distributed Control and Data Planes	2	C	1	2,4,5
3.	The Genesis of SDN	2	C	1	1,4,5
4.	Introducing Mininet	4	D,I	3	1,2,3,7
UNIT II: SDN ABSTRACTIONS		**11**			
5.	How SDN Works	2	C,D	1,2	1,5,6
6.	The Open flow Protocol	1	C,D	2	1,2,3
7.	SDN Controllers: Introduction -General Concepts -VMware -Nicira-V Mware/ Nicira	1	D,I	3	1,2,3,5
8.	Open Flow – Related – Mininet -NOX /POX - Trema -Ryu-Big Switch Networks / Flood	2	D,I	3	1,2,3,5

	light				
9.	Layer3 Centric -Plexxi-Cisco OnePK	1	D,I	3	2
10.	Setting up the Environment and Implementation of Controllers in Mininet	4	D,I	3	1,2.3,8
UNIT III: PROGRAMMING SDN'S		**8**			
11.	Network Programmability	2	I,O	4	2,6
12.	Network Function Virtualization	2	I,O	2	2,5
13.	NetApp Development, Network Slicing	4	I,O	3,4	1,2,3
UNIT IV:SDN APPLICATIONS AND USE CASES		**11**			
14.	SDN in the Data Center	2	I	2	1,2,5
15.	SDN in Other Environments	1	I	2	1
16.	SDN Applications	2	I	5	1,2
17.	SDN UseCases	2	I	5	1,2,5
18.	The Open Network Operating System	4	D,I,O	3	1,2,3
UNIT V:SDN'S FUTUREAND PERSPECTIVES		**6**			
19.	SDN Open Source	2	C	2	1
20.	SDN Futures	2	C	1,5	1,6
21.	Final Thoughts and Conclusions	2	C	5	1,2
Total contact hours		**45***			

LEARNING RESOURCES	
Sl.No.	**TEXT BOOKS**
1.	Software Defined Networks: A Comprehensive Approach by Paul Goransson and ChuckBlack, Morgan Kaufmann Publications, 2014
2.	SDN - Software Defined Networks by Thomas D. Nadeau & KenGray, O'Reilly, 2013
3.	Software Defined Networking with Open Flow By Siamak Azodolmolky, Packt Publishing, 2013
REFERENCE BOOKS / OTHER READING MATERIAL	
4.	Feamster, Nick, Jennifer Rexford, and Ellen Zegura. "The road to SDN: anintellectual history of programmable networks. "ACMSIGCOMM Computer Communication Review 44.2 (2014):87-98.
5.	Kreutz, Diego, etal. "Software – defined networking: Acomprehensivesurvey. "Proceedings ofthe IEEE103.1(2015):14-76.
6.	Nunes, Bruno A A, etal. "Asurvey of software – defined networking: Past, present, and future of programmable networks. "Communications Surveys & Tutorials, IEEE16.3 (2014):1617-1634.
7.	Lantz, Bob, Brandon Heller, and Nick McKeown. "A networking laptop: rapid prototyping for software – defined networks. "Proceedings of the 9th ACMSIGCOMM Workshop on Hot Topicsin Networks.ACM,2010.

8.	Monsanto, Christopher, etal. "Composings oftware defined networks."Presented a spart of the 10th USENIX Symposiumon Networked Systems Design and Implementation (NSDI13). 2013.

17PCS425E	**SERVICE ORIENTED ARCHITECTURE**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Elective				
Coursedesignedby	Department of Computer Science & Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	To gain the basic principles of service orientated architecture							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Learn service oriented analysis techniques	a						
2.	Learn technology under lying the service design	k						
3.	Learna dvanced concepts in building SOA	c						
4.	Understand the Java Web services	a						
5.	To know about various Web services specification standards	b						

Session	Description of Topics	Contact hours	C D I O	IOs	Reference
UNIT I: FUNDAMENTAL OF SOA		**9**			
1.	Understand the Fundamental of SOA and Defining SOA: Introduction to SOA , Understand the necessity of SOA, Defining	1	C	1	1
2.	Explain the Evolution of SOA: Analyze the SOA timeline from XML to Web servicesto SOA, Describe abrief history about XML, Web Services and SOA	1	C	1	1
3.	Introduction to Service Oriented Enterprise (SOE):	1	C	1	1
4.	Comparing SOA to past architectures: Analyze the past architectures	1	C	1	1
5.	Understand the Basic concepts of SOA Architecture: Understand the Scope Of SOA and Analyze the SOA Reference Model	1	C	1	1
6.	Understand the Key Service characteristics of SOA: List the Key Service characteristics of SOA	1	C	1	1
7.	Understand the Anatomy of SOA: Analyze SOA architecture and Receive knowledge to establish the SOA environment	1	C	1	1
8.	Analyze how components in an SOA interrelate: Understand the SOA component and Analyze specific behaviors, and relationships among these components	1	C	1	1
9.	Understand the Technical Benefits and Business Benefits of SOA: List the Technical Benefits of SOA, and Assess Business Benefits of SOA	1	C	1	1

UNITII: WEB SERVICE AND SOA		9			
10.	Introduction to Web Services and Primitive SOA: Understand Web Service Framework with respect to SOA and List the Logical component soft he Web services framework	1	C	2	1
11.	Explain Service descriptions with WSDL layout: Analyze the WSDL Services with SOA and Identify and Categorize the Meta data and servic e contracts	1	C	2	1
12.	Explain Messaging with SOAP: Analyze the SOAP Protocol and SOA and Describe the SOAP nodes and message path	1	C	2	1
13.	Understand the Message exchange Patterns and Coordination: Analyze the Web Services a Activity Management, Coordination types and coordination protocols	1	C	2	1
14.	Explain about Atomic Transactions: categorize the ACID properties and analyze atomic transaction with SOA	1	C	2	1
15.	Understand Business activities with SOA: analyze business activities and protocols	1	C	2	1
16.	Understand the advanced concepts of Orchestration and Choreography: Receive knowledge on advanced concepts of Orchestration and Choreography	1	C,I	2	1
17.	Understand Service layer abstraction: Analyze the Service layer configuration scenarios	1	C,I	2	1
18.	Understand Application Service Layer :problems solved by layering services Analyze Business Service Layer and Orchestration Service Layer: Analyze the casestudy Scenarios	1	C,I	2	1

UNIT III: BUILDING SOA		9			
19.	Understand basic phases of the SOA delivery life cycle: Explain the various SOA Delivery Strategies and analyze top – down strategy, bottom – up strategy and agilestrategy with Prosand cons	1	C,D	3	1
20.	Introduction to service – oriented analysis and process steps: Analyze the Objectives and service-oriented process steps	1	C,D	3	1
21.	Understand the Business – centric SOA and Deriving business services -service modelling: List the Benefits of a business -centric SOA and Identify Sources from which business	1	C-D	3	1
22.	Introduction to service-oriented design: Objectives of service – oriented design and Understand various technology under lying the	1	C-D	3	1
23.	Introduction to WSDL language basics: Define the structure of WSDL and implement sample WSDL file	1	C	3	1
24.	Introduction to SOAP basics: Recognize SOAP language basics Define the structure of SOAP and Implement SOAP style webservices in Java.	1	C	3	1
25.	Understand SOA composition guidelines: List the SOA Composition Guidelines and Evaluate the preliminary steps to composing SOA and choosing service layers and standards	1	C	3	1
26.	Understand the Entity – centric business service design: List the step – by – step process	1	C	3	1
27.	Explain Application service design: List the Application service design process steps Describe Task centric business service design: categorize the Task –	1	C	3	1

	centric business service design process steps				
UNIT IV: JAVA WEB SERVICES		**9**			
28. .	Introduction to SOA support in J2EE: Understand the SOA platform basics and building blocks	1	C	4	1-4
29. .	Overview of Java API for XML-based web services (JAX-WS): Receive knowledge on creation of SOA compliant webservice using Java API for XML - based webservices (JAX-WS)and acquire hands -on experience.	1	C	4	1-4
30. .	Introduction to Java Architecture for XML binding (JAXB): Building webservices and client with examples	1	C	4	1-4
31. .	Introduction to Java API for XML Registries (JAXR)	1	C	4	1-4
32. .	Overview of Java API for XML based RPC (JAX-RPC)	1	C	4	1-4
33.	Explain Web Services Interoperability	1	C	4	1-4
34.	Introduction to SOA support in .NET: Receive knowledge on NET Platform overview	1	C	4	1-4
35.	Overview of ASP.NET webservices: Understand the ASP.NET Programming Basics and Creating a WebSite Using Visual Studio IDE	1	C	4	1-4
36.	Analyze the Case Studies: Implement the Small Business Customer Management application as a web applications using ASP.NET Overview of Web Services Enhancements (WSE)	1	C	4	6

UNIT V: WS*SPECIFICATION STANDARDS & SECURITY		9			
37.	Introduction toWS-BPEL basics:Basic terms usedin theBPELterminology	1	C	5	1-7
38.	WS-Coordination overview	1	C	5	1-7
39.	Introduction to WS-Choreography	1	C	5	1-7
40.	Describe the WS-Policy with SOA	1	C	5	1-7
41.	Overview of WS Security	1	C	5	1-7
42.	Overview of Notification and Eventing	1	C	5	1-7
43.	Explain about Transaction Management	1	C	5	4
44.	Analyze the Case study-SOA in cloud	1	C	5	4
45.	Research issues: Analyze the research focus on SOA and issues Comparative Analysisof SOA and Cloud Computing	1	C	5	4
Total contact hours		**45***			

17PCS434E	NETWORK SECURITY	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Elective				
Coursedesignedby	Department of Computer Science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	To understandthe various types services i.e. Confidentiality, Authentication, Data Integrity, Non-Repudiation and Access control and the mechanisms used to mitigate the security risks							
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Ability to understand the application of mathematic sincry ptography	a						
2.	Understand the mechanism used in the classical encryption	a	b					

	system and different type of block ciphermode of operation							
3.	Abilityto encrypt / decrypta message using Secret Key and Public Key Cryptography	a	b					
4.	Understand the various types of authentication algorithm	a						
5.	Understand the security measure taken over Internet security	j						
6.	Understand the various types of vulnerabilities and detection system	j						

Session	Description ofTopic	Contact hours	C-D-I-O	IOs	Reference
UNIT I: SECRET KEY CRYPTOGRAPHY		**9**			
1.	Classical Encryption Techniques, SDES	3	D,I	1,2	1,3,5
2.	Block Cipher and Data Encryption Standard (DES)	3	D	2,3	1,3,5
3.	Attack, Linear Cryptanalysis	1	D	3	2,5
4.	Block Cipher Operation and AES	2	D	2,3	1,3,5
UNIT II: PUBLIC KEY CRYPTOGRAPHY		**9**			
5.	Mathematical Background for Cryptography	3	C	1	2,3
6.	Fermat'sand Euler'sTheorems, Testing for Primality	1	C	1	1,3
7.	Public Key Cryptography and RSA	2	D,I	3	1,2,3
8.	Discrete Logarithm and its application	1	C	1	2,3
9.	Elliptic Curve Cryptography	2	C,D,I	3	2.3
UNIT III: AUTHENTICATION		**9**			
10.	Cryptographic Hash	1	D,I	4	2,4,5
11.	Key Management	2	D,I	3	2,4,5
12.	Authentication	4	D,I	4	2,4,5
13.	Secure Hash Algorithm(SHA)	2	D,I	4	1,4,5
UNIT IV: INTERNET SECURITY		**9**			
14. .	IP Security– IPSec	2	C	5	2,4
15.	Transport Layer Security	1	C	5	2,4
16.	Wireless LAN Security	2	C	5	2,4
17.	CellPhone Security	1	C	5	2,4
18.	Web Service Security	3	C	5	2,4

UNIT V: VULNERABILITY AND INTRUSION DETECTION SYSTEM		**9**			
19.	Non-Cryptographic Protocol Vulnerabilities	2	C	6	2
20.	Software Vulnerabilities	2	C	6	2
21.	Virus, Worms and otherMalwares	2	C	6	2
22.	Firewall	1	C	6	2
23.	Intrusion Prevention and Detection	2	C	6	2
Total contact hours		**45***			

LEARNING RESOURCES	
Sl. No.	**TEXT BOOKS**
1.	Williams Stallings "Cryptography and Network Security– Principles and Practice", Sixth Edition, Pearson Publication,2016
2.	Bernard Menezes "Network Security and Cryptography", Cengage Learning, Third Impression 2014
REFERENCE BOOKS/OTHER READING MATERIAL	
3.	Atul Kahate "Cryptography and Network Security", Tata McGraw Hill Publication Company Limited, 2006
4.	Charlie Kaufman etal "Network Security– Private Communication in a Public World", Second Edition, PHI Learning Private Limited, 2011
5.	Charles P. Pfleegeretal "Security in Computing", Third Edition, Pearson Education, 2004

17PCS424E	**SEMANTIC WEB**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/Codes/Standards	Nil				
CourseCategory	Professional Elective				
Coursedesignedby	Department of Computer science and Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	Thiscourse provides the students with the concepts to create the SemanticWeb include a systematic treatment ofthe differentlanguages like XML,RDF,OWL,and rules and technologies (explicitmetadata, ontologies, and logic and inference) that are central toSemantic Web development.

INSTRUCTIONAL OBJECTIVES		STUDENT OUTCOMES						
At the end of the course, student will be able to								
1.	Understand the XML technologies, RDF and OWL	a	i					
2.	Developsemantic web application usingprotégé	a	i					
3.	Developsemantic web services	a	i					

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNITI: THE SEMANTICWEB VISION		**9**			
1.	Levels of semantics, Semantic Web Technologies – Layered Architecture.	3	C	2	1
2.	Thinking and Intelligen tWeb applications tools. The information age.	3	C,D	2	1
3.	Today's World Wide Web Limitations, syntacticweb, data-unstructured, semistructured and structured	3	C,D	1	2
UNIT II: ONTOLOGY DEVELOPMENT		**9**			
4.	The role ofXML– XML and the web– Web services – XML technologies – XML revolution – Structuring with schemas –presentation technologies.	4	C,D	1	5 and 6
5.	Introduction to RDF,Syntaxfor RDF, Simple Ontologies inRDFSchema,An Example.	2	C,D	1	1,2,3,5,6 and7
6.	Queryingin RDF. OWL language – OWL Syntax and Intuitive Semantics, OWL Species, examples.	3	C,D	2	1,23,5,6`and7,
UNIT III : ONTOLOGY RULESAND QUERYING		**9**			
7.	Ontology tools- Ontology development using protégé, Description Logics, Automated Reasoning with OWL	2	C,D	2	1,2,3,4,5,6and7,
8.	Exercises – First – Order Rule Language, Combining Rules with OWLDL.	4	C ,D,I	2	1,2 3,4,5,6and7,
9.	SPARQL: Query Language for RDF, Conjunctive Queries for OWLDL, Exercises, Ontology Engineering.	3	C,D,I	2	1,2 3,4,5,6and7,

UNIT IV: SEMANTIC WEB SERVICE		**9**			
10.	Semantic webservice concepts	3	C	1	5 and 6
11.	Representation mechanisms for semantic webservices	3	C,D	1	5 and 6
12.	WSMO– WSDL-S – Relatedwork in thearea of semantic webservice frameworks.	3	C, D	3	5 and 6
UNIT V: SEMANTIC WEB SERVICE DISCOVERY		**9**			
13.	Short comings and limitation of conventional webservice discovery	2	C	3	5 and 6
14.	Centralized discovery architecture – P2P discovery architecture– Algorithm approaches	4	C,D	3	5 and 6
15.	Web service modelingontology– Conceptual model forservice discovery–Discovery based on semantic descriptions	3	C,D	3	5 and 6
Total contact hours		**45***			

LEARNING RESOURCES	
1.	Grigoris Antoniou and Frank Van Harmelen, "A Semantic Web Primer", The MIT Press, Cambridge, Massachusetts London, England, 2004.
2.	Pascal Hitzler, Markus Krötzsch and Sebastian Rudolph ,"Foundations of Semantic Web Technologies" Chapman & Hall / CRC, 2009.
3.	Toby Segaran, Colin Evans, Jamie Taylor, "Programming the Semantic Web BuildF lexible Applications with Graph Data," O'Reilly Media,2009.
4.	www.semanticweb.org
5.	Frank. P. Coyle, "XML,Web Services and the data revolution", Pearson Education, 2002.
6.	Jorge Cardoso,"Semantic webservices: Theory, tools and applications", Information science, 2007.
7.	Michael C, Daconta, LeoJ.Obrstand KevinT. Smith, "The semantic Web: A guide to the future of XML, web services,and knowledge management", John wiley & sons, 2003.

17PCS426E	PATTERN RECOGNITION TECHNIQUES	L	T	P	C
		3	0	0	3
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book/ Codes/ Standards	Nil				
Course Category	Professional Elective				
Course designed by	Department of Computer Science Engineering				
Approval	Academic Council Meeting, 2017				

PURPOSE	This course provide a way to learn the various pattern recognition techniques and their applications	
INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**
At the end of the course, students will be able to		a
1.	Understand the fundamentals of Pattern Recognition techniques	a
2.	Learn Statistical models of Pattern Recognition	a
3.	Understand the principles of Clustering approaches to Pattern Recognition	a
4.	Understand the Syntactic Pattern Recognition techniques	a c k
5.	Understand the Neural Network approachto Pattern Recognition	a c k

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
UNIT I: INTRODUCTION TO PATTERN RECOGNITION		**8**			
1.	Pattern and features , Classification, Description, Pattern Mappings	1	C	1	1,2,3
2.	Patterns and Feature Extraction with examples	1	C	1	1,2,3
3.	Classifiers, Decision Regions, Boundaries	1	C	1	1,2,3
4.	Training and learning in pattern recognition systems	1	C	1	1,2,3
5.	Pattern recognition approaches , Statistical pattern recognition, Syntactic pattern recognition , Neural pattern recognition, Comparison	2	C	1	1
6.	Black Box approaches , Reasoning driven pattern recognition	1	C	1	1,2

UNIT II: STATISTICAL PATTERN RECOGNITION		**10**			
7.	Introduction to Stat PR, Statistical models, Gaussian case and Class Dependence	1	C	2	1
8.	Discriminant Functions – Uniform Densities – Classifier Performance, Riskand Errors	1	C	2	1
9.	Supervised learning– Parametric estimation –Maximum Likelihood Estimation	1	C	2	1
10.	Bayesian parameter estimation	1	C	2	1
11.	Nonparametric approaches – Density estimation	1	C	2	1
12.	Parzen Windows , k-nn Nonparametric estimation	1	C	2	1
13.	Nearest Neighbor Rule	1	C	2	1
14.	Linear Discrimant Functions, Fisher's Linear Discriminant– Discreteand Binary Classification problems	2	C	2	1
15.	Techniques to directly obtain Linear Classifiers	1	C	2	1
UNIT III: UNSUPERVISED LEARNING AND CLUSTERING		**8**			
16.	Formulation of unsupervised problems, Unsupervised Learning Approaches	2	C	3	1
17.	Clustering for unsupervised learning and classification, c-means algorithm	1	C	3	1
18.	Learning Vector Quantization, Formal Characterization of General Clustering Procedures	2	C	3	1
19. .	Clustering Strategies , Cluster Swapping Approaches	1	C	3	1
20.	Hierarchical clustering procedure	1	C	3	1

UNIT IV: SYNTACTIC PATTERN RECOGNITION		**11**			
21.	Syntactic Pattern Recognition, Grammar based approaches, Formal Grammars, Types of Grammars	2	C	4	1
22. .	String generation as Pattern Description	1	C	4	1
23.	Recognition by String Matching and Parsing,	1	C	4	1
24. .	Cocke-Younger-Kasami (CYK) Parsing Algorithm	1	C,D	4	1
25. .	Augmented Transition Networks, High Dimensional Grammars, Stochastic Grammars and applications	2	C	4	1
26.	Graph based structural representations, GraphIsomorphism	2	C	4	1
27.	Attributed Graphs, Match Graphs, Cliques, Structural Unification using attributed graphs	2	C,D	4	1
UNIT V:NEURAL PATTERN RECOGNITION		**9**			
28.	Neural Networks fundamentals, Learning in Neural networks, Physical Neural Networks	1	C	5	1
29.	Artificial Neural Networks model, activation functions, weights,	1	C	5	1
30.	Neural Network based Pattern Associators, CAM , Linear Associative Mappings, Different approaches	2	C	5	1
31. .	Hetero associative memory design, Hebbian learning	1	C,D	5	1
32. .	Feed forward Network Architecture, Trainingin Feed forward networks, GDR, Derivation of Delta Rule	2	C,D	5	1
33.	Back propagation Algorithm, Pattern Associat or for Character Classification	2	C,D	5	1
Total contact hours		**45***			

LEARNING RESOURCES	
Sl.No	**TEXT BOOK**

1.	RobertJ, Schalkoff, "Pattern Recognition: Statistical, Structural and Neural Approaches", John Wiley & SonsInc.,New York, Reprint2014.
REFERENCE BOOKS/OTHER READING MATERIAL	
2.	EarlGose, Richard Johnson baugh, SteveJost, "Pattern Recognition and Image Analysis", Prentice Hall of India Private Ltd., New Delhi– 110 001, 1999.
3.	DudaR.O. and HartP.E.,"Pattern Classification and Scene Analysis", Wiley, New York, 1973