

**M.KUMARASAMY COLLEGE OF ENGINEERING (Autonomous) – KARUR 639113**

**B.E. – COMPUTER SCIENCE AND  
ENGINEERING**

**REGULATION 2016**

**CURRICULUM AND SYLLABUS**

**M.KUMARASAMY COLLEGE OF ENGINEERING (Autonomous) – KARUR 639113**

<b>M.KUMARASAMY COLLEGE OF ENGINEERING (AUTONOMOUS), KARUR – 639 113</b>									
<b>CURRICULUM and SYLLABUS</b>									
<b>Regulations</b>		<b>R 2016</b>							
<b>Programme Name</b>		<b>B.E. COMPUTER SCIENCE AND ENGINEERING (CS)</b>							
<b>SEMESTER I</b>									
<b>Course Code</b>	<b>Course Name</b>	<b>Category</b>	<b>Hours / Week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CA</b>	<b>ES</b>	<b>TOTAL</b>
<b>THEORY</b>									
16HS101	Technical English I	HS	3	0	0	3	50	50	100
16BS101	Engineering mathematics I	BS	3	2	0	4	50	50	100
16BS102	Engineering Physics	BS	3	0	0	3	50	50	100
16BS103	Applied Chemistry	BS	3	0	0	3	50	50	100
16ES102	Basic Electrical and Electronics Engineering	ES	3	0	0	3	50	50	100
16ES104	Principles of Computing Techniques	ES	3	0	0	3	50	50	100
<b>PRACTICAL</b>									
16BS112	Chemistry Laboratory	BS	0	0	2	1	70	30	100
16ES112	Basic Electrical and Electronics Laboratory	ES	0	0	2	1	70	30	100
16ES113	Computer Programming Laboratory	ES	0	0	2	1	70	30	100
<b>Total</b>						<b>22</b>			

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<b>SEMESTER II</b>									
<b>Course Code</b>	<b>Course Name</b>	<b>Category</b>	<b>Hours / Week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CA</b>	<b>ES</b>	<b>TOTAL</b>
<b>THEORY</b>									
16HS201	Technical English II	HS	2	0	2	3	50	50	100
16BS201	Engineering mathematics II	BS	3	2	0	4	50	50	100
16BS202	Applied Physics	BS	3	0	0	3	50	50	100
16HS202	Environmental Science and Engineering	HS	3	0	0	3	50	50	100
16ES203	Algorithms and Data Structures I	ES	3	2	0	4	50	50	100
16ES205	Engineering Graphics	ES	1	0	4	3	50	50	100
<b>PRACTICAL</b>									
16BS211	Physics Laboratory	BS	0	0	2	1	70	30	100
16ES212	Basic Civil and Mechanical Laboratory	ES	0	0	2	1	70	30	100
16ES214	Data Structures Laboratory	ES	0	0	2	1	70	30	100
<b>Total</b>						<b>23</b>			
<b>SEMESTER III</b>									
<b>Course Code</b>	<b>Course Name</b>	<b>Category</b>	<b>Hours / Week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CA</b>	<b>ES</b>	<b>TOTAL</b>
<b>THEORY</b>									
16BS302	Discrete Mathematics	BS	3	2	0	4	50	50	100
16ECX01	Digital Principles and Design	ES	3	0	0	3	50	50	100
16CS301	Algorithms and Data Structures II	PC	3	0	0	3	50	50	100
16CS302	Object Oriented Programming	PC	3	0	2	4	60	40	100
16CS303	Computer Architecture and Organization	PC	3	0	0	3	50	50	100
16CS304	Operating Systems	PC	3	0	0	3	50	50	100
<b>PRACTICAL</b>									
16CS311	Algorithms Laboratory	PC	0	0	4	2	70	30	100
16CS312	Operating Systems Laboratory	PC	0	0	4	2	70	30	100
16CD311	Career Skill Development I	EES	0	0	2	1	70	30	100
<b>Total</b>						<b>25</b>			

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<b>SEMESTER IV</b>									
<b>Course Code</b>	<b>Course Name</b>	<b>Category</b>	<b>Hours / Week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CA</b>	<b>ES</b>	<b>TOTAL</b>
<b>THEORY</b>									
16BS401	Applied Probability and Queuing Theory	BS	3	2	0	4	50	50	100
16ECX02	Microprocessors and Microcontrollers	ES	3	0	0	3	50	50	100
16CS401	Database Management Systems	PC	3	0	0	3	50	50	100
16CS402	Graphics and Multimedia	PC	3	0	2	4	60	40	100
16CS403	Software Engineering	PC	3	0	0	3	50	50	100
<b>PRACTICAL</b>									
16ECX12	Assembly Language Programming Laboratory	ES	0	0	2	1	70	30	100
16CS411	Database Management Systems Laboratory	PC	0	0	4	2	70	30	100
16CS412	Computer Skills	EES	0	0	4	2	70	30	100
16CD411	Career Skill Development II	EES	0	0	2	1	70	30	100
<b>Total</b>						<b>23</b>			
<b>SEMESTER V</b>									
<b>Course Code</b>	<b>Course Name</b>	<b>Category</b>	<b>Hours / Week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CA</b>	<b>ES</b>	<b>TOTAL</b>
<b>THEORY</b>									
16BS502	Statistics and Numerical Methods	BS	3	2	0	4	50	50	100
16CS501	Computer Networks	PC	3	0	0	3	50	50	100
16CS502	Web Programming	PC	3	0	0	3	50	50	100
16CS503	Theory of Computation	PC	3	2	0	4	50	50	100
16CS504	Embedded Systems	PC	3	0	2	4	60	40	100
16_ _ _ _	Professional Elective I / Open Elective I	PE/ OE	3	0	0	3	50	50	100
<b>PRACTICAL</b>									
16CS511	Network Programming Laboratory	PC	0	0	4	2	70	30	100
16CS512	Web Programming Laboratory	PC	0	0	4	2	70	30	100
16CS513	Mobile Application Development Laboratory	PC	0	0	4	2	70	30	100
16CD511	Career Skill Development III	EES	0	0	2	1	70	30	100
<b>Total</b>						<b>28</b>			

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<b>SEMESTER VI</b>									
<b>Course Code</b>	<b>Course Name</b>	<b>Category</b>	<b>Hours / Week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CA</b>	<b>ES</b>	<b>TOTAL</b>
<b>THEORY</b>									
16CS601	Compiler Design	PC	3	2	0	4	50	50	100
16CS602	Big Data Analytics	PC	3	0	0	3	50	50	100
16CS603	Machine Learning Techniques	PC	3	0	0	3	50	50	100
16CS604	Object Oriented Analysis and Design	PC	3	0	2	4	60	40	100
16_____	Professional Elective II / Open Elective II	PE/ OE	3	0	0	3	50	50	100
<b>PRACTICAL</b>									
16CS611	Compiler Design Laboratory	PC	0	0	4	2	70	30	100
16CS612	Big Data Analytics Laboratory	PC	0	0	4	2	70	30	100
16CD611	Career Skill Development IV	EES	0	0	2	1	70	30	100
<b>Total</b>						<b>22</b>			

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<b>CURRICULUM and SYLLABUS</b>									
<b>Regulations</b>			<b>R 2016</b>						
<b>Programme Name</b>			<b>B.E. COMPUTER SCIENCE AND ENGINEERING (CS)</b>						
<b>SEMESTER VII</b>									
<b>Course Code</b>	<b>Course Name</b>	<b>Category</b>	<b>Hours / Week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CA</b>	<b>ES</b>	<b>TOTAL</b>
<b>THEORY</b>									
16CS701	Cloud Computing and Virtualization	PC	3	0	0	3	50	50	100
16BAX01	Professional Ethics and Human Values	HS	3	0	0	3	50	50	100
16CSE__	Professional Elective III	PE	3	0	0	3	50	50	100
16CSE__	Professional Elective IV	PE	3	0	0	3	50	50	100
16CSE__	Professional Elective V	PE	3	0	0	3	50	50	100
<b>PRACTICAL</b>									
16CS711	Cloud Computing Laboratory	PC	0	0	4	2	70	30	100
16CS712	Software Testing Laboratory	PC	0	0	4	2	70	30	100
<b>Total</b>						<b>19</b>			

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<b>SEMESTER VIII</b>									
<b>Course Code</b>	<b>Course Name</b>	<b>Category</b>	<b>Hours / Week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CA</b>	<b>ES</b>	<b>TOTAL</b>
<b>THEORY</b>									
16CSE__	Professional Elective VI	PE	3	0	0	3	50	50	100
16_____	Professional Elective VII / Open Elective III	PE/ OE	3	0	0	3	50	50	100
<b>PRACTICAL</b>									
16CS811	Project Work	EES	0	0	20	10	70	30	100
<b>Total</b>						<b>16</b>			

**TOTAL CREDITS: 178 (133)**

**M.KUMARASAMY COLLEGE OF ENGINEERING (Autonomous) – KARUR 639113**

<b>PROFESSIONAL ELECTIVE COURSES</b>									
<b>Course Code</b>	<b>Course Name</b>	<b>Category</b>	<b>Hours / Week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CA</b>	<b>ES</b>	<b>TOTAL</b>
16CSE01	Data Warehousing and Data Mining	PE	3	0	0	3	50	50	100
16CSE02	Database Tuning	PE	3	0	0	3	50	50	100
16CSE03	Artificial Intelligence	PE	3	0	0	3	50	50	100
16CSE04	Advanced Database Management Systems	PE	3	0	0	3	50	50	100
16CSE05	Database Security and Privacy	PE	3	0	0	3	50	50	100
16CSE06	Natural Language Processing	PE	3	0	0	3	50	50	100
16CSE07	Advanced Java Programming	PE	3	0	0	3	50	50	100
16CSE08	Functional Programming	PE	3	0	0	3	50	50	100
16CSE09	Digital Image Processing	PE	3	0	0	3	50	50	100
16CSE10	Digital Signal Processing	PE	3	0	0	3	50	50	100
16CSE11	Real Time Operating Systems	PE	3	0	0	3	50	50	100
16CSE12	Visualization Techniques	PE	3	0	0	3	50	50	100
16CSE13	Soft Computing	PE	3	0	0	3	50	50	100
16CSE14	Security in Computing	PE	3	0	0	3	50	50	100
16CSE15	Biometrics	PE	3	0	0	3	50	50	100
16CSE16	Robotics	PE	3	0	0	3	50	50	100
16CSE17	Human Interface System Design	PE	3	0	0	3	50	50	100
16CSE18	TCP/IP and Internet Programming	PE	3	0	0	3	50	50	100
16CSE19	Wireless Networks	PE	3	0	0	3	50	50	100
16CSE20	Adhoc and Sensor Networks	PE	3	0	0	3	50	50	100
16CSE21	Cyber Forensics	PE	3	0	0	3	50	50	100
16CSE22	Parallel and Distributed Computing	PE	3	0	0	3	50	50	100
16CSE23	Mobile Computing	PE	3	0	0	3	50	50	100
16CSE24	Free and Open Source Software	PE	3	0	0	3	50	50	100
16CSE25	Linux Internals	PE	3	0	0	3	50	50	100
16CSE26	Social Network Analysis	PE	3	0	0	3	50	50	100
16CSE27	Disaster Management	PE	3	0	0	3	50	50	100
16CSE28	Agile Methodologies	PE	3	0	0	3	50	50	100
16CSE29	GPU Programming	PE	3	0	0	3	50	50	100
16CSE30	Software Project Management	PE	3	0	0	3	50	50	100
16CSE31	Software Quality and Testing	PE	3	0	0	3	50	50	100
16CSE32	Foundation Skills in Integrated Product Development	PE	3	0	0	3	50	50	100
16CSE33	Internet of Things	PE	3	0	0	3	50	50	100

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<b>ONE CREDIT COURSES</b>						
<b>Course Code</b>	<b>Course Name</b>	<b>Category</b>	<b>Hours</b>	<b>Credits</b>	<b>Maximum Marks</b>	
				<b>C</b>	<b>CA</b>	<b>TOTAL</b>
16CSY01	Hardware and Trouble Shooting	EES	15	1	100	100
16CSY02	Python Programming	EES	15	1	100	100
16CSY03	3D Animations	EES	15	1	100	100
16CSY04	Programming in C++	EES	15	1	100	100
16CSY05	Data Analytics using Python	EES	15	1	100	100
16CSY06	RASPBERRY PI	EES	15	1	100	100
16CSY07	Project Management Tools	EES	15	1	100	100
16CSY08	Indian Constitutions	EES	15	1	100	100
16CSY09	Agriculture for Engineers	EES	15	1	100	100



**M.KUMARASAMY COLLEGE OF ENGINEERING (Autonomous) – KARUR 639113**

Department	Science & Humanities				R 2016	Semester	III
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
<b>16BS302</b>	<b>DISCRETE MATHEMATICS (Common to CSE &amp; IT)</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>4</b>	<b>60</b>	<b>100</b>
<b>Course Objective (s):</b> <ul style="list-style-type: none"> <li>To obtain general knowledge about the area of discrete mathematics</li> <li>To understand a variety of methods and to construct mathematical proofs</li> <li>To model situations in a mathematical way and derive useful results</li> </ul>							
<b>Course Outcomes:</b> <ol style="list-style-type: none"> <li>Obtain perception in the area of combinatorics and graph theory</li> <li>Ability to apply it in special applications such as coding and cryptography.</li> <li>Demonstrate their knowledge in predicate and propositional calculus</li> </ol>							
<b>Unit I</b>	<b>PROPOSITIONAL CALCULUS</b>						<b>9</b>
Propositions- Logical connectives-Compound propositions-Conditional and biconditional propositions- Truth tables - Tautologies and Contradictions - Logical and equivalences and implications - DeMorgan's Laws-Normal forms-Principal conjunctive and disjunctive normal forms - Rules of inference-Arguments-Validity of arguments							
<b>Unit II</b>	<b>PREDICATE CALCULUS</b>						<b>9</b>
Predicates-Statement Function -Variables-free and bound variables- Quantifiers- Universe of discourse- Logical equivalences and implications for quantified statements- Theory of inference- The rules of universal specification and generalization-Validity of arguments							
<b>Unit III</b>	<b>SET THEORY AND FUNCTIONS</b>						<b>9</b>
Set Operations-properties-Power set-Relations-Graph and matrix of a relation- Partial Ordering- Equivalence relations-Partitions- Functions -Types of Functions- composition of relation and functions- inverse functions							
<b>Unit IV</b>	<b>COMBINATORICS</b>						<b>9</b>
Basics of Counting - Counting arguments- Pigeonhole Principle- Permutations and Combinations- Recursion and recurrence relations-Generating Functions- Mathematical Induction- Inclusion -Exclusion.							
<b>Unit V</b>	<b>GRAPH THEORY</b>						<b>9</b>
Introduction to Graphs-Graph operations- Graph and Matrices-Graph Isomorphism- Connected Graphs- Euler Graphs- Hamilton paths and circuits- planar Graph-Graph colouring-Trees- Shortest path problem-Directed and Undirected Graphs- Flows in Networks.							

<b>TEXT BOOK(S):</b>	
1.	Trembly J.P and Manohar R, —Discrete Mathematical Structures with Applications to Computer Sciencell, Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 2003.
2.	Ralph. P. Grimaldi, —Discrete and Combinatorial Mathematics: An Applied IntroductionII, Fourth Edition, Pearson Education Asia, Delhi, 2002.

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<b>REFERENCE(S):</b>	
<b>1.</b>	Kenneth H Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, Seventh Edition, McGraw Hill Education India Private Limited, New Delhi, 2013.
<b>2.</b>	A.Doerr and K.Levasseur, Applied Discrete Structures, Galgotia Publication, New Delhi, 2004.
<b>3.</b>	B.Kolman, R.C.Busby and S.C.Ross, Discrete Mathematical Structures, Fifth Edition, Pearson Education, New Delhi, 2005.
<b>4.</b>	Johnsonbaugh, Richard, Discrete Mathematics, Sixth Edition, Maxwell, International Edition, 2006.

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Department	ELECTRONICS AND COMMUNICATION ENGINEERING			R2016	Semester		III
Course Code	Course Name	Hours/Week			Credit	Total hours	Maximum Marks
		L	T	P	C		
16ECX01	DIGITAL PRINCIPLES AND DESIGN (Common to CSE & IT)	3	0	0	3	45	100
<b>Course Objective (s):</b> The purpose of learning this course is to							
<ul style="list-style-type: none"> <li>• Boolean algebra, Boolean functions and realization of functions with basic gates.</li> <li>• Design of combinational and sequential circuits.</li> <li>• Design circuits with MSI devices.</li> <li>• The usage of HDL for designing larger systems.</li> </ul>							
<b>Course Outcomes:</b>							
<ol style="list-style-type: none"> <li>1. Design and Analyse both combinational and sequential networks.</li> <li>2. Analyse the characteristics and structure of different memory systems and programmable logic devices.</li> </ol>							
<b>UNIT I</b>	<b>BOOLEAN ALGEBRA AND LOGIC GATES</b>						<b>9</b>
Boolean postulates and laws –De-Morgan’s Theorem- Principle of Duality- Boolean expression – Minimization of Boolean expressions– Sum of Products (SOP), Product of Sums (POS) and its Conversion– Minimization: Karnaugh map, Tabulation Method-Don’t care conditions. Logic Gates- Implementations of Logic Functions using gates, NAND –NOR implementations							
<b>UNIT II</b>	<b>COMBINATIONAL LOGIC</b>						<b>9</b>
Design procedure of Combinational circuits: Adders - Subtractors – Parallel adder/ Subtractor- Carry look ahead adder- BCD adder- 2- bit Magnitude Comparator- Multiplexer / Demultiplexer- Encoder / Decoder – Parity Generator/Checker – Code converters: Binary to Gray – Gray to Binary - BCD to Excess 3 – Excess 3 to BCD -Implementation of combinational logic using decoders and multiplexer							
<b>UNIT III</b>	<b>SEQUENTIAL LOGIC</b>						<b>9</b>
Flip flops SR, JK, T, D and Master slave – Characteristic and excitation tables and equations –Level and Edge Triggering –Realization of one flip flop using other flip flops – counters - Ring counters and Sequence detector - Design of Synchronous counters - Registers – shift registers- Universal shift register - Introduction to Hardware Description Language (HDL) – HDL for Flip Flops – Shift Registers – Counters							
<b>UNIT IV</b>	<b>SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL LOGIC</b>						<b>9</b>
Analysis and design of synchronous sequential circuits with state diagram, State table, State minimization and State assignment. Design of fundamental mode – primitive state / flow table – Minimization of primitive state table – state assignment – Excitation table - cycles – Races –Hazards: Static, Dynamic and Essential – Hazards elimination							
<b>UNIT V</b>	<b>MEMORY AND PROGRAMMABLE LOGIC DEVICES</b>						<b>9</b>
Classification of memories – ROM Organization: PROM, EPROM, EEPROM – RAM Organization: Static RAM, Dynamic RAM - Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using PROM, PLA, PAL.							

**TEXT BOOK (S)**

1.	Morris Mano, M, — Digital Design, Third Edition, Prentice Hall of India, New Delhi, 2003.
2.	Roth, Charles H., —Fundamentals of Logic Design, Thomson Publication Company, New Delhi,2003.

**REFERENCE (S)**

1.	Yarbrough, John M., —Digital Logic Applications and Design, Thomson Publications, New Delhi, 2007.
2.	Leach, Donald P. and Malvino, Albert Paul., —Digital Principles and Applications, Fifth Edition, Tata McGraw-Hill, New Delhi, 2003.
3.	Givone, Donald D., —Digital Principles and Design, Tata McGraw-Hill, New Delhi, 2003.

<b>Department</b>	<b>COMPUTER SCIENCE AND ENGINEERING</b>	<b>R 2016</b>	<b>Semester</b>	<b>III</b>
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Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CS301	<b>ALGORITHMS AND DATA STRUCTURES II</b>	3	0	0	3	45	100

**Course Objective (s):**

- To impart knowledge on runtime analysis of algorithms
- To synthesize efficient algorithms in real time problem
- To design and implement various algorithms

**Course Outcomes:**

1. Compute the runtime efficiencies of algorithms using various analysis methods
2. Solve the graph problems using various graph algorithms
3. Make use of Divide and conquer, Transform and conquer techniques for solving sorting and searching problems
4. Solve real time problems using greedy, dynamic programming methodologies
5. Apply backtracking, branch and bound techniques to deal with real time problems

**Unit I | INTRODUCTION TO ALGORITHM ANALYSIS**

**9**

The Role of Algorithms in Computing – Performance Analysis – Probabilistic Analysis – Randomized Algorithms – Amortized Analysis – Aggregate Analysis – Accounting Method

**Unit II | GRAPH ALGORITHMS**

**9**

Basic Terminologies – Representations of Graph – Topological sort – Graph Traversals : Breadth first search – Depth first search – Biconnectivity – Euler Circuits – Shortest path algorithms : Unweighted Shortest Path – Dijkstra’s algorithm – Network flow problem – Minimum Spanning Trees : Prim’s algorithm – Kruskal’s Algorithm

**Unit III | ANALYSIS OF SORTING AND SEARCHING ALGORITHMS**

**9**

Sequential search and Brute Force string matching – Divide and Conquer: Binary search – Merge sort – Quick sort – Closest Pair Problem – Convex Hull problem – Transform and Conquer : Presorting – Binary Heap – Heap Sort – Problem reduction

**Unit IV | ANALYSIS OF GREEDY AND DYNAMIC PROGRAMMING ALGORITHMS**

**9**

Greedy Technique : Introduction – Knapsack Problem – Huffman trees - Travelling Salesperson Problem - Dynamic Programming: Multistage Graph– Optimal Binary Search trees – Travelling Salesperson Problem - Floyd Warshall algorithm - Bellman Ford algorithm

**Unit V | ANALYSIS OF BACKTRACKING AND BRANCH-AND-BOUND ALGORITHMS**

**9**

Backtracking : General method – n Queens problem – Graph coloring – Hamiltonian cycle – Knapsack Problem – Branch and Bound: Assignment Problem – Travelling Salesperson Problem – NP Problems: NP Hard: Chromatic Number decision problem – Flow Shop scheduling problem – NP Complete

**TEXT BOOK(S):**

1.	Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education Asia, 2014
2.	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd edition, Pearson Education Asia, 2014

**REFERENCE(S):**

1.	T. Cormen, C. Lieserson, R. Rivest, and C. Stein, “Introductions to Algorithms”, Prentice-Hall/India, 3rd edition, 2009
2.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Second Edition, Universities Press, Hyderabad, 2008

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<b>Department</b>	<b>COMPUTER SCIENCE AND ENGINEERING</b>				<b>R 2016</b>	<b>Semester</b>	<b>III</b>
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
<b>16CS302</b>	<b>OBJECT ORIENTED PROGRAMMING</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>60</b>	<b>100</b>

**Course Objective (s):**

- To understand the fundamentals of object oriented programming in Java
- To learn the concepts of Array, String Handling
- To study the basics of generics and collections
- To establish a firm foundation on core Java concepts like Exceptions and Concurrent programming
- To develop Graphical User Interface using Event Driven Programming

**Course Outcomes:**

1. Make use of Object Oriented programming concepts to solve real time problems.
2. Construct the programs with inheritance, packages and string handling mechanisms.
3. Utilize the different collections and Input/Output file streams.
4. Make use of exception handling mechanisms and multithreading to solve real time problems.
5. Develop simple applications using event handling.

<b>Unit I</b>	<b>INTRODUCTION</b>	<b>9</b>
Introduction to OOP – Thinking Object Oriented – Object Oriented Design. Introduction to Java – JVM – Data types – Variables – Operators – Control statements – Classes and Methods – Instances and Initialization – Constructors and Destructors – Garbage collection – Abstract Classes and Methods – Arrays		
<b>Unit II</b>	<b>INHERITANCE AND PACKAGES</b>	<b>9</b>
Inheritance – Access Specifiers – Interfaces – Default interface method – Polymorphism – Packages – this Pointer – Static Instances – String Handling – The Object class – Object Cloning		
<b>Unit III</b>	<b>GENERIC AND COLLECTIONS</b>	<b>9</b>
Enumerations – Type Wrappers – Autoboxing – Annotations – Generic classes – Generic methods – Generic interfaces – Collections – Lists – Sets – Maps – I/O streams – File streams		
<b>Unit IV</b>	<b>EXCEPTION HANDLING AND MULTITHREADING</b>	<b>9</b>
Exception handling – Exception hierarchy – Throwing and catching exceptions – Throws – Finally – Built in Exceptions – User defined Exceptions – Chained exceptions – Multithreaded programming – Interrupting threads – Thread states – Thread priorities – Thread synchronization – Inter Thread Communication		
<b>Unit V</b>	<b>EVENT HANDLING</b>	<b>9</b>
The applet class – Basics of event handling – Delegation event model – Event classes – Event listener interfaces – Adapter classes – AWT – Swing		

<b>List of Experiments:</b>	<b>15 Hours</b>
<ol style="list-style-type: none"> <li>1. Simple Java program with classes and Instances</li> <li>2. Programs using inheritance and dynamic polymorphism</li> <li>3. Programs using Interface</li> <li>4. Programs using String handling</li> <li>5. Programs using Type Wrappers</li> <li>6. Programs using Generics</li> <li>7. Programs using Collection Classes</li> <li>8. Programs using Files and Exception Handling</li> <li>9. Programs using Multithreading</li> <li>10. Programs using Swing.</li> </ol>	

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<b>TEXT BOOK(S):</b>	
1.	Herbert Schildt, "Java the Complete Reference", Ninth edition, McGraw-Hill Osborne Media, 2014.
2.	P.J.Deitel and H.M.Deitel, "JAVA™ HOW TO PROGRAM", seventh edition, Pearson International Edition, 2009.

<b>REFERENCE(S):</b>	
1.	K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.
2.	Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.
3.	Timothy Budd, —An Introduction to Object-Oriented ProgrammingI, Third Edition, Pearson Education, 2008.

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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	III
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CS303	COMPUTER ARCHITECTURE AND ORGANIZATION	3	0	0	3	45	100

**Course Objective (s):**

- To understand the basic structure and operations of digital computer
- To study the design of arithmetic and logic unit and implementation of fixed-point and floating-point arithmetic operations
- To study the concepts of control unit and pipelining
- To study the organization of memory unit
- To study the interfacing of I/O devices

**Course Outcomes:**

1. Explain the organization and working principle of computer hardware components
2. Solve the problems using various arithmetic algorithms
3. Analyze the execution sequence of instruction
4. Explain the hierarchy of memory systems
5. Summarize the concepts of I/O organization

**Unit I | BASIC STRUCTURE OF COMPUTERS**

**9**

Functional Units – Basic Operational Concepts – Bus Structures – Software Performance – Memory Locations and Addresses – Memory Operations – Instruction and Instruction Sequencing – Addressing Modes – Assembly Language

**Unit II | ARITHMETIC UNIT**

**9**

Addition and Subtraction of Signed Numbers – Multiplication of Unsigned Numbers – Signed Operand Multiplication – Fast Multiplication – Integer Division – Floating-Point Numbers and Operations

**Unit III | BASIC PROCESSING UNIT AND PIPELINING**

**9**

Basic Processing Unit : Fundamental Concepts – Execution of a Complete Instruction – Multiple Bus Organization – Hardwired Control – Micro Programmed Control – Pipelining : Basic Concepts – Data Hazards – Instruction Hazards – Influence on Instruction Sets – Data Path and Control Consideration – Superscalar Operation – Case Study: UltraSPARC II

**Unit IV | MEMORY SYSTEM**

**9**

Memory Concepts – Semiconductor RAMs – ROMs – Speed, Size and Cost – Cache Memories – Performance Considerations – Virtual Memories – Memory Management Requirements – Case Study: Blu-ray Disk

**Unit V | I/O ORGANIZATION**

**9**

Accessing I/O Devices – Interrupts – Direct Memory Access – Buses – Standard I/O Interfaces: PCI - SCSI - USB – RAID

**TEXT BOOK(S):**

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Sixth Edition, McGraw Hill Education (India) Edition, 2012.

**REFERENCE(S):**

1. William Stallings, “Computer Organization and Architecture - Designing for Performance”, Ninth Edition, Prentice Hall, 2012.
2. David A. Patterson and John L. Hennessey, “Computer organization and design, The Hardware/Software interface”, Morgan Kauffman / Elsevier, Fifth edition, 2014.
3. John P.Hayes, “Computer Architecture and Organization”, Third Edition, McGraw Hill, 2012.

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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	III
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CS304	OPERATING SYSTEMS	3	0	0	3	45	100

**Course Objective (s):**

- To study the basic concepts and functions of operating systems
- To learn about processes, threads and scheduling algorithms
- To learn about deadlock and various memory management schemes
- To understand the files and disk management
- To learn the basics of Linux system and windows 7

**Course Outcomes:**

1. Explain the concepts of OS, Process and Threads
2. Apply various CPU Scheduling algorithms and Synchronization Techniques
3. Utilize various schemes for deadlock handling and memory management
4. Make use of various file and disk management strategy
5. Explain the design principles of Linux and windows 7 Operating systems

<b>Unit I</b>	<b>INTRODUCTION</b>	<b>9</b>
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Introduction to operating system: Types of computer systems – System structure: System calls and types – System programs – Operating system structure – Operating system generation and System boot – Process management: Process concept– Process scheduling – Operations on processes –Inter process communication – Multithreaded Programming: Overview – Models

<b>Unit II</b>	<b>PROCESS SCHEDULING</b>	<b>9</b>
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Scheduling criteria – Scheduling algorithms – Thread scheduling– Real time scheduling – Process Synchronization: The critical section problem – Semaphores – Classic problems of synchronization – Monitors.

<b>Unit III</b>	<b>DEADLOCK AND MEMORY MANAGEMENT</b>	<b>9</b>
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Deadlock: Deadlock characterization – Methods for handling deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock detection – Recovery from deadlock – Memory management: Swapping – Contiguous memory allocation – Paging – Segmentation – Structure of the page table – Virtual Memory: Demand paging – Page replacement – Allocation of frames.

<b>Unit IV</b>	<b>STORAGE MANAGEMENT</b>	<b>9</b>
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File concept – Access methods – Directory and Disk structure – File system mounting – File sharing –Protection – File system implementation – Directory implementation – Allocation methods – Free-space management – Mass Storage Structure: Disk scheduling – Swap-space management.

<b>Unit V</b>	<b>CASE STUDY</b>	<b>9</b>
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Linux System: Design principles – Kernel modules – Process management – Scheduling – Memory management – File systems – Windows 7: Design principles – System components – Terminal services and Fast user switching – File systems.

**TEXT BOOK(S):**

1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2015.
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**REFERENCE(S):**

1.	William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011.
2.	Andrew S. Tanenbaum, Herbert Bos "Modern Operating Systems", Fourth Edition, Pearson Education.



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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	III
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CS311	ALGORITHMS LABORATORY	0	0	4	2	60	100	

**Course Objective (s):**

- To implement graph traversal and searching algorithms
- To understand the practical application of non linear data structures
- To demonstrate the execution of advanced algorithms

**Course Outcomes:**

1. Design programs using divide and Conquer technique to solve real time problems
2. Develop programs that implements various graph algorithms to solve graph problems
3. Design programs to give solution for real time problems using dynamic programming
4. Construct programs using greedy techniques for solving real time problems
5. Build solution for real time problems using back tracking technique

**LIST OF EXPERIMENTS:**

1. Randomized Merge Sort
2. Implementation of BFS and DFS
3. Prim's and Kruskal's Algorithm
4. Implementation of Dijkstra's Algorithm
5. Implementation of knapsack problem
6. Computing transitive closure using warshall algorithm
7. Travelling salesperson using dynamic programming
8. N Queens Problem
9. Graph coloring
10. Subset generation

**REFERENCE(S):**

1.	Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education Asia, 2014.
2.	Herbert Schildt, "Java: The Complete Reference", Ninth Edition, McGraw-Hill Education

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	III
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CS312	OPERATING SYSTEMS LABORATORY	0	0	4	2	60	100	

**Course Objective (s):**

- Be familiar with the use of UNIX commands and Shell Programming.
- Be exposed to the Concepts of Process synchronization.
- Be exposed to Various CPU scheduling algorithms.
- Be familiar with Deadlocks, Memory Management and Replacement Schemes.
- Learn to use File and Directory allocation strategies.

**Course Outcomes:.**

1. Experiment with basic Unix commands and shell programming
2. Compare the performance of various CPU scheduling algorithms
3. Develop a program to implement IPC and synchronization
4. Experiment with deadlock avoidance and memory management schemes
5. Develop a program to implement file allocation and directory implementation

**LIST OF EXPERIMENTS**

1. Basics of UNIX commands.
2. Shell Programming.
3. Inter process Communication
4. Implement the following CPU scheduling algorithms
  - a) FCFS b) SJF c) Round Robin d) Priority
5. Implementation of Semaphores
6. Implementation of Bankers Algorithm for Deadlock Avoidance
7. Memory management scheme I
  - a) Best fit b)First fit c)Worst fit
8. Implement e all page replacement algorithms
  - a) FIFO b) LRU
9. Implement all file allocation strategies
  - a) Sequential b) Indexed
10. Implementation of Single Level Directory

**REFERENCE(S):**

1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2015.
2.	UNIX: Concepts and Applications by Sumitabha Das, Second Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011

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Department	Science & Humanities					R 2016	Semester	IV
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
<b>16BS401</b>	<b>APPLIED PROBABILITY AND QUEUEING THEORY (Common to CSE &amp; IT)</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>4</b>	<b>60</b>	<b>100</b>	
<p>Course Objective (s):</p> <ul style="list-style-type: none"> <li>• Have a well – founded knowledge of standard distributions which can describe real life phenomena.</li> <li>• Acquire skills in handling situations involving more than one random variable and functions of random variables.</li> <li>• Understand and characterize phenomena which evolve with respect to time in a probabilistic manner.</li> <li>• Be exposed to basic characteristic features of a queuing system and acquire skills in analyzing queuing models</li> <li>• Understand test of hypothesis and how they relate to engineering applications</li> </ul>								
<p>Course Outcomes:</p> <ol style="list-style-type: none"> <li>1. Demonstrate and be able to examine and understand and use basic probability.</li> <li>2. Ability to characterize probability models using probability mass (density) functions and cumulative distribution functions.</li> <li>3. Introduced to the techniques of developing discrete and continuous probability distributions and its applications.</li> <li>4. Demonstrate their knowledge in special processes like poisson process, random process in terms of its mean and correlation functions.</li> <li>5. Ability to understand the terminology and nomenclature appropriate queueing theory and understanding various queueing models.</li> </ol>								
<b>Unit I</b>	<b>RANDOM VARIABLE AND STANDARD DISTRIBUTIONS</b>						<b>9</b>	
Random variable - Probability mass function - Probability density functions- Properties - Moments - Moment generating functions and their properties. Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions and their properties								
<b>Unit II</b>	<b>TWO DIMENSIONAL RANDOM VARIABLES</b>						<b>9</b>	
Joint distributions - Marginal and conditional distributions – Covariance – Correlation and regression - Transformation of random variables - Central limit theorem.								
<b>Unit III</b>	<b>TESTING OF HYPOTHESIS</b>						<b>9</b>	
Sampling distributions - Tests for single mean, Proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – chi-square test for goodness of fit – Independence of attributes.								
<b>Unit IV</b>	<b>MARKOV PROCESSES AND MARKOV CHAINS</b>						<b>9</b>	
Classification-First order, Second order, strictly stationary order, wide-sense stationary - Markov process - Markov chains – Transition probabilities - Poisson process								
<b>Unit V</b>	<b>QUEUEING THEORY</b>						<b>9</b>	
Markovian models – Birth and Death queueing models - Steady state results: Single and multiple server queueing models - Pollaczek- Khintchine formula								

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<b>TEXT BOOK(S):</b>	
1.	Oliver Ibe, "Fundamentals of Applied Probability and Random Processes" 2nd Edition, Elsevier, 2014
2.	D. Gross and C.M. Harris, "Fundamentals of Queueing Theory", Wiley Student edition, 2002
3.	R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia , 8th edition, 2007.

<b>REFERENCE(S):</b>	
1.	R.A Johnson, Miller & Freund's Probability and Statistics for Engineers, Seventh Edition, Pearson Education, Delhi, 2009.
2.	Allen. A. O, Probability, Statistics and Queuing Theory: with computer Science Applications, Academic press, 2014.
3.	Trivedi. K.S, Probability and Statistics with Reliability, Queuing and Computer Applications, John Wiley and sons, Second edition, 2012.
4.	Taha.H.A, Operations Research: An Introduction, Eighth Edition, Prentice Hall of India Ltd, New Delhi, 2008.

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	IV
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CS401	DATABASE MANAGEMENT SYSTEMS	3	0	0	3	45	100	

**Course Objective (s):**

- To understand the principles of database design
- To sketch the features of Relational Database with Structured Query Language
- To learn the techniques for controlling concurrent transactions
- To study about Query processing and its optimization techniques

**Course Outcomes:**

1. Explain the database architecture and various data models
2. Illustrate the features of SQL and PL/SQL commands
3. Apply the concepts of Normalization to eradicate anomalies from the database
4. Outline the significance of various concurrency control techniques
5. Summarize the techniques to optimize a query for reducing the cost of execution

**Unit I | FUNDAMENTALS OF DATABASE DESIGN**

**9**

Purpose of Database Systems – View of Data - Database System Architecture – Database Users and Administrators – Data Models – Entity Relationship Model – Constraints – Entity Sets – Attributes – Keys – E-R Diagrams – Design Issues - Extended E-R Features – Introduction of Relational Model – E-R Reduction to Relational Schemas.

**Unit II | RELATIONAL DATABASE**

**9**

Structure of Relational Databases – Schema Diagrams – Relational Query Languages - Relational Algebra – Queries in SQL – Set Operations – Aggregate Operations – Joins – Views – Integrity Constraints – Authorization – Advanced SQL – Functions and Procedures – Triggers – Assertion – Embedded SQL – Dynamic SQL- SQL Application Programming using C and Java

**Unit III | LOGICAL DATABASE DESIGN**

**9**

Need for good database design – Functional Dependencies and Keys – Closure of Functional Dependencies Set – Closure of attributes - Dependency Preservation - Decomposition using Functional dependencies – Atomic domains and First Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Multi valued Dependencies - Decomposition using Multi valued dependencies – Fourth Normal Form – Join Dependencies – Fifth Normal Form – Introduction to Domain Key Normal Form

**Unit IV | TRANSACTIONS AND CONCURRENCY CONTROL**

**9**

Transaction Model – ACID properties – Transaction States – Serializability - Conflict serializability – View Serializability – Testing Serializability - Concurrency Control – Lock Based Protocols – Deadlocks – Multiple Granularity – Time Stamp Based Protocols – Validation Based Protocols – Multi Version Schemes – Recovery System – Failure Classification – Storage – Recovery and Atomicity – Recovery Algorithm

**Unit V | QUERY PROCESSING AND OPTIMIZATION**

**9**

Indexing and Hashing – Query Processing – Measures of Query Cost – Join Operation – Other Operations – Evaluation of Expressions – Transformation of Relational Expressions – Choice of Evaluation Plans – Materialized Views

**TEXT BOOK(S):**

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", McGraw Hill, Sixth Edition, 2013
2. C.J.Date, A.Kannan and S.Swamynathan,"An Introduction to Database Systems", Pearson Education, Eighth Edition, 2006

**REFERENCE(S):**

1. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Pearson Education, Fifth Edition, 2009
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, Fourth Edition, 2015
3. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Pearson Education/Addison Wesley, Sixth Edition, 2014

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	IV
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CS402	GRAPHICS AND MULTIMEDIA	3	0	2	4	60	100	
<b>Course Objective (s):</b>								
<ul style="list-style-type: none"> <li>To study the basic 2D and 3D Transformations</li> <li>To study various compression &amp; file formats used in imaging and multimedia systems</li> <li>To analyze different media and design issues related to multimedia systems</li> </ul>								
<b>Course Outcomes:</b>								
<ol style="list-style-type: none"> <li>Apply the algorithms for processing 2 Dimensional transformation</li> <li>Utilize 3 Dimensional transformation, projections and various visible surface algorithms</li> <li>Explain the concepts of multimedia system design</li> <li>Describe the concepts of various types of compression, decompression and file format</li> <li>Explain the concepts of multimedia authoring tools, hypermedia linking and embedding</li> </ol>								
<b>Unit I</b>	<b>OUTPUT PRIMITIVES</b>							<b>9</b>
Basics – Line – Curve and ellipse drawing algorithms – Examples – Applications – Attributes – Two-Dimensional geometric transformations – Two – Dimensional clipping and viewing								
<b>Unit II</b>	<b>THREE DIMENSIONAL CONCEPTS</b>							<b>9</b>
Three dimensional Geometric transformation: Translation Rotation – Scaling – Reflection – Shearing – Composite Transformation – Parallel and Perspective projections – Visible Surface Algorithms: Z-Buffer Algorithm – Painter's Algorithm – BSP trees								
<b>Unit III</b>	<b>MULTIMEDIA SYSTEMS DESIGN</b>							<b>9</b>
Multimedia basics – Multimedia applications – Multimedia system architecture – Evolving technologies for multimedia – Defining objects for multimedia systems – Multimedia data interface standards – Multimedia databases								
<b>Unit IV</b>	<b>COMPRESSION AND FILE FORMATS</b>							<b>9</b>
Compression and Decompression: Need for Data Compression – Types of Compression – Binary Image Compression Schemes – Image Compression – Video Compression – Audio Compression. Data and File Format Standards: Rich Text Format – TIFF File Format – Resource Interface File Format – MIDI File Format – JPEG DIB File Format – AVI Indeo File Format – MPEG Standards – TWAIN								
<b>Unit V</b>	<b>APPLICATION DESIGN</b>							<b>9</b>
Multimedia Application Classes – Types of Multimedia Systems – Virtual Reality – Components of Multimedia Systems – Multimedia Authoring Systems – Multimedia Authoring Tools – User Interface Design – Mobile Messaging – Hypermedia Message Components – Hypermedia Linking and embedding								

**List of Experiments:**

- To implement DDA line drawing algorithm
- To implement Curve and ellipse drawing algorithms
- To perform 2D transformation such as translation, rotation, scaling and reflection
- To implement Cohen-Sutherland 2D clipping
- To implement 3D transformation for translation, scaling, rotation
- To perform animation using any animation software
  - Tweening
  - Masking
  - Zooming
  - Fading effect
  - Shadow and glow effect
- Bouncing ball in Flash
- Create a flash program to customize the cursor
- Design a flash program for slideshow
- Design a webpage using flash

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<b>TEXT BOOK(S):</b>	
1.	Donald Hearn and M. Pauline Baker, "Computer Graphics C Version", Pearson Education, 2003.
2.	Prabat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", Prentice Hall India, 2007, New Delhi.

<b>REFERENCE(S):</b>	
1.	Ralf Steinmetz, Klara Steinmetz, "Multimedia Computing, Communications & Applications", Pearson education, 2009.
2.	D. Hearn and M. Pauline Baker, Computer Graphics (C Version), Pearson Education, 2nd Edition, 2004.
3.	J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and Practice, Second Edition in C, Pearson Education, 2003

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	IV
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CS403	SOFTWARE ENGINEERING	3	0	0	3	45	100	

**Course Objective (s):**

- To understand the software life cycle models.
- To understand the importance of the software development process.
- To know the significance of UML models.
- To apply designing and testing principles in software development process.
- To develop correct and robust software products

**Course Outcomes:**

1. Outline the features of different lifecycle models.
2. Develop UML model for software projects.
3. Make use of suitable models for designing application software.
4. Make use of software testing procedures in software development process.
5. Explain software project management and software maintenance practices.

<b>Unit I</b>	<b>SOFTWARE PROCESS MODELS</b>	<b>9</b>
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Software and Software Engineering – Process Model: Generic Process Model – Prescriptive Process Model – Specialized Process Model – Unified Process Model – Personal and Team Process Model – Agile Development – Principles of Framework Activity.

<b>Unit II</b>	<b>REQUIREMENTS ENGINEERING AND MODELING</b>	<b>9</b>
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Requirements Engineering – Functional and Non Functional Requirements – Establishing the Groundwork – Eliciting Requirements – Developing Use case – Requirement Model – Negotiation Requirements – Validation Requirements – Requirement Analysis – Modeling: Domain Analysis and Modeling – Scenario Based Modeling – UML Model – Data Modeling – Class Based Modeling.

<b>Unit III</b>	<b>SOFTWARE DESIGN</b>	<b>9</b>
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Design Process – Design Concepts – Design Model – Architectural Design – User Interface Design Elements – Component Level Design – Pattern Based Design.

<b>Unit IV</b>	<b>SOFTWARE TESTING STRATEGIES</b>	<b>9</b>
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Introduction to Software Testing – Software Testing Life Cycle (STLC) – Strategic Approach to Software Testing – Strategic Issues – Test Strategies for Conventional Software – Unit Testing – Integration Testing – System Testing – The Art of Debugging – Conventional Applications: Basis Path Testing – Control Structure Testing – Black Box Testing – White Box Testing – Model Based Testing – Testing Object Oriented Applications.

<b>Unit V</b>	<b>SOFTWARE PROJECT MANAGEMENT</b>	<b>9</b>
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Software Configuration Management: SCM Process – Configuration management for WebApps - Software Cost Estimation – Risk Management – Maintenance and Reengineering.

**TEXT BOOK(S):**

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| 1. | R.S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, McGraw Hill International Edition, 2014. |
| 2. | M.G. Limaye, "Software Testing – Principles, Techniques and Tools", Tata McGraw Hill, 2011.                                  |

**REFERENCE(S):**

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| 1. | Stephan Schach, "Software Engineering", Tata McGraw Hill, 2007   |
| 2. | Pfleeger and Lawrence "Software Engineering: Theory and Practice", Pearson Education, Second edition, 2001 |



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<b>Department</b>	<b>COMPUTER SCIENCE AND ENGINEERING</b>					<b>R 2016</b>	<b>Semester</b>	<b>IV</b>
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>	
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>			
<b>16CS411</b>	<b>DATABASE MANAGEMENT SYSTEMS LABORATORY</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>60</b>	<b>100</b>	

**Course Objective (s):**

- To understand the significance of better database design
- To learn the usage and syntax of various SQL components
- To practice in real time applications development

**Course Outcomes:**

1. Design a database for enterprise applications with suitable data model
2. Build a database using SQL and PL/SQL commands
3. Normalize the relations to eliminate anomalies and redundancy of data
4. Build an enterprise application with suitable User Interface and database

**LIST OF EXPERIMENTS:**

1. Design a database for enterprise applications with the various Data Models
2. DDL commands:
  - a. Creation of tables.
  - b. Usage of alter, drop commands
3. DML commands:
  - a. Data Insertion using different ways
  - b. Integrity constraints
  - c. Usage of truncate command
4. SQL Queries
  - a. Simple SQL Queries
  - b. Nested Queries
  - c. Aggregation Functions
  - d. Grouping and Ordering commands
5. JOIN Queries in SQL
6. DCL and TCL commands:
  - a. Setting privileges and revoke privileges.
  - b. Save point, roll back and roll back to commands
7. Introduction about PL/SQL and conditional Statements
8. Cursor in PL/SQL
9. Trigger in PL/SQL
10. Procedure and Function in PL/SQL
11. Normalization of Relation
12. Develop an Enterprise application with suitable User Interface and database

**REFERENCE(S):**

<b>1.</b>	Steven Feuerstein, Bill Pribyl — Oracle PL/SQL Programming, Sixth Edition, O'Reilly Media, February 2014
<b>2.</b>	James Groff, Paul Weinberg, Andy Oppel — SQL: The Complete Reference, 3rd Edition, McGraw-Hill, 2009
<b>3.</b>	Oracle® Database, PL/SQL Language Reference, 11g Release 2 (11.2), December 2014

**M.KUMARASAMY COLLEGE OF ENGINEERING (Autonomous) – KARUR 639113**

Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	IV
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CS412	COMPUTER SKILLS	0	0	4	2	60	100	
<b>Course Objective (s):</b> <ul style="list-style-type: none"> <li>To learn the latest technological developments in the field of Computer Science and Engineering</li> </ul>								
<b>Course Outcomes:</b> Solve simple real time problems using computer software or tools								
Students have to undergo 60 hrs of training, in any of the recent tools/ software/ technologies in CSE related area, of their choice with the approval of the department. At the end of the training, student will complete a mini project and submit a report to the department.								

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Department	Computer Science and Engineering				R 2016	Semester	V
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CS501	COMPUTER NETWORKS	3	0	0	3	45	100
<b>Course Objective (s):</b>							
<ul style="list-style-type: none"> <li>To trace the flow of information from one node to another node in the network</li> <li>To identify the component required to build different types of networks</li> <li>To choose the required functionality at each layer for given application</li> </ul>							
<b>Course Outcomes:</b>							
<ol style="list-style-type: none"> <li>Summarize the layers of the OSI model and TCP/IP</li> <li>Explain various services of data link layer</li> <li>Compare the different routing protocols.</li> <li>Illustrate the congestion control mechanisms in transport layer</li> <li>Make use of various application layer protocols</li> </ol>							
<b>Unit I</b>	<b>INTRODUCTION TO DATA COMMUNICATION</b>						<b>11</b>
Introduction: Components – Representation of data – Physical topology – Categories of network – Layering and protocols – Internet Architecture – Transmission media – Signal encoding techniques – Channel access techniques							
<b>Unit II</b>	<b>DATA LINK LAYER AND LAN</b>						<b>9</b>
Link layer services – Introduction to Switches and Routers – Framing – Error detection and control – Flow control – Media access control – Ethernet – CSMA/CD – Token ring – FDDI – Wireless LANs – CSMA/CA							
<b>Unit III</b>	<b>NETWORK LAYER</b>						<b>9</b>
Circuit switching – Packet switching – IPV4 – IPV6 – Subnetting – Unicast routing protocol: Distance vector routing – Link state routing – Path vector routing – ARP – DHCP – ICMP							
<b>Unit IV</b>	<b>TRANSPORT LAYER</b>						<b>9</b>
Overview of transport layer – Transport layer protocols: UDP – TCP – TCP connection management – Flow control – Retransmission – Congestion control in transport layer – TCP congestion control							
<b>Unit V</b>	<b>APPLICATION LAYER</b>						<b>7</b>
Responsibilities of application layer – HTTP – WWW – FTP – Email Protocols: SMTP – POP3 – IMAP – MIME – DNS – SNMP							

**TEXT BOOK(S):**

1.	Larry L. Peterson, Bruce S. Davie, 'Computer Networks: A system approach', Fifth Edition, Morgan Kaufmann Publishers, 2012
2.	Behrouz A Forouzan 'Data Communication and Networking', Fourth Edition, Mcgraw Hill, 2016

**REFERENCE(S):**

1.	Ying-Dar Lin, Ren - Hung Hwang, Fred Baker, 'Computer Networks: An Open Source Approach', McGraw Hill publisher, 2011
2.	James F. Kurose, Keith W. Ross, 'Computer Networking - A Top Down Approach Featuring the Internet', Fifth Edition, Pearson Education, 2009
3.	Nader. F. Mir, 'Computer and Communication Networks', Pearson Prentice Hall Publishers, 2010

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Department	Computer Science and Engineering				R 2016	Semester	V
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CS502	WEB PROGRAMMING	3	0	0	3	45	100

**Course Objective (s):**

- To learn the basic and programming concepts of web technology
- To understand the importance of Scripting Languages
- To explore the knowledge in HTML, XML, Servlets and JSP

**Course Outcomes:**

1. Build web pages using HTML and Cascading Styles sheets
2. Build Dynamic Web Pages using JavaScript and XML
3. Develop dynamic web page using servlet and JSP
4. Develop the client server application with database connectivity using PHP
5. Describe the different methodologies of web services

**Unit I HTML and CSS**

**9**

HTML – Basic HTML Tags – List Tags – Table Tags – Frameset – CSS – Inline – Internal – External CSS – Border – Margin - Padding

**Unit II Client Side Scripting Language and XML**

**9**

Introduction to JavaScript – Datatypes – Operators – Objects – Loops – Built-In Objects – DOM Events – Regular Expression – Validation – Basic XML – DTD – XML Schema

**Unit III Servlet and JSP**

**9**

Java Servlet – Servlet Lifecycle – GET and POST Method – Sessions – Cookies – JSP – Expressions – Scriptlets – Declarations – JSTL

**Unit IV PHP**

**9**

Introduction to PHP – Using PHP – Variables – Built-In Functions – Connecting to Database – Session Variables – Cookies - Building Web Applications

**Unit V INTRODUCTION TO WEB SERVICES**

**9**

Definition – Java Web Services – Basics – Service Roles – architectural process – WSDL –SOAP – RESTFUL – Three Tier Architecture

**TEXT BOOK(S):**

1. Jeffrey C Jackson, “ Web Technology - A computer Science perspective”, Pearson Education, 2007
2. Chris Bates, “Web Programming - Building Internet Applications”, Wiley India, 2006

**REFERENCE(S):**

1. David Chappell, “ Java Web Services”, O'Reilly, 2002
2. Deitel, Nieto, Lin and Sadhu —“XML How to Program, first edition, Pearson Education”, USA, 2002

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Department	Computer Science and Engineering				R 2016	Semester	V
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CS503	THEORY OF COMPUTATION	3	2	0	4	60	100

**Course Objective (s):**

- To understand and design various Computing models like Finite State Machine, Pushdown Automata, and Turing Machine.
- To understand the various types of grammar and the corresponding languages.
- To understand Decidability and Undecidability of various problems.

**Course Outcomes:**

1. Apply the concept of finite automata for regular language
2. Apply the concept of regular expression
3. Apply the concept of context free grammar and languages
4. Apply the concepts of PDA for Formal Language and grammar
5. Apply the concepts of Turing Machine, Undecidability

<b>Unit I</b>	<b>FINITE AUTOMATA</b>	<b>9</b>
Basic Mathematical Notation and Techniques–Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non deterministic Finite Automata (NFA) – Finite Automata with Epsilon Transitions– Equivalence of DFA and NFA.		
<b>Unit II</b>	<b>REGULAR EXPRESSION</b>	<b>9</b>
Regular Expression – FA and Regular Expressions – Equivalence and minimization of Automata– Closure Properties of Regular Expression – Proving languages not to be Regular.		
<b>Unit III</b>	<b>CONTEXT-FREE GRAMMARS</b>	<b>9</b>
Context Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Simplification of CFG– Elimination of Useless Symbols – Unit productions, Null productions – Normal forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL.		
<b>Unit IV</b>	<b>PUSHDOWN AUTOMATA</b>	<b>9</b>
Definition of the Pushdown automata –Languages of a Pushdown Automata –Equivalence of Pushdown automata and CFG– Deterministic Pushdown Automata – Non Deterministic pushdown automata– Equivalence of Pushdown automata to CFL– Equivalence of CFL to Pushdown automata.		
<b>Unit V</b>	<b>TURING MACHINES AND UNDECIDABILITY</b>	<b>9</b>
Turing Machines – Language of a Turing Machine – Techniques for TM –A language that is not Recursively Enumerable (RE) – An undecidable problem that is RE– Rice Theorem – Post’s Correspondence Problem.		

**TEXT BOOK(S):**

1.	J.E. Hopcroft, R. Motwani and J.D. Ullman, —Introduction to Automata Theory, Languages and Computations, second Edition, Pearson Education, 2007
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**REFERENCE(S):**

1.	H.R. Lewis and C.H. Papadimitriou, —Elements of the theory of Computation, Second Edition, Pearson Education, 2003.
2.	Thomas A. Sudkamp, An Introduction to the Theory of Computer Science, Languages and Machines, Third Edition, Pearson Education, 2007.
3	Raymond Greenlaw and H.James Hoover, —Fundamentals of Theory of Computation, Principles and Practice, Morgan Kaufmann Publishers, 1998.
4	J. Martin, —Introduction to Languages and the Theory of Computation, Third Edition, Tata McGraw Hill, 2003.
5	Micheal Sipser, —Introduction of the Theory and Computation, Thomson Brokecole, 1997.

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Department	Computer Science and Engineering				R 2016	Semester	V
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CS504	EMBEDDED SYSTEMS	3	0	2	4	60	100
<b>Course Objective (s):</b> <ul style="list-style-type: none"> <li>To learn the architecture and programming of ARM processor</li> <li>To familiarize with the embedded computing platform design and analysis</li> <li>To be exposed to the basic concepts of real time operating systems</li> <li>To run and debug programs in an IDE</li> <li>To design an embedded processor based system for a real-time application.</li> </ul>							
<b>Course Outcomes:</b> <ol style="list-style-type: none"> <li>Describe the architecture and programming of ARM processor.</li> <li>Explain the basic concepts of real time Operating systems.</li> <li>Develop Embedded C program for simple real time applications</li> <li>Explain embedded computing platforms</li> <li>Outline the basic designing techniques of Embedded systems.</li> </ol>							
<b>UNIT I</b>	<b>INTRODUCTION TO EMBEDDED SYSTEMS AND ARM PROCESSOR</b>						<b>9</b>
Introduction – Complex Systems and Microprocessors - System Design Process – ARM Processor – Architecture - Instruction Set – Programming. Programming Input and Output- Supervisor Mode, Exceptions and Traps.							
<b>UNIT II</b>	<b>PROCESSES AND OPERATING SYSTEMS</b>						<b>9</b>
Introduction – Multiple Tasks and Multiple Processes – Preemptive Real - Time Operating Systems – Priority Based Scheduling– Inter-Process Communication Mechanisms – Evaluating Operating System Performance – Power Management and Optimization for Processes – Design Example.							
<b>UNIT III</b>	<b>EMBEDDED C PROGRAMMING</b>						<b>9</b>
Programming Embedded Systems in C – Programming using Microcontroller/OS II Functions – Inline Functions and Inline Assembly – Portability Issues – Meeting Real Time Constraints – Multistate Systems and Function Sequences.							
<b>UNIT IV</b>	<b>EMBEDDED COMPUTING PLATFORM</b>						<b>9</b>
The CPU Bus – Memory Devices – I/O Devices – Component Interfacing – Embedded Software Development Tools – Emulators and Debuggers. Challenges of Embedded Systems							
<b>UNIT V</b>	<b>EMBEDDED SYSTEMS DESIGNING</b>						<b>9</b>
Embedded System Design Process – Design Issues – Design Methodologies – Complete Design of Example Embedded Systems –Optimization and Performance Analysis – Introduction to Multiprocessors in Embedded Systems – Networks for Embedded Systems							

**List of Experiments:**

15 Periods

<ol style="list-style-type: none"> <li>Study of ARM evaluation system</li> <li>Interfacing PWM.</li> <li>Interfacing keyboard and LCD.</li> <li>Interfacing EPROM and interrupt.</li> <li>Interrupt performance characteristics of ARM</li> <li>Flashing of LEDS.</li> <li>Interfacing stepper motor and temperature sensor.</li> <li>Implementing zigbee protocol with ARM.</li> </ol>
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<b>TEXTBOOKS:</b>	
1.	Wayne Wolf, "Computers as Components - Principles of Embedded Computing System Design", Third Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.
2.	Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay ,  The 8051 Microcontroller and Embedded Systems —, Pearson Education, Second edition, 2008.
<b>REFERENCES:</b>	
1.	David. E. Simon, "An Embedded Software Primer", First Edition, Fifth Impression, Addison-Wesley Professional, 2007.
2.	Andrew N Sloss, D. Symes, C. Wright, —ARM System Developer's Guidell, First Edition, Morgan Kaufmann/Elsevier, 2006. 3. Steve Heath, —Embedded Systems Design  , Second Edition, Elsevier, 2008.

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Department	Computer Science and Engineering					R 2016	Semester	V
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CS511	<b>NETWORK PROGRAMMING LABORATORY</b>	0	0	4	2	30	100	

**Course Objective (s):**

- To implement communication protocols like UDP, TCP and FTP
- To understand the various network topologies and devices
- To explain various IP addresses and its functionalities

**Course Outcomes:**

1. Design a simple network using various networking devices
2. Experiment with UDP, TCP, SMTP and FTP protocols
3. Compare the various IP addresses
4. Analyze different topologies and its features

**LIST OF EXPERIMENTS:**

1. Network topology configuration with hubs and switches
2. Socket programming
3. UDP
4. TCP
5. SMTP
6. FTP
7. Study about various IP addresses and subnetting
8. OPNET installation
9. Building simple network using OPNET
10. Simulating Basic network components

**REFERENCE(S):**

1.	Behrouz A Forouzan 'Data Communication and Networking', Fourth Edition, Mcgraw Hill, 2016.
2.	Larry L. Peterson, Bruce S. Davie, 'Computer Networks: A system approach', Fifth Edition, Morgan Kaufmann Publishers, 2010.
3.	<a href="http://opnetprojects.com/opnet-tutorial/">http://opnetprojects.com/opnet-tutorial/</a>



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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	V
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CS512	WEB PROGRAMMING LABORATORY	0	0	4	2	60	100	

**Course Objective (s):**

- To create simple web pages
- To implement CSS and Client Side Scripting
- To understand servlet and JSP concepts

**Course Outcomes:**

1. Develop a basic webpage using HTML.
2. Develop creative web pages using Cascading style sheets
3. Experiment dynamic web page with validation using JavaScript objects
4. Demonstrate server side program using Servlets, JSP and PHP
5. Process XML file using DTD, XSD and XSL

**LIST OF EXPERIMENTS:**

1. Create a simple webpage using HTML5 Semantic and Structural Elements
2. Create a simple college website using Internal and External CSS
3. Design a dynamic web page with validation using JavaScript
4. Design a web page with forms to compare dates
5. Create a simple application using servlet
6. Create a simple web page using JSP and AJAX
7. Write XML DTD to validate the XML file
8. Write XML XSD to validate the XML file
9. Display the XML file using XSL
10. Design a simple web page in PHP

**REFERENCE(S):**

1.	Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", Pearson International, 4th Edition, 2012
2.	Jeffrey C. Jackson, "Web Technologies A computer Science Perspective", Pearson, 2011

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	V
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CS513	MOBILE APPLICATION DEVELOPMENT LABORATORY	0	0	4	2	60	100	

**Course Objective (s):**

- To understand the basics of Android devices and Platform
- To explore the basic building blocks for application development
- To develop and publish the Android applications

**Course Outcomes:**

1. Develop android application with the use of layout, activity and activity lifecycle.
2. Utilize the GPS to create location based application
3. Make use of media and camera API to create multimedia based application
4. Experiment with the XML file parser
5. Utilize SQLite to create database in application

**LIST OF EXPERIMENTS:**

1. Android platform and Project Structure
2. Developing a simple android application
3. Creating Applications with Multiple Activities and a Simple Menu using ListView
4. Developing an application with the support of activity lifecycle
5. Write an application that uses SQLite databases
6. Creating activity for parsing the XML file
7. Write an application to implement Fragment
8. Develop an android application that makes use of GPS
9. Media and Camera API
10. Sensor programming

**REFERENCE(S):**

1.	Dawn Griffiths, David Griffiths, "Head First: Android Development" ,OReilly, 2015,
2.	Greg Milette, Adam Stroud, "PROFESSIONAL Android™ Sensor Programming", John Wiley and Sons, 2012,

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Department	Computer Science and Engineering				R 2016	Semester	VI
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CS601	COMPILER DESIGN	3	2	0	4	60	100

**Course Objective (s):**

- To design the front end of the compiler, scanner, parser, intermediate code generator, object code generator, and the parallel compilation strategies

**Course Outcomes:**

- Explain the design of a compiler and its phases and lexical analyzer
- Identify the similarities and differences among various parsing techniques and grammar transformation techniques
- Translate given input to intermediate code
- Apply the techniques for code generation
- Identify the various types of optimizations for language transformations

**Unit I LEXICAL ANALYSIS**

**9**

Introduction to Compiler – Analysis of the Source Program – The Phases of Compiler – Compiler Construction Tools – Lexical Analyzer – Input Buffering – Specification of Tokens-Recognition of Tokens – A Language for Specifying Lexical Analyzer

**Unit II SYNTAX ANALYSIS AND RUN-TIME ENVIRONMENTS**

**9**

Syntax analysis: The Role of the Parser – Top Down Parsing – Bottom Up Parsing – LR Parsers-Constructing SLR Parsing Table – Type Checking – Run Time Environment – Source Language Issues – Storage Organization – Storage Allocation Strategies.

**Unit III INTERMEDIATE CODE GENERATION**

**9**

Intermediate Languages – Declarations – Assignment Statements – Boolean Expressions – Flow of Control Statements – Back Patching – Procedure Calls

**Unit IV CODE GENERATION**

**9**

Issues in the Design of a Code Generator – Target Machine – Basic Block and Flow Graphs – Next use Information – Simple Code Generator – Register Allocation and Assignment – The DAG Representation of Basic Blocks – Generating Code from DAGs

**Unit V CODE OPTIMIZATION**

**9**

Principle Sources of Optimization – Peephole Optimization – Optimization of Basic Blocks – Loops in Flow Graphs – Introduction to Global Data - Flow Analysis - Code Improving Transformations.

**TEXT BOOK(S):**

- Alfred V. Aho, Ravi Sethi Jeffrey D.Ullman, —Compilers: Principles, Techniques and Tools, Pearson Education, 2011.

**REFERENCE(S):**

- David Galles ,||Modern compiler design||, Pearson Education, 2008.
- Steven S.Muchnick,||Advanced compiler Design & implementation —, Morgan Kaufmann Publishers, 2000.
- Charles N.Fischer, Richard. J.LeBlanc, —Crafting a compiler with C||, Pearson Education, 2008.

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Department	Computer Science and Engineering				R 2016	Semester	VI
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CS602	BIG DATA ANALYTICS	3	0	0	3	45	100

**Course Objective (s):**

- To understand the fundamentals of big data analytics
- To recognize the key concepts of Hadoop framework, Map Reduce, Pig and Hive
- To explore tools and practices for working with big data

**Course Outcomes:**

1. Explain the concepts of big data and analytics
2. Explain the working procedure of hadoop ecosystem
3. Make use of map reduce framework and PIG scripting to process real time data
4. Explain different forms of databases and data warehouse used in big data
5. Apply the concepts of big data to solve real world problems

**Unit I INTRODUCTION TO BIG DATA ANALYTICS**

**9**

Introduction to Big Data – Big data characteristics – Objectives and applications – Drivers for big data – Challenges for processing big data – Importance of analytics in big data – Classification of analytics – Top analytics tools

**Unit II HADOOP ECOSYSTEM**

**9**

Hadoop Ecosystem – Hadoop Execution Environment – Hadoop Distributed File System (HDFS) – HDFS Architecture and Configuration – Processing data in Hadoop – Data Storage in HDFS – HDFS Access – Commands – APIs – Applications

**Unit III MAPREDUCE FRAMEWORK AND PIG**

**9**

MapReduce Framework – Architecture – Working of MapReduce – Mapper – Reducer – Partitioner – Counter – MapReduce Programming model – Introduction to Apache Pig : Basic Latin commands – Keywords – Data types – Operators – UDF statements – Load/Store Functions

**Unit IV DATABASES OF HADOOP**

**9**

Introduction to Apache HIVE – HIVE architecture – Managing Tables – Data types and Schemas – Partitions and buckets - NoSql Databases: Introduction to Cassandra – Features and Data Types – CRUD – Collections – Introduction to MongoDB – Data Types – CRUD – MongoDB shell

**Unit V BIG DATA TECHNOLOGIES AND APPLICATIONS**

**9**

Introduction to Spark – Spark Ecosystem – Spark – Streaming – Resilient Distributed Datasets and Transformations – Spark in Scala Programming language – Analysis of Big Data: Twitter data – E-Commerce data – Blogs data.

**TEXT BOOK(S):**

1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publication, First edition, 2016

**REFERENCE(S):**

1. Tom White, Hadoop The Definitive Guidell, First Edition. O'Reilly, 2009
2. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analytics, John Wiley & sons, 2012.
3. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.
4. Learning Spark: Lightning-Fast Big Data Analysis Kindle Edition by Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia.

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Department	Computer Science and Engineering					R 2012	Semester	6
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
<b>16CS603</b>	<b>MACHINE LEARNING TECHNIQUES</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>	
<b>Course Objective (s):</b>								
<ul style="list-style-type: none"> <li>• Recognize definition, goals and applications of Machine Learning techniques.</li> <li>• Understand the concepts of Descriptive Statistics.</li> <li>• Recognize various machine learning techniques such as Supervised and Unsupervised Learning Concepts, Classification, Regression etc.</li> <li>• Understand the fundamentals of Neural Networks and Data Science.</li> <li>• Understand the fundamentals of R language and its usage for statistical computing</li> </ul>								
<b>Course Outcomes:</b>								
<ol style="list-style-type: none"> <li>1. Explain the fundamentals of Machine Learning.</li> <li>2. Demonstrate various concepts of Descriptive Statistics.</li> <li>3. Apply Machine Learning techniques such as classification, regression.</li> <li>4. Outline the basics of neural networks, data science and Deep Learning.</li> <li>5. Constructs the concepts of R programming.</li> </ol>								
<b>Unit I</b>	<b>INTRODUCTION OF MACHINE LEARNING</b>							<b>9</b>
Definition, Goals and Applications of Machine Learning - Types of Learning Techniques: Supervised, Unsupervised and Semi-supervised, Reinforcement Learning - Aspects of Developing a Learning System: Training Data, Concept Representation, Function Approximation - Examples of Machine Learning Problems-Structure of Learning versus Designing-Training versus Testing- Characteristics of Machine Learning Tasks- Predictive and Descriptive Tasks.								
<b>Unit II</b>	<b>DESCRIPTIVE STATISTICS</b>							<b>9</b>
Central tendency: Mean, Median, Mode- Measures of Dispersion: Variance, Standard Deviation-Measures of Shape : Skewnes , kurtosis, Percentile, Five number summary-Data Visualization: Box plot, Histogram, Bar Chart, Pie Chart, Scatter plot- Association Analysis: Covariance, Correlation, Types of Correlation :Pearson Correlation, Spearman Correlation, Kendall Correlation, Two Way Tables, Chi-Squared Test for Two Way Tables.								
<b>Unit III</b>	<b>SUPERVISED AND UNSUPERVISED LEARNING</b>							<b>9</b>
Supervised Learning: Regression, Simple Linear Regression, Multiple Linear Regression, Logistic Regression-Classification, Decision Tree, k-Nearest Neighbors, Support Vector Machine (SVM). Unsupervised Learning: Clustering, Introduction, Distance Measure, Clustering Methods: Density Based Clustering, DBSCAN, Grid Based Clustering-Cluster Tendency Assessment-Applications of Clustering.								
<b>Unit IV</b>	<b>NEURAL NETWORKS AND INTRODUCTION TO DATA SCIENCE</b>							<b>9</b>
Introduction to Neural Networks-Activation Functions -Learning Rate-Stochastic Gradient Descent-Feed forward-Back Propagation-Basics of Deep Learning Networks-Introduction to Data Science-Digital Data- Data Science and its components.								
<b>Unit V</b>	<b>R OBJECTS AND HANDS-ON LAB USING R</b>							<b>9</b>
Introduction to R, R Objects and Classes : Class, Object, Vector, List, Factor, Matrix, Array, Data Frame, Manipulating Objects, Input/output-R constructs-R Advantages-Hands on-Experiments for: Data Description, Data Visualization, Correlation analysis, Clustering, Regression, Classification, Neural networks.								

<b>REFERENCE BOOK(S):</b>	
1.	Practical Data Science with R. Author(s): Nina Zumel, John Mount, Manning Shelter Island.ko
2.	Data Mining Concepts and Techniques, 3rd Edition. Author(s): J.Han, M Kamber, J Pei.
3.	Introduction to Data Mining. Author(s): Pang-Ning Tan, Steinberg, Vipin Kumar.
4.	Introduction to Statistical Learning using R. Author(s): Trevor Hastie, Tibshirani.
5.	Applied Predictive Modeling. Author(s): by Max Kuhn, Kjell Johnson.

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CS604	OBJECT ORIENTED ANALYSIS AND DESIGN	3	0	2	4	60	100

**Course Objective (s):**

- To learn basic OO analysis and design skills through an elaborate case study.
- To use the UML design diagrams.
- To apply the appropriate design patterns.

**Course Outcomes(CO):**

1. Illustrate basics of Object Oriented system development concepts
2. Apply conventional frameworks and data modeling concepts for designing a software
3. Identify attributes, objects to define relationships using decision support models for software design
4. Utilize object oriented design principles to design a software
5. Use Software Quality Assurance techniques to improve the software quality

<b>Unit I</b>	<b>FUNDAMENTALS</b>	<b>9</b>
Introduction OOAD – Two Orthogonal Views of the Software - Why object orientation – Object basics – Object oriented systems development life cycle.		
<b>Unit II</b>	<b>OBJECT ORIENTED METHODOLOGIES</b>	<b>9</b>
Rumbaugh methodology – Booch methodology – Jacobson methodology – Patterns – Frameworks – Unified approach – Unified modeling language – Use case diagram – Class diagram – Sequence diagram – Activity diagram.		
<b>Unit III</b>	<b>OBJECT ORIENTED ANALYSIS</b>	<b>9</b>
Identifying use cases – Identifying Tentative classes – Identifying Classes and their Behaviors using SCM - Identifying object relationships – Attributes and methods.		
<b>Unit IV</b>	<b>OBJECT ORIENTED DESIGN</b>	<b>9</b>
Design axioms – Designing classes – Object storage – Introduction – Object store and persistence overview – Database Management Systems- Case Study: Traffic Management, Weather Monitoring Station, Vacation Tracking System.		
<b>Unit V</b>	<b>SOFTWARE QUALITY AND USABILITY</b>	<b>9</b>
Introduction to SQA – Quality Assurance Tests – Testing Strategies – Impact of object orientation on Testing – Test cases-Test Plan – System usability and measuring user satisfaction.		

**TEXT BOOK(S):**

1.	Ali Bahrami , “Object Oriented Systems Development”, McGraw Hill Education, Indian Edition, 2004, ISBN-13:978-0-07-026512-7.
2.	Martin Fowler, “UML Distilled “, 2nd Edition, Prentice Hall of India / Pearson Education, 2002.

**REFERENCE(S):**

1.	Stephen R. Schach, “Introduction to Object Oriented Analysis and Design”, Tata McGraw - Hill, 2003.
2.	James Rumbaugh, Ivar Jacobson and Grady Booch ,”The Unified Modeling Language Reference Manual”, Addison Wesley, 1999.
3.	Hans – Erik Eriksson, Magnus Penker, Brain Lyons and David Fado, “UML Toolkit”, OMG Press Wiley Publishing Inc., 2004.
4.	Barclay, “Object-Oriented Design with UML and Java”, Elsevier, 2008.

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	VI
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CS611	COMPILER DESIGN LABORATORY	0	0	4	2	30	100	

**Course Objective (s):**

- To Learn about compiler writing tools.
- To implement the different Phases of compiler
- To Be familiar with control flow and data flow analysis
- To Learn simple optimization techniques

**Course Outcomes:**

1. Implement the different Phases of compiler using tools
2. Analyze the control flow and data flow of a typical program
3. Optimize a given program
4. Generate an assembly language program equivalent to a source language program

**LIST OF EXPERIMENTS:**

11. Implementation of Symbol Table
12. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)
13. Implementation of Lexical Analyzer using Lex Tool
14. Generate YACC specification for a few syntactic categories.
  - a) Program to recognize a valid arithmetic expression that uses operator +, -, \* and /.
  - b) Implementation of Calculator using LEX and YACC
15. Convert the BNF rules into Yacc form and write code to generate Abstract Syntax Tree.
16. Implement type checking
17. Implement control flow analysis and Data flow Analysis
18. Implement any one storage allocation strategies(Heap,Stack,Static)
19. Construction of DAG
20. Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assembly instructions can be simple move, add, sub, jump. Also simple addressing modes are used.
21. Implementation of Simple Code Optimization Techniques (Constant Folding., etc.)

**REFERENCE(S):**

1.	Alfred V. Aho, Ravi Sethi Jeffrey D.Ullman, —Compilers: Principles, Techniques and Tools, Pearson Education, 2011.
2.	David Galles, —Modern compiler design, Pearson Education, 2008.

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Department	Computer Science and Engineering				R 2016	Semester	VI
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CS612	BIG DATA ANALYTICS LABORATORY	0	0	4	2	30	100

**Course Objective (s):**

- To impart architectural concepts of hadoop framework
- To design map reduce program to solve complex problems

**Course Outcomes:**

1. Installation of various big data tool
2. Demonstrate the working of Hadoop Databases
3. Explain HDFS setup and their commands
4. Make use of map reduce programming and pig scripting to solve problems
5. Perform data analytics using spark

**LIST OF EXPERIMENTS:**

1. Installation of Hadoop
2. HDFS Setup and Hadoop Shell Commands
3. MapReduce – Running Word Count Program
4. Stop Word Elimination Problem
5. Map Reduce Program to Mine Weather Dataset
6. Pig Installation and scripting operations
7. Hive Installation and database operations
8. CRUD Operations in MongoDB
9. CRUD Operations in Cassandra
10. Data Analytics using Apache Spark

**REFERENCE(S):**

1.	Tom White, Hadoop The Definitive Guidell, First Edition. O'Reilly, 2009
2.	Learning Spark: Lightning-Fast Big Data Analysis Kindle Edition by Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia.



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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CSE01	DATA WAREHOUSING AND DATA MINING	3	0	0	3	45	100
<b>Course Objective (s):</b> <ul style="list-style-type: none"> <li>To outline the concepts of Data Warehousing and OLAP</li> <li>To highlight the different techniques involved in Data Mining.</li> </ul>							
<b>Course Outcomes:</b> <ol style="list-style-type: none"> <li>Design the Data warehouse schema and OLAP operations for the given problems</li> <li>Explain the functions involved in the Data Mining Process</li> <li>Apply the Association Rule Mining techniques and Classification algorithms to solve the real world problems.</li> <li>Apply the various clustering algorithms for partitioning the given data.</li> <li>Use the WEKA tool in Data Mining applications.</li> </ol>							
<b>Unit I</b>	<b>DATA WAREHOUSING &amp; ONLINE ANALYTICAL PROCESSING</b>						<b>9</b>
Basic Concepts – Data Warehousing Components – Data Warehouse Models – Metadata – Data Cube: A Multidimensional Data Model – Schemas for Multidimensional Data Models – Dimensions - Measures – OLAP: Types of OLAP – ROLAP, MOLAP, HOLAP.							
<b>Unit II</b>	<b>DATA MINING</b>						<b>9</b>
Data Mining Functionalities – Data Preprocessing: An Overview – Data Cleaning – Data Integration – Data Reduction – Data Transformation.							
<b>Unit III</b>	<b>ASSOCIATION RULE MINING &amp; CLASSIFICATION</b>						<b>9</b>
Association Rule Mining: Basic Concepts – Frequent Itemset Mining Methods- Finding Frequent Itemsets by Confined Candidate Generation – Finding Frequent Itemsets without Candidate Generation - Classification: Basic Concepts – Decision Tree Induction – Bayes Classification Methods – Rule Based Classification.							
<b>Unit IV</b>	<b>CLUSTERING</b>						<b>9</b>
Basic Concepts- Requirements for Cluster Analysis - Overview of Basic Clustering Methods - Partitioning Methods – Hierarchical Based Clustering – Density Based Methods.							
<b>Unit V</b>	<b>TOOLS &amp; APPLICATIONS OF DATA MINING</b>						<b>9</b>
WEKA: Introduction – Data Preprocessing – Classification – Clustering - Association Rules - Attribute Selection - Data Visualization- Applications: Text Mining- World Wide Web Mining – Multimedia Mining.							

**TEXT BOOK(S):**

1.	Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, 3 <sup>rd</sup> Edition, Elsevier, Reprinted 2012
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**REFERENCE(S):**

1.	Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, 27 <sup>th</sup> Reprint 2013.
2.	Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction To Data Mining”, Pearson Education, 2016.
3.	Ian Witten, Eibe Frank, Mark Hall, Christopher Pal, “Data Mining: Practical Machine Learning Tools and Techniques”, Elseiver, 4 <sup>th</sup> Edition, 2016.

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CSE02	DATABASE TUNING	3	0	0	3	45	100	

**Course Objective (s):**

- To understand the application on database management system, operating system, and hardware.
- To learn the principles of underlying any tuning puzzle
- To understand the application of real time databases.
- To apply tuning tools and troubleshoot the various DBMS queries
- To tune to data warehouse and e-commerce applications

**Course Outcomes:**

1. Explain the basics of database tuning
2. Illustrate the indexing and normalization of tuning
3. Adapt the advanced features of databases in design, administration and applications
4. Identify the techniques to improve the performance of a database
5. Explain the use of existing resources within the database environment

<b>Unit I</b>	<b>TUNING THE GUTS</b>	<b>9</b>
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Tuning the Guts : Locking and Concurrency Control – Logging and the Recovery Subsystem – Operating Systems Considerations – Hardware Tuning.

<b>Unit II</b>	<b>INDEX TUNING AND NORMALIZATION</b>	<b>9</b>
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Index Tuning : Types of Queries – Key Types – Data Structures – Sparse Versus Dense Indexes – To Cluster or Not To Cluster – Distributing the Indexes of a Hot Table – Tuning Relational Systems: Normalization – Clustering Two Tables – Aggregate Maintenance – Record Layout – Query Tuning – Triggers.

<b>Unit III</b>	<b>REAL TIME DATABASES</b>	<b>9</b>
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Client Server Mechanisms – Objects, Application Tools and Performance – Tuning the Application Interface – Bulk Loading Data – Accessing Multiple Databases – Real time databases : transaction chopping – optimal Chopping algorithm – Understanding Access plans.

<b>Unit IV</b>	<b>TROUBLESHOOTING</b>	<b>9</b>
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Consumption chain approach – Query Plan Explainers – Performance Monitors – Event Monitors – Finding Suspicious Queries – Analyzing a Query’s Access Plan – Profiling a Query Execution – DBMS Subsystems – Checking DBMS resource.

<b>Unit V</b>	<b>TUNING DATAWAREHOUSE AND E-COMMERCE APPLICATIONS</b>	<b>9</b>
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Data Warehouse Tuning – Tuning for CRM Systems – Federated Data Warehouse Tuning – E-commerce architecture – Tuning e-commerce architecture – Capacity planning.

**TEXT BOOK(S):**

1.	Dennis Shasha and Philippe Bonnet, “Database Tuning, Principles, Experiments, and Troubleshooting Techniques”, Morgan Kaufmann, An Imprint of Elsevier, 2003.
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**REFERENCE(S):**

1.	Thomas Connolly and Carlolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2003.
2.	Tamer M. Ozsu , Patrick Ualduriel, “Principles of Distributed Database Systems”, Second Edition, Pearson Education, 2003.
3.	Margaret H. Dunham, S. Sridhar “Data Mining Introductory & Advance Topics”, PHI, 2002.

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CSE03	ARTIFICIAL INTELLIGENCE	3	0	0	3	45	100	

**Course Objective (s):**

- To understand the various characteristics of Intelligent agents
- To learn about the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI

**Course Outcomes:**

1. Describe the fundamentals in AI
2. Utilize various problem solving methods in AI
3. Illustrate various knowledge representation techniques in AI
4. Outline the different ways of designing a software agents
5. Summarize the various applications of AI

<b>Unit I</b>	<b>INTRODUCTION</b>	<b>9</b>
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Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

<b>Unit II</b>	<b>PROBLEM SOLVING METHODS</b>	<b>9</b>
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Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games

<b>Unit III</b>	<b>KNOWLEDGE REPRESENTATION</b>	<b>9</b>
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First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information

<b>Unit IV</b>	<b>SOFTWARE AGENTS</b>	<b>9</b>
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Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

<b>Unit V</b>	<b>APPLICATIONS</b>	<b>9</b>
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AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving

**TEXT BOOK(S):**

1.	S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2.	I. Bratko, —"Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

**REFERENCE(S):**

1.	M. Tim Jones, —"Artificial Intelligence: A Systems Approach(Computer Science)", Jones and Bartlett Publishers, Inc.; First Edition, 2008
2.	Nils J. Nilsson, —"The Quest for Artificial Intelligence", Cambridge University Press, 2009.
3.	William F. Clocksin and Christopher S. Mellish," Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.
4.	Gerhard Weiss, —"Multi Agent Systems", Second Edition, MIT Press, 2013.
5.	David L. Poole and Alan K. Mackworth, —"Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.

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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CSE04	ADVANCED DATABASE MANAGEMENT SYSTEMS	3	0	0	3	45	100
<b>Course Objective (s):</b> <ul style="list-style-type: none"> <li>To acquire knowledge on distributed databases and its applications.</li> <li>To study the usage and applications of Object Oriented database</li> <li>To understand the principles of intelligent databases and uses usage of advanced data models.</li> <li>To understand the concepts and methodologies of mobile databases.</li> <li>To learn emerging databases such as XML and Web databases.</li> </ul>							
<b>Course Outcomes:</b> <ol style="list-style-type: none"> <li>Select the appropriate high performance database like distributed and client server databases.</li> <li>Interpret and represent the real world data using object oriented database</li> <li>Illustrate the rule set in the database to implement intelligent databases</li> <li>Predict the concepts and methodologies of mobile databases.</li> <li>Describe the data using XML database for better interoperability</li> </ol>							
<b>Unit I</b>	<b>DISTRIBUTED AND CLIEND SERVER ARCHITECTURE</b>						<b>9</b>
Distributed Database Concepts – Data Fragmentation, Replication and Allocation – Types of Distributed Database Systems – Query Processing in Distributed Databases – Transaction Processing Concepts: Concurrency Control and Recovery.							
<b>Unit II</b>	<b>OBJECT AND OBJECT RELATIONAL DATABASES</b>						<b>9</b>
Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle							
<b>Unit III</b>	<b>INTELLIGENT DATABASES</b>						<b>9</b>
Active Databases Concepts and Triggers – Temporal Databases– Spatial and Multimedia Databases– Deductive Databases.							
<b>Unit IV</b>	<b>MOBILE DATABASES</b>						<b>9</b>
Mobile Databases: Mobile Computing Architecture – Application – Multimedia Databases – Geographic Information Systems: Components – Characteristics – Conceptual Data Models – DBMS Enhancements – Standards and Operations.							
<b>Unit V</b>	<b>XML and WEB DATABASES</b>						<b>9</b>
XML – XML Data Model – DTD – XML Schema – XML Documents and Data Basics – XML Querying – Web Databases Programming using PHP							

**TEXT BOOK(S):**

1. Ramez Elmasri, Shamkant B.Navathe, 'Fundamentals of Database Systems', Fifth Edition, Pearson Education/Addison Wesley, 2007.

**REFERENCE(S):**

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, 'Database System Concepts', Fifth Edition, McGraw Hill, 2006.
2. Thomas Cannolly and Carolyn Begg, 'Database Systems, A Practical Approach to Design, Implementation and Management', Sixth Edition, Pearson Education, 2007.
3. C.J.Date, A.Kannan and S.Swamynathan, 'An Introduction to Database Systems', Eighth Edition, Pearson Education, 2006.
4. Raghu Ramakrishnan, Johannes Gehrke, 'Database Management Systems', McGraw Hill, Third Edition 2004

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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CSE05	DATABASE SECURITY AND PRIVACY	3	0	0	3	45	100
<b>Course Objective (s):</b>							
<ul style="list-style-type: none"> <li>To understand the fundamentals of security, and how it relates to information systems</li> <li>To identify risks and vulnerabilities in operating systems from a database perspective</li> <li>To learn good password policies, and techniques to secure passwords in an organization</li> </ul>							
<b>Course Outcomes:</b>							
<ol style="list-style-type: none"> <li>Explain the concepts of security for database application development</li> <li>Explain the authentication process in the database</li> <li>Illustrate the database application security models and virtual private databases</li> <li>Illustrate the security audit methods</li> <li>Explain the privacy preserving and data mining techniques</li> </ol>							
<b>Unit I</b>	<b>CONCEPTS OF SECURITY</b>						<b>9</b>
Introduction-Information Systems-Database Management Systems-Information Security Architecture- Database Security-Asset Types and value-Security Methods Authentication Methods-User Administration-Password Policies-Vulnerabilities-E-mail Security							
<b>Unit II</b>	<b>ADMINISTRATION OF USERS &amp; PROFILES,PASSWORD POLICIES,PRIVILEGES AND ROLES</b>						<b>10</b>
Introduction-Authentication-Creating Users, SQL Server User-Removing, Modifying Users-Default, Remote Users Defining and Using Profiles-Designing and Implementing Password Policies-Granting and Revoking User Privileges-Creating, Assigning and Revoking User Roles							
<b>Unit III</b>	<b>DATABASE APPLICATION SECURITY MODELS &amp; VIRTUAL PRIVATE DATABASES</b>						<b>9</b>
<b>Database Application Security Models:</b> Introduction-Types of Users-Security Models-Application Types-Application Security Models-Data Encryption <b>Virtual Private Databases:</b> Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager-Implementing Row and Column level Security with SQL Server							
<b>Unit IV</b>	<b>DATA BASE AUDITING</b>						<b>7</b>
Overview of database auditing- auditing environment-auditing process- auditing models -application of Auditing - Statistical database security							
<b>Unit V</b>	<b>PRIVACY PRESERVING DATA MINING TECHNIQUES</b>						<b>10</b>
Introduction- Privacy Preserving Data Mining Algorithms-General Survey-Randomization Methods-Group Based Anonymization-Distributed Privacy Preserving Data Mining-Application of Privacy Preserving Data Mining.							

**TEXT BOOK(S):**

1. Hassan A. Afyouni, "Database Security and Auditing", Third Edition, Cengage Learning, 2009

**REFERENCE(S):**

1. Ron Ben Natan, "Implementing Database Security and Auditing", Elsevier, Indian reprint 2006.

2. <http://charuaggarwal.net/toc.pdf>

3. <http://adrem.ua.ac.be/sites/adrem.ua.ac.be/files/securitybook.pdf>

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<b>Department</b>	<b>Computer Science and Engineering</b>				<b>R 2016</b>	<b>Semester</b>	<b>-</b>
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
<b>16CSE06</b>	<b>NATURAL LANGUAGE PROCESSING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>

**Course Objective (s):**

- Provide the student with knowledge of various levels of analysis involved in NLP.
- Understand the applications of NLP.
- Gain knowledge in automated Natural Language Generation and Machine Translation.

**Course Outcomes:**

1. Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.
2. Develop key notions, such as algorithm, computability, decidability, and complexity through problem solving.
3. Apply the concept of Formal Language and Grammar.
4. Explain the concept of Semantic analysis.
5. Explain the relevance of the Machine Translation.

<b>Unit I</b>	<b>OVERVIEW AND MORPHOLOGY</b>	<b>9</b>
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Introduction – Models – Algorithms - Regular Expressions Basic Regular Expression Patterns – Finite State Automata- Morphology - Inflectional Morphology - Derivational Morphology - Finite-State Morphological Parsing - Porter Stemmer.

<b>Unit II</b>	<b>WORD LEVEL AND SYNTACTIC ANALYSIS</b>	<b>9</b>
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N-grams Models of Syntax - Counting Words - Unsmoothed N-grams-Smoothing- Back off Deleted Interpolation – Entropy - English Word Classes – Tag sets for English-Part of Speech Tagging-Rule Based Part of Speech Tagging -Stochastic Part of Speech Tagging - Transformation-Based Tagging.

<b>Unit III</b>	<b>CONTEXT FREE GRAMMARS</b>	<b>9</b>
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Context Free Grammars for English Syntax- Context- Free Rules and Trees -Sentence- Level Constructions– Agreement – Sub Categorization-Parsing – Top-down – Early Parsing -feature Structures –Probabilistic Context-Free Grammars.

<b>Unit IV</b>	<b>SEMANTIC ANALYSIS</b>	<b>9</b>
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Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus-Representing Linguistically Relevant Concepts -Syntax- Driven Semantic Analysis - Semantic Attachments -Syntax- Driven Analyzer-Robust Analysis - Lexemes and Their Senses - Internal Structure -Word Sense unambiguous - Information Retrieval.

<b>Unit V</b>	<b>LANGUAGE GENERATION AND DISCOURSE ANALYSIS</b>	<b>9</b>
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Discourse -Reference Resolution - Text Coherence - Discourse Structure – Coherence-Dialog and Conversational Agents - Dialog Acts – Interpretation -Conversational Agents –Language Generation-Architecture-Surface Realizations- Discourse Planning-Machine Translation -Transfer Metaphor–Interlingua – Statistical Approaches.

**TEXT BOOK(S):**

<b>1.</b>	Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition,2008.
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**REFERENCE(S):**

<b>1.</b>	C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press. Cambridge, MA.,1999
<b>2.</b>	James Allen, Benjamin/Cummings, "Natural Language Understanding", 2nd edition, 1995.

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CSE07	ADVANCED JAVA PROGRAMMING	3	0	0	3	45	100	
<b>Course Objective (s):</b> <ul style="list-style-type: none"> <li>To develop next generation GUI development using Java FX Technology.</li> <li>To design JSF Technologies for developing dynamic web pages.</li> <li>To understand and create components in JMS.</li> <li>To develop scripting techniques using Jython</li> </ul>								
<b>Course Outcomes(CO):</b> <ol style="list-style-type: none"> <li>To develop next generation GUI development using Java FX Technology</li> <li>To Understand the Advance Concepts of JavaFx</li> <li>To design JSF Technologies for developing dynamic web pages</li> <li>To understand and create components in JMS Enterprise and Programming</li> <li>To develop scripting techniques using Jython</li> </ol>								
<b>Unit I</b>	<b>JAVA FX TECHNOLOGY FOR RICH CLIENT APPLICATIONS</b>						<b>9</b>	
<b>Java FX Architecture:</b> JavaFX8 application structure, using pure java code, using FXML-Application, scene and stage. Tools for development Scene Builder, Netbeans 8, Eclipse(Fx) <b>-FXML and Scene builder:</b> MVC approach, FXML controller, Layout , Built in UI controls ,applying CSS to UI controls <b>-Lambda Expressions:</b> Functional interfaces, Properties and Binding, Lambda to handle events.								
<b>Unit II</b>	<b>JAVA FX ADVANCED CONCEPTS</b>						<b>9</b>	
<b>Animation and visual effects:</b> Working with images <b>-Custom UI, Charts:</b> Theme, custom controls, pie and line charts with event handling <b>-Java FX media:</b> Media Events, Playing audio, Playing video <b>-Java FX 3D:</b> 3D basic scenes in java FX <b>-Java FX on Web:</b> Web Engine, Viewing HTML content in Web View, Web Events.								
<b>Unit III</b>	<b>JAVA SERVER FACES TECHNOLOGY</b>						<b>9</b>	
<b>JSF 2.2 Introduction:</b> Installation and setup, Architecture, JavaServer Faces Implementation of MVC, The JSF Lifecycle, JavaServer Faces user interface components <b>-JSF Programming:</b> HTML5 and JSF2.2,Managed beans, JSF Expression language, Handling GUI and Events, Validating user input, JSF and AJAX integration <b>-Advanced Topics:</b> Custom Components, Facelets, Introduction to Prime Faces.								
<b>Unit IV</b>	<b>JMS-ENTERPRISE JMS PROGRAMMING</b>						<b>9</b>	
Overview and history of the Java Message Service (JMS) <b>-Guidelines for choosing JMS-Types of messages - Constructing and sending messages-receiving messages-Synchronously and Asynchronously:</b> publish/subscribe and point-to-point messaging <b>.Message driven beans in Enterprise JavaBeans 2.0:</b> understanding and using JMS transactions <b>-Security concepts in JMS.</b>								
<b>Unit V</b>	<b>SCRIPTING TECHNIQUES</b>						<b>9</b>	
<b>Python for the Java Platform:</b> Basics <b>-Introduction to Jython, Scripting with Jython -Jython and Java Integration - Databases and Jython:</b> Object Relational Mapping and Using JDBC <b>-Developing Applications with Jython:</b> Web Applications With Django <b>-Developing Applications with Jython:</b> GUI Applications, Testing and Continuous Integration in Jython.								

TEXT BOOK(S):	
1.	Carl Dea, Mark Heckler, GerritGrunwald, José Pereda, Sean Phillips, "JavaFX 8: Introduction by Example", 2nd Edition 2014, Apress, ISBN13: 978-1-4302:6460:6.
2.	AnghelLeonard, "Mastering Java Server Faces 2.2", June 2014, Packt Publishing, ISBN: 9781782176466.
3.	Shaun Terry, "Enterprise JMS Programming", 1 <sup>st</sup> Edition, M&T Books, ISBN-13: 978-0764548970.
4.	Josh Juneau , Jim Baker , Donna L. Baker , Frank Wierzbicki , Leo Soto Muoz , Victor Ng , " The Definitive Guide to Jython: Python for the Java Platform" , 2010, Apress Publication. ISBN13: 978-1-4302-2527-0.

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<b>REFERENCE(S):</b>	
1.	Paul Deital,HarveyDeital, "Java How to Program ",10th Edition,2015, Pearson, ISBN:10: 0133813436 / ISBN:13: 9780133813432.
2.	Kogent Learning Solutions Inc "Java Server Programming Java EE 7 (J2EE 1.7)", Black Book 2015, dream tech press, ISBN: 13: 9789351194170.
3.	<a href="http://pdf.coreservlets.com/">http://pdf.coreservlets.com/</a> .
4.	<a href="https://docs.oracle.com/javase/tutorialas">https://docs.oracle.com/javase/tutorialas</a> .
5.	<a href="http://www.jython.org/jythonbook/en/1.0/">http://www.jython.org/jythonbook/en/1.0/</a> .



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Department	Computer Science and Engineering				R 2016	Semester	--
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CSE08	FUNCTIONAL PROGRAMMING	3	0	0	3	45	100
<b>Course Objective (s):</b> <ul style="list-style-type: none"> <li>To make you acquainted with the mechanics of writing Haskell programs</li> <li>To tackle a more challenging programming task.</li> </ul>							
<b>Course Outcomes:</b> <ol style="list-style-type: none"> <li>Explain the basic constructs of functional programming</li> <li>Make use of functions and modules to write a simple programs</li> <li>Utilize the IO streams and exception handling mechanisms to handle dynamic inputs</li> <li>Make use of functors and monoids to solve simple problems</li> <li>Explain the significance of monoids and zippers in Hashkell programming</li> </ol>							
<b>Unit I</b>	<b>INTRODUCTION TO FUNCTIONAL PROGRAMMING</b>						<b>9</b>
Functional Programming: Introduction to lambda calculus – fundamentals of functional programming languages – Haskell programming: Introduction – basic data models – basic operators – decision making – types and type class							
<b>Unit II</b>	<b>FUNCTIONS AND MODULES IN HASKELL</b>						<b>9</b>
Defining functions: guards, pattern matching and recursion – Higher order function – Lambda expression – Other functions – Function composition – List Module – Char module – Map module – Set module – Custom module							
<b>Unit III</b>	<b>I/O USING HASKELL</b>						<b>9</b>
Files and Streams – Command line arguments – Randomness – bytestrings – Exception							
<b>Unit IV</b>	<b>FUNCTORS AND MONOIDS IN HASKELL</b>						<b>9</b>
Functionally solving problems:Reverse polish notation calculator – Heathrow to London – Functors redux – Applicative functors – newtype keyword – Monoids							
<b>Unit V</b>	<b>MONADS AND ZIPPERS IN HASKELL</b>						<b>9</b>
Monad type class – do notation – list monad – monad laws – monadic functions – making monads – Zippers: manipulating trees – lists – simple file system using trees							

**TEXT BOOK(S):**

- Graham Hutton, "Programming in Haskell (2nd edition)", Cambridge University Press, 2016.

**REFERENCE(S):**

- <http://learnyouahaskell.com/chapters>

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<b>Department</b>	<b>COMPUTER SCIENCE AND ENGINEERING</b>				<b>R 2016</b>	<b>Semester</b>	-
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
<b>16CSE09</b>	<b>DIGITAL IMAGE PROCESSING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>

**Course Objective (s):**

- Learn digital image fundamentals.
- Be exposed to simple image processing techniques.
- Be familiar with image compression and segmentation techniques.
- Learn to represent image in form of features.

**Course Outcomes:**

1. Discuss digital image fundamentals.
2. Apply image enhancement techniques.
3. Use image restoration and segmentation Techniques.
4. Apply image compression and wavelets techniques.
5. Represent features of images.

**Unit I DIGITAL IMAGE FUNDAMENTALS**

**9**

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models.

**Unit II IMAGE ENHANCEMENT**

**9**

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

**Unit III IMAGE RESTORATION AND SEGMENTATION**

**9**

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities– Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation.

**Unit IV WAVELETS AND IMAGE COMPRESSION**

**9**

Wavelets – Subband coding - Multiresolution expansions - Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

**Unit V IMAGE REPRESENTATION AND RECOGNITION**

**9**

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

**TEXT BOOK(S):**

1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.

**REFERENCE(S):**

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
3. William K Pratt, "Digital Image Processing", John Willey, 2002.
4. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.
5. <http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html>
6. <http://eeweb.poly.edu/~onur/lectures/lectures.html>.

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<b>Department</b>	<b>COMPUTER SCIENCE AND ENGINEERING</b>				<b>R 2016</b>	<b>Semester</b>	<b>-</b>
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
<b>16CSE10</b>	<b>DIGITAL SIGNAL PROCESSING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>

**Course Objective (s):**

- To introduce discrete Fourier transform and its applications.
- To teach the design of infinite and finite impulse response filters for filtering undesired signals.
- To introduce signal processing concepts in systems having more than one sampling frequency.

**Course Outcomes:**

1. Explain the basics of signals and systems
2. Perform frequency transforms for the signals.
3. Design IIR filter.
4. Design FIR filter.
5. Explain the finite word length effects in digital filters

<b>Unit I</b>	<b>SIGNALS AND SYSTEMS</b>	<b>9</b>
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Basic elements of DSP – concepts of frequency in Analog and Digital Signals – sampling theorem – Discrete – time signals, systems – Analysis of discrete time LTI systems – Z transform – Convolution – Correlation.

<b>Unit II</b>	<b>FREQUENCY TRANSFORMATIONS</b>	<b>9</b>
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Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms - Decimation – in – time Algorithms, Decimation – in – frequency Algorithms – Use of FFT in Linear Filtering – DCT – Use and Application of DCT.

<b>Unit III</b>	<b>IIR FILTER DESIGN</b>	<b>9</b>
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Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF) filter design using frequency translation.

<b>Unit IV</b>	<b>FIR FILTER DESIGN</b>	<b>9</b>
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Structures of FIR – Linear phase FIR filter – Fourier Series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques

<b>Unit V</b>	<b>FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS</b>	<b>9</b>
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Binary fixed point and floating point number representations – Comparison - Quantization noise –truncation and rounding – quantization noise power- input quantization error- coefficient quantization error – limit cycle oscillations-dead band- Overflow error-signal scaling.

**TEXT BOOK(S):**

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|----|--|
| 1. | John G. Proakis and Dimitris G.Manolakis, “Digital Signal Processing – Principles, Algorithms & Applications”, Fourth Edition, Pearson Education, Prentice Hall, 2007. |
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**REFERENCE(S):**

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|----|--|
| 1. | Emmanuel C.lfeachor, and Barrie.W.Jervis, “Digital Signal Processing”, Second Edition, Pearson Education, Prentice Hall, 2002. |
| 2. | Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Third Edition, Tata Mc Graw Hill, 2007.              |
| 3. | A.V.Oppenheim, R.W. Schafer and J.R. Buck, Discrete-Time Signal Processing, 8th Indian Reprint, Pearson, 2004.                 |
| 4. | Andreas Antoniou, “Digital Signal Processing”, Tata McGraw Hill, 2006.   |

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Department	Computer Science and Engineering				R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
<b>16CSE11</b>	<b>REAL TIME OPERATING SYSTEMS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>
<b>Course Objective (s):</b>							
<ul style="list-style-type: none"> <li>To study the fundamental problems, concepts, and approaches in the design and analysis of real-time systems.</li> </ul>							
<b>Course Outcomes:</b>							
<ol style="list-style-type: none"> <li>1. Explain the Scheduling concepts of RTOS</li> <li>2. Illustrate the various commercial real time operating systems</li> <li>3. Explain the models and languages of real time operating system</li> <li>4. Summarize the different memory management techniques used in real time Operating Systems.</li> <li>5. Demonstrate real time Operating Systems in various application</li> </ol>							
<b>Unit I</b>	<b>INTRODUCTION TO RTOS</b>						<b>9</b>
Introduction - Issues in Real Time Computing - Structure of a Real Time System - Task Classes - Performance Measures for Real Time Systems - Estimating Program Run times - Task Assignment and Scheduling - Classical Uniprocessor scheduling algorithms - UniProcessor scheduling of IRIS Tasks - Task Assignment - Mode Changes and Fault Tolerant Scheduling							
<b>Unit II</b>	<b>REAL TIME KERNEL</b>						<b>9</b>
Difference between general purpose OS and RTOS - Real time kernel architecture - Polled loop cyclic executive - Interrupt service routine - function queue scheduling - RTOS based system design - RTOS Porting to Target - Features of freeware and commercial real time operating systems: Vxworks, Micrium OS , RTLinux , Free RTOS and C Executive							
<b>Unit III</b>	<b>REAL TIME MODELS AND LANGUAGES</b>						<b>9</b>
Event Based - Process Based and Graph based Models - Petrinet Models - Real Time Languages - RTOS Tasks - RT scheduling - Interrupt processing - Synchronization - Control Blocks - Memory Requirements							
<b>Unit IV</b>	<b>MICRIUM-OS AND RT LINUX APIS</b>						<b>9</b>
Task Management - Intertask communication and Synchronization - semaphores - Mutex - Message queues - Mailbox - Time Management - Event Management - Memory Management - Scheduling and Dispatching - POSIX Threads - Developing simple multi tasking applications using ucos-II and RTLinux							
<b>Unit V</b>	<b>RTOS APPLICATION DOMAINS</b>						<b>9</b>
Comparison and study of RTOS: Vxworks , $\mu$ COS – Case studies: RTOS for Image Processing, Embedded RTOS for voice over IP, RTOS for fault Tolerant Applications, RTOS for Control Systems							

**TEXT BOOK(S):**

1. C.M. Krishna, Kang G. Shin, "Real-Time Systems", McGraw-Hill International Editions, 1997.

**REFERENCE(S):**

1. Stuart Bennett, "Real Time Computer Control - An Introduction", Second edition ,Perntice Hall PTR, 1994.
2. Peter D. Lawrence, "Real time Micro Computer System Design – An Introduction", McGraw Hill, 1988.
3. S.T. Allworth and R.N. Zobel, "Introduction to real time software design", Macmillan, second Edition, 1987.
4. R.J.A Buhur, D.L. Bailey, "An Introduction to Real-Time Systems", Prenticeall International, 1999.

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<b>Department</b>	<b>Computer Science and Engineering</b>				<b>R 2016</b>	<b>Semester</b>	<b>-</b>
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
<b>16CSE12</b>	<b>VISUALIZATION TECHNIQUES</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>

**Course Objective (s):**

- To learn about different Visualization Techniques
- To study the Interaction techniques in information visualization fields
- To understand Various abstraction mechanisms
- To create interactive visual interfaces

**Course Outcomes:**

1. Explain the basics of data visualization and principle of Perception
2. Accept the concept of Computer Visualization
3. Make use of various multidimensional visualization technique in real time system
4. Summarize the basics of textual methods
5. Extend the Animation Design for the real time systems

<b>Unit I</b>	<b>FOUNDATIONS FOR DATA VISUALIZATION</b>	<b>9</b>
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Introduction to Visualization – Visualization stages – Experimental Semiotics based on Perception – Gibson's Affordance theory – A Model of Perceptual Processing – Cost and Benefits of Visualization – Types of Data

<b>Unit II</b>	<b>COMPUTER VISUALIZATION</b>	<b>9</b>
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Non-Computer Visualization – Computer Visualization: Exploring Complex Information Spaces – Fisheye Views – Applications – Comprehensible Fisheye views – Fisheye views for 3D data – Non Linear Magnification – Comparing Visualization of Information Spaces – Abstraction in computer Graphics – Abstraction in user interfaces

<b>Unit III</b>	<b>MULTIDIMENSIONAL VISUALIZATION</b>	<b>9</b>
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1D, 2D, 3D – Multiple Dimensions – Trees – Web Works – Data Mapping : Document Visualization – Workspaces

<b>Unit IV</b>	<b>TEXTUAL METHODS OF ABSTRACTION</b>	<b>9</b>
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From Graphics to Pure Text – Figure Captions in Visual Interfaces – Interactive 3D illustrations with images and text – Related work – Consistency of rendered – Images and their textual labels – Architecture – Zoom techniques for illustration purpose – Interactive handling of images and text

<b>Unit V</b>	<b>ABSTRACTION IN TIME AND INTERACTIVE SYSTEMS</b>	<b>9</b>
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Animation Non-Photorealistic Computer Graphics – Interaction Facilities and High Level Support for Animation Design – Zoom Navigation in User Interfaces – Interactive Medical Illustrations – Rendering Gestural Expressions – Animation design for Simulation – Tactile Maps for Blind People – Synthetic holography – Abstraction Vs Realism – Integrating Spatial and Non Spatial Data

**TEXT BOOK(S):**

<b>1.</b>	Colin Ware, "Information Visualization Perception for Design", edition 3, Morgan Kaufmann, 2012.
<b>2.</b>	Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, "Readings in Information Visualization Using Vision to think", Morgan Kaufmann Publishers 1st Edition.
<b>3.</b>	Thomas Strothotte, "Computer Visualization–Graphics Abstraction and Interactivity", Springer Verlag Berlin Heidelberg.

**REFERENCE(S):**

<b>1</b>	Chaomei Chen, "Information Visualization", Beyond the horizon, second edition, Springer Verlag, 2004.
<b>2</b>	Pauline Wills, "Visualisation: A Beginner's Guide", Hodder and Stoughton, 1999.
<b>3</b>	Benedikt. M, "Cyberspace: First Steps", MIT Press, 1991.

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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CSE13	Soft Computing	3	0	0	3	45	100

**Course Objective (s):**

- To Learn the concepts involved in Soft Computing Techniques
- To Use the MATLAB Tool for Programming the Soft Computing Techniques

**Course Outcomes(CO):**

1. Illustrate the importance of Neural Network
2. Understand the Fuzzy Logic and its relations sets
3. Explain the basic Knowledge on Genetic Algorithm
4. Infer the Algorithms based on Hybrid Systems
5. Use the MATLAB Tool for Solving Engineering or Real Life Problems in Soft Computing

**Unit I | NEURAL NETWORKS**

**9**

Fundamentals of Neural Networks: Basics – Architectures – Characteristics – Learning Methods – Back propagation Networks: Architecture – Back propagation Learning – Associative memory: Autocorrelators – Hetero correlators – Adaptive Resonance Theory: ART1, ART2.

**Unit II | FUZZY LOGIC**

**9**

Fuzzy Set Theory: Crisp Sets – Fuzzy Sets C Crisp Relations – Fuzzy Relations – Fuzzy Systems: Crisp Logic – Predicate Logic – Fuzzy Logic – Fuzzy Based Systems – Defuzzification Methods.

**Unit III | GENETIC ALGORITHMS**

**9**

Fundamentals of Genetic Algorithms: Basic Concepts – Creation of Offsprings – Working Principles – Fitness Function – Genetic Modeling: Crossover – Inversion & Deletion – Mutation Operator – Bitwise Operators.

**Unit IV | HYBRID SYSTEMS**

**9**

Hybrid Systems: Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems – Neuro Fuzzy Hybrids – Neuro Genetic Hybrids – Fuzzy Genetic Hybrids.

**Unit V | PROGRAMMING USING MATLAB**

**9**

Using Neural Network Toolbox – Using Fuzzy Logic Toolbox – Using Genetic Algorithm & Directed Search Toolbox.

**TEXT BOOK(S):**

1. Rajasekaran.S and VijayalakshmiPai.G.A, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2013.

**REFERENCE(S):**

1. Timothy J.Ross, "Fuzzy Logic with Engineering applications", John Wiley and Sons, 2010.
2. Jang.J.S.R, Sun.C.T, Mizutani.E, "Neuro fuzzy and Soft Computing", PHI Learning Pvt. Ltd., 2012.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 2002.

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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	--
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
<b>16CSE14</b>	<b>SECURITY IN COMPUTING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>
<b>Course Objective (s):</b>							
<ul style="list-style-type: none"> <li>• To Learn Cryptography Basics</li> <li>• To Understand Vulnerabilities Detection and Prevention</li> <li>• To Know the Different Types of Security Threats in Networks</li> <li>• To Know the Different Types of Security Threats in Databases</li> <li>• To Learn Security Models and Standards.</li> </ul>							
<b>Course Outcomes:</b>							
<ol style="list-style-type: none"> <li>1. Illustrate the basic algorithms for Encrypting and Decrypting Data</li> <li>2. Explain various security issues in program</li> <li>3. Summarize the security in networks</li> <li>4. Infer the Knowledge about the Security in database</li> <li>5. Summarize the Security Models and Standards</li> </ol>							
<b>Unit I</b>	<b>ELEMENTARY CRYPTOGRAPHY</b>						<b>9</b>
Terminology and Background – Substitution Ciphers – Transpositions – Making Good Encryption Algorithms – Data Encryption Standard- AES Encryption Algorithm – Public Key Encryption – Cryptographic Hash Functions – Key Exchange – Digital Signatures – Certificates							
<b>Unit II</b>	<b>PROGRAM SECURITY</b>						<b>9</b>
Secure programs – Non-malicious Program Errors – Viruses – Targeted Malicious code – Controls Against Program Threat – Control of Access to General Objects – User Authentication – Good Coding Practices – Open Web Application Security Project Flaws – Common Weakness Enumeration Most Dangerous Software Errors							
<b>Unit III</b>	<b>SECURITY IN NETWORKS</b>						<b>9</b>
Threats in networks – Encryption – Virtual Private Networks – PKI – SSH – SSL – IPsec – Content Integrity – Access Controls – Wireless Security – Honeypots – Traffic Flow Security – Firewalls –Intrusion Detection Systems – Secure e-mail.							
<b>Unit IV</b>	<b>SECURITY IN DATABASES</b>						<b>9</b>
Security requirements of database systems – Reliability and Integrity in databases –Redundancy –Recovery – Concurrency/ Consistency – Monitors – Sensitive Data – Types of disclosures –Inference-finding and confirming sql injection							
<b>Unit V</b>	<b>SECURITY MODELS AND STANDARDS</b>						<b>9</b>
Secure SDLC – Secure Application Testing – Security architecture models – Trusted Computing Base – Bell-LaPadula Confidentiality Model – Biba Integrity Model – Graham-Denning Access Control Model – Harrison-Ruzzo-Ulman Model – Secure Frameworks – COSO – CobiT – Compliances – PCI DSS – Security Standards - ISO 27000 family of standards – NIST.							

**TEXT BOOK(S):**

1.	Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fifth Edition, Pearson Education, 2015.
2.	Michael Whitman, Herbert J. Mattord, "Management of Information Security", Fifth Edition, Course Technology, 2017.

**REFERENCE(S):**

1.	William Stallings, "Cryptography and Network Security : Principles and Practices", Seventh Edition, Pearson, 2017.
2.	Michael Howard, David LeBlanc, John Viega, "24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them", First Edition, Mc GrawHill Osborne Media, 2009.
3.	Justin Clarke "SQL injection Attacks and defense" Elsevier ,2012
4.	<a href="https://www.owasp.org/index.php/Top_10_2010">https://www.owasp.org/index.php/Top_10_2010</a>
5.	<a href="http://cwe.mitre.org/top25/index.html">http://cwe.mitre.org/top25/index.html</a>
6.	<a href="https://www.pcisecuritystandards.org/security_standards/pci_dss.shtml">https://www.pcisecuritystandards.org/security_standards/pci_dss.shtml</a>

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Department	Computer Science and Engineering				R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CSE15	BIOMETRICS	3	0	0	3	45	100

**Course Objective (s):**

- To understand the basics of Biometrics and its functionalities.
- To learn the concepts of Finger Print, Facial Recognition, IRIS , sensors and Behavioral Biometrics
- To learn the applications of biometric with security

**Course Outcomes:**

1. Explain the basic concepts, applications and issues in biometric systems.
2. Apply the different types of recognition techniques for Finger Print and Facial recognition.
3. Design of IRIS Recognition system using Segmentation, Normalization and Encoding techniques.
4. Explain the behavioral of biometrics systems.
5. Explain the applications and trends in biometric systems.

<b>Unit I</b>	<b>INTRODUCTION</b>	<b>9</b>
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Person Recognition-Biometric Systems-Biometric Functionalities: Verification, Identification-Biometric Systems Errors-The design cycle of biometric systems-Applications of Biometric Systems-Security and Privacy Issues.

<b>Unit II</b>	<b>FINGER PRINT AND FACIAL RECOGNITION</b>	<b>9</b>
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FINGERPRINT: Introduction-Friction Ridge Pattern-Finger Print Acquisition: Sensing Techniques, Image Quality - Feature Extraction-Matching-Indexing.  
FACE RECOGNITION: Introduction-Image Acquisition: 2DSensors, 3DSensors-Face Detection-Feature Extraction-Matching.

<b>Unit III</b>	<b>IRIS AND OTHER TRAITS</b>	<b>9</b>
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Design of an IRIS Recognition System- IRIS Segmentation-Normalization-Encoding and Matching IRIS Quality-Performance Evaluation-Other Traits-Ear Detection-Ear Recognition-Gait Feature Extraction and Matching-Challenges-Hand Geometry-Soft Biometrics.

<b>Unit IV</b>	<b>BEHAVIORAL BIOMETRICS</b>	<b>9</b>
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Introduction-Features-Classification of Behavioral Biometrics-Properties of Behavioral Biometrics-Signature-Keystroke Dynamics-Voice-Merits-Demerits-Applications-Error Sources-Types-Open Issues-Future Trends.

<b>Unit V</b>	<b>APPLICATIONS AND TRENDS</b>	<b>9</b>
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Application Areas: Surveillance Applications-Personal Applications-Design and Deployment-User System Interaction-Operational Processes-Architecture-Application Development-Design Validation-Disaster Recovery Plan-Maintenance-Privacy Concerns.

**REFERENCE(S):**

1.	James wayman,Anil k.Jain ,Arun A.Ross ,Karthik Nandakumar, —Introduction to BiometricsII, Springer, 2011.
2.	John Vacca "Biometrics Technologies and Verification Systems" Elsevier 2007.
3.	James Wayman,Anil Jain,David MAltoni,DasioMaio(Eds) "Biometrics Systems Technology",Design and Performance Evaluation.Springer 2005.
4.	Khalid saeed with Marcin Adamski, Tapalina Bhattasali, Mohammed K. Nammous, Piotr panasiuk, mariusz Rybnik and soharab H.Sgaikh, —New Directions in Behavioral BiometricsII, CRC Press 2017.
5.	Paul Reid "Biometrics For Network Security "Person Education 2004.
6.	Shimon K.Modi , —Biometrics in Identity Management :concepts to applicationsII, Artech House 2011.



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Department	Computer Science and Engineering				R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CSE16	ROBOTICS	3	0	0	3	45	100
<b>Course Objective (s):</b>							
<ul style="list-style-type: none"> <li>• To understand Robot Transformations and Sensors</li> <li>• To implement Robot cell design and applications</li> <li>• To understand Micro/Nano robotic systems.</li> </ul>							
<b>Course Outcomes:</b>							
<ol style="list-style-type: none"> <li>1. Explain the fundamentals of Robotics.</li> <li>2. Summarize the end efforts and robot controls.</li> <li>3. Describe the robot transformations and sensors working.</li> <li>4. Apply robot cell design to various environments.</li> <li>5. Explain about micro and nano robotics system.</li> </ol>							
<b>Unit I</b>	<b>INTRODUCTION TO ROBOTICS</b>						<b>9</b>
Robot Anatomy: Definition, Law of Robotics, History and Terminology of Robotics-Accuracy and Repeatability of Robotics-Simple Problems Specifications of Robot-Speed of Robot-Robot Joints and Links-Robot Classifications-Architecture of Robotic Systems-Robot Drive Systems Hydraulic, Pneumatic and Electric System.							
<b>Unit II</b>	<b>END EFFECTORS AND ROBOT CONTROLS</b>						<b>10</b>
Mechanical Grippers-Slider Crank Mechanism, Screw Type, Rotary Actuators, Cam Type-Magnetic Grippers-Vacuum Grippers-Air Operated Grippers-Gripper Force Analysis-Gripper Design-Simple Problems-Robot Controls-Point to Point Control, Continuous Path Control, Intelligent Robot-Control System for Robot Joint-Control Actions-Feedback Devices-Encoder, Resolver, LVDT-Motion Interpolations-Adaptive Control.							
<b>Unit III</b>	<b>ROBOT TRANSFORMATIONS AND SENSORS</b>						<b>8</b>
Robot Kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation-Homogeneous Coordinates, Multiple Transformation-Simple Problems. Sensors in Robot-Touch Sensors-Tactile Sensor-Proximity and Range Sensors: Robotic Vision Sensor, Force Sensor, Light Sensors, Pressure Sensors.							
<b>Unit IV</b>	<b>ROBOT CELL DESIGN AND APPLICATIONS</b>						<b>9</b>
Robot Work Cell Design and Control: Sequence Control, Operator Interface, Safety Monitoring Devices in Robot, Mobile Robot Working Principle, Actuation Using MATLAB, NXT Software Introductions. Robot Applications: Material Handling, Machine Loading and Unloading, Assembly, Inspection, Welding, Spray Painting and Undersea Robot.							
<b>Unit V</b>	<b>MICRO/NANO ROBOTICS SYSTEM</b>						<b>9</b>
Micro/Nanorobotics System Overview-Scaling Effect-Top Down and Bottom up Approach-Actuators of Micro/Nano Robotics System-Nanorobot Communication Techniques-Fabrication of micro/nano Grippers-Wall Climbing Micro Robot Working Principles-Biomimetic Robot-Swarm Robot-Nanorobot in Targeted Drug Delivery System.							

**REFERENCE(S):**

1.	S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009.
2.	Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012.
3.	Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
4.	Francis N. Nagy, Andras Siegler, Engineering foundation of Robotics, Prentice Hall Inc., 1987.
5.	P.A. Janaki Raman, Robotics and Image Processing an Introduction, Tata McGraw Hill Publishing company Ltd., 1995.
6.	Carl D. Crane and Joseph Duffy, Kinematic Analysis of Robot manipulators, Cambridge University press, 2008.
7.	Fu. K. S., Gonzalez. R. C. & Lee C.S.G., "Robotics control, sensing, vision and intelligence", McGraw Hill Book co, 1987.

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8.	Craig. J. J. "Introduction to Robotics mechanics and control", Addison- Wesley, 1999.
9.	Ray Asfahl. C., "Robots and Manufacturing Automation", John Wiley & Sons Inc., 1985.
10.	Bharat Bhushan., "Springer Handbook of Nanotechnology", Springer, 2004.
11.	Julian W. Gardner., "Micro sensor MEMS and Smart Devices", John Wiley & Sons, 2001.

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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CSE17	HUMAN SYSTEM INTERFACE DESIGN	3	0	0	3	45	100

**Course Objective (s):**

- To learn basic OO analysis and design skills through an elaborate case study.
- To use the UML design diagrams.
- To apply the appropriate design patterns.

**Course Outcomes(CO):**

1. Describe basics of human computer interacting criterion
2. Illustrate standard design heuristics for making human computer interactive systems
3. Infer evaluating strategies and assisting methodologies of HCI systems
4. Explain user models and task models to study various norms available in human computer interactions
5. Describe impact and necessity of dialogs and groupware prospective in HCI systems

<b>Unit I</b>	<b>FOUNDATIONS OF HUMAN-COMPUTER INTERACTION</b>	<b>9</b>
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Introduction – Input channels and Output channels: Vision, Hearing, Touch, Movement – Human memory: Sensory memory, STM and LTM – Thinking-Reasoning and problem solving, Emotions, Individual difference, psychology – Text entry devices, display devices: 3D interaction, paper, memory, processing and networks, Ergonomics, Interaction styles – WIMP: Interactivity, Design issues: Context and experience

<b>Unit II</b>	<b>THE DESIGN PROCESS</b>	<b>9</b>
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Navigation – Screen – Screen design Iteration and prototyping, Software life cycle – Usability – Support Usability –Standards – Guidelines – Golden rules and heuristics

<b>Unit III</b>	<b>IMPLEMENTATION SUPPORT AND EVALUATION</b>	<b>9</b>
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Elements of Windowing: programming application – Toolkits, UI management systems, Goals, Expert analysis – User participation – Evaluation methods - Universal Design, User support

<b>Unit IV</b>	<b>USER MODELS AND TASK MODELS</b>	<b>9</b>
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Cognitive Models, GOMS, linguistic, physical and device models – Socio-organizational issues: power and organizational structure, free rider problem, Critical mass, invisible workers, stakeholder requirements – Communication and collaboration models – Ethnography, face to face communication, gesture, body language – back channels – Conversations – Task analysis, task decomposition, knowledge based technique

<b>Unit V</b>	<b>DIALOGS AND GROUPWARE</b>	<b>9</b>
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Dialogue notations: STN, H-STN, JSD, Petri net, state charts, flow charts, Concurrent dialogues: Modelling rich interaction-status event analysis-rich set behavior- properties of events – Groupware: definition, time/space matrix, computer mediated communication (email, BB, structured text message, video, virtual environment) – Meeting and Decision support systems (argumentation tools, meeting rooms, shared work surfaces) – Shared application (shared PCs and windows, shared editors, co-authoring tools, shared diaries)

**TEXT BOOK(S):**

1.	Alan Dix, Janet Finlay, Gregory D. Abowd and Russel Beale, "Human Computer Interaction", 3rd Edition, 2004, Pearson Education, ISBN: 978-0130461094
2.	John M. Carroll, "Human - Computer Interaction in the Millennium", 2008, 3 rd Edition, Pearson Education, Second Impression, ,ISBN: 978-0-201-70447-1

**REFERENCE(S):**

1.	K.Meena and R.Sivakumar, "Human-Computer Interaction", 2015, Prentice Hall India, ISBN: 978-8120350502
2.	Yvonne Rogers, Heken Sharp and Jenny Preece, "Interaction Design: Beyond Human-Computer Interaction", 3 rd Edition, 2011, John Wiley & Sons, Inc, ISBN: 0470665769, ISBN: 978-0470665763
3.	Ben Shneiderman and Catherine Plaisant, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", 5 th Edition, 2009, Pearson AddisonWesley, ISBN: 978-0-32153735-5

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CSE18	TCP/IP AND INTERNET PROGRAMMING	3	0	0	3	45	100

**Course Objective (s):**

- Understand a complete TCP client and server communication with elementary socket functions
- Design and implement client –server applications using Sockets
- Learn the socket options for DNS
- Construct network programs
- Build complex network applications

**Course Outcomes(CO):**

- 1.Understanding of client and server establishment in TCP/ IP protocols
- 2.Explain various socket operations in TCP/ IP
- 3.Demonstrate various socket operations UDP and IPv4
- 4.Summarize various functions in TCP,UDP,DNS,BOOTS and DHCP
- 5.Comparing various sockets options , IpV4 and IPv6 interoperability

<b>Unit I</b>	<b>INTRODUCTION AND TCP/IP</b>	<b>9</b>
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Introduction – simple daytime client – protocol independence – Error handling – simple daytime server – Roadmap to client/server – Overview of TCP/IP protocol – TCP connection establishment and termination – TCP state transition diagram – Time-wait state – SCTP association establishment and termination – port numbers – TCP port numbers and concurrent servers – Buffer size and limitations – standard internet services – protocol usage by common Internet applications

<b>Unit II</b>	<b>ELEMENTARY TCP SOCKETS</b>	<b>9</b>
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Socket function – connect function – bind function – listen function – accept function - Fork and exec functions – concurrent servers – close function – getsockname and getpeername – TCP Echo server and Echo client – normal startup and termination – POSIX signal handling – Wait and Waitpid functions – Termination of server process – Crashing and rebooting of server host

<b>Unit III</b>	<b>SOCKET OPTIONS AND UDP SOCKETS</b>	<b>9</b>
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Get sock opt and set sock opt function – IPV4, ICMP and TCP socket options – UDP Echo server and client – recvfrom and send to functions – Connect function with UDP – dg\_cli function – lack of flow control with UDP

<b>Unit IV</b>	<b>DNS, BOOTP AND DHCP</b>	<b>9</b>
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DNS – resolvers and name servers – gethostbyname function – gethostbyaddr function – getservbyname and getservbyport function – tcp\_connect function – tcp\_listen function – udp\_client – udp\_connect, udp\_server function - BOOTP and DHCP

<b>Unit V</b>	<b>ADVANCED SOCKETS</b>	<b>9</b>
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IPV4 and IPV6 interoperability – Daemon processes and the inetd superserver – Advanced I/O functions – Routing Sockets – Key Management Sockets

**TEXT BOOK(S):**

1.	W.Richard Stevens, Bill Fenner, Andrew M. Rudoff “Unix Network programming” 3rd edition Volume – 1, Pearson Education, 2015
2.	Douglas.E.Comer “Internetworking with TCP/IP” principles, protocols and architecture, 6 th Edition, Volume – 1, Pearson Education, 2013

**REFERENCE(S):**

1.	Behrouz A.Forouzan, “ TCP/IP protocol suite”, 4th edition, Mc Graw Hill education private limited,2010
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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
<b>16CSE19</b>	<b>WIRELESS NETWORKS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>
<b>Course Objective (s):</b>							
<ul style="list-style-type: none"> <li>• To learn the fundamental technologies that help in the networking of wireless devices.</li> <li>• To learn about different wireless technologies</li> <li>• To learn about the evolution of cellular systems</li> <li>• To understand the various wireless standards used right from 2 to 5G cellular networks</li> </ul>							
<b>Course Outcomes(CO):</b>							
<ol style="list-style-type: none"> <li>1. Apply the knowledge of basic Network Topologies and Protocols</li> <li>2. Students will be able to analyze different functionalities provided by networking standards in the domain of network design</li> <li>3. Students will be acquiring knowledge to apply the engineering skills in network design and implementation</li> <li>4. Studies about the various networking standards and help the students to understand about its basic functionalities specially the wireless networks</li> <li>5. Studies about the analysis of different network protocols and generation helps in the network designing.</li> </ol>							
<b>Unit I</b>	<b>INTRODUCTION AND WIRELESS LANS</b>						<b>9</b>
Frequency Spectrum – Signal Propagation – Modulation – Multiplexing – Spread Spectrum – IEEE 802.11 Wireless LANs : Wireless LAN Equipment – WLAN Topologies – WLAN Technologies – Architecture – PHY – Data Link Layer – Beacon Frame – Roaming in a Wireless LAN – Security in Wireless LANs – Power Management – Other WLAN Standards. Bluetooth : Overview – Architecture – Radio and Baseband – L2CAP and Frame Format – RFCOMM – SDP – Bluetooth Evolution.							
<b>Unit II</b>	<b>WIRELESS NETWORKS</b>						<b>9</b>
Ultra-Wideband : Standard and Applications. Radio-Frequency Identification : System – Applications. Wireless Metropolitan Area Networks : Wireless Broadband: IEEE 802.16 – WiMAX. Satellite : Communication – Systems – Wireless Sensor Networks : Applications – Sensor Node – Self Organized Networks – ZigBee.							
<b>Unit III</b>	<b>2G 2.5G CELLULAR NETWORKS</b>						<b>9</b>
Global System for Mobile (GSM) – Network Architecture – Location Area Update – Call Routing – Handoff – General Packet Radio Service (GPRS) – Packet Switching – GPRS Architecture – GPRS Services – GPRS Terminals – Packet Data Protocol Context – Enhanced Data Rates for Global Evolution (EDGE) – High Speed Circuit Switched Data (HSCSD) – Code Division Multiple Access (CDMA) : Concept – IS-95 – Software Handoff. GSM vs CDMA. 2G Mobile Wireless Services : WAP and iMode – SMS.							
<b>Unit IV</b>	<b>3G CELLULAR NETWORKS</b>						<b>9</b>
UMTS/WCDMA – CDMA 2000 – UMTS/WCDMA vs CDMA 2000 – UMTS – Channel Structure on the Air Interface – UTRAN – Core and Radio Network Management – UMTS Security – HSDPA.							
<b>Unit V</b>	<b>4G CELLULAR NETWORKS</b>						<b>9</b>
4G Features and Challenges – 4G Applications – Multicarrier modulation – Smart Antenna Techniques – OFDM-MIMO Techniques – Adaptive Modulation and Coding with Time Slot Scheduler – BLAST system – Software Defined Radio – Cognitive Radio – LTE – Network Architecture and Interfaces – FDD Air Interface and Radio Networks – Scheduling – Mobility Management and Power Optimization – LTE Security Architecture – Interconnection with UMTS and GSM – LTE Advanced – Introduction to 5G.							

<b>TEXT BOOK(S):</b>	
1.	Pei Zheng, Feng Zhao, David Tipper, Jinmei Tatuya, Keiichi Shima, Yi Qian, Larry L. Peterson, Lionel M. Ni, Manjunath D, Qing Li, Joy Kuri, Anurag Kumar, Prashant Krishnamurthy, Leonidas Guibas, Vijay K.Garg, Adrian Farrel, Bruce S. Davie, Wireless Networking Complete, Elsevier, 2010..

<b>REFERENCE(S):</b>	
1.	Maritin Sauter, From GSM to LTE: An Introduction to Mobile Networks and Mobile BroadbandII, John Wiley and Sons, 2011.
2.	Asoke K Talukder, Roopa Yavagal, Mobile Computing – Technology, Application and Service Creation, McGraw Hill, 2007.
3	Leonhard Korowajczuk, LTE, WiMAX and WLAN Network Design, Optimization and Performance Analysis, Wiley-Blackwell, 2011.
4	Erik Dahlman, Stefan Parkvall, Johan Skold, 4G: LTE/LTE-Advanced for Mobile Broadband, Second Edition, Academic Press Inc., 2013.

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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CSE20	ADHOC AND SENSOR NETWORKS	3	0	0	3	45	100

**Course Objective (s):**

- To understand the design issues in ad hoc and sensor networks
- To learn the different types of MAC protocols
- To be familiar with different types of ad hoc routing protocols
- To be exposing to the TCP issues in ad hoc networks
- To learn the architecture and protocols of wireless sensor networks

**Course Outcomes:**

1. Explain basics of ad hoc wireless networks and MAC protocols.
2. Explain the routing protocols of wireless sensor networks.
3. Interpret the transport and security protocols in ad hoc wireless networks.
4. Describe the basic principles to sensor networks.
5. Outline the performance of protocols from a qos perspective in wireless sensor networks.

<b>Unit I</b>	<b>AD HOC WIRELESS NETWORKS AND MAC PROTOCOLS</b>	<b>9</b>
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Cellular and Ad Hoc Networks – Issues in Ad Hoc Wireless Networks – MAC Protocols : Design Issues and Design Goals of MAC Protocols for Ad Hoc Wireless Networks – Classification of MAC Protocols – Contention Based Protocols – Reservation and Scheduling Mechanisms – Other MAC Protocols.

<b>Unit II</b>	<b>ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS</b>	<b>9</b>
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Design Issues and Classification of Routing Protocols –Table-Driven Routing Protocol – On-Demand Routing Protocol – Hybrid Routing Protocols – Multicast Routing : Design Issues and Classification – Tree Based and Mesh Based Multicast Protocols – Energy Efficient and QoS Guarantees Multicast Protocols.

<b>Unit III</b>	<b>TRANSPORT LAYER AND SECURITY PROTOCOLS</b>	<b>9</b>
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Design Issues – Design Goals – Classification of Transport Layer Protocols for Ad Hoc Wireless Network – TCP over Ad Hoc Wireless Network – Security in Ad Hoc Wireless Network – Network Security Requirements – Network Security Attacks – Key Management – Secure Routing in Ad hoc Networks.

<b>Unit IV</b>	<b>INTRODUCTION TO SENSOR NETWORKS</b>	<b>9</b>
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Unique Constraints and Challenges – Advantages and Applications – Collaborative Processing – Key Definitions – Localization and Tracking – Network Sensor : MAC – General Issues – Geographic Energy Aware Routing – Attribute Based Routing.

<b>Unit V</b>	<b>TRANSPORT, QoS AND SECURITY IN WIRELESS SENSOR NETWORKS</b>	<b>9</b>
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Data centric and Contention Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Broadcast Authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols.

**TEXT BOOK(S):**

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|----|---|
| 1. | C. Siva Ram Murthy and B.S. Manoj, Ad Hoc Wireless Networks – Architectures and Protocols, Pearson Education, Second Edition, 2005. |
| 2. | Feng Zhao and Leonidas Guibas, Wireless Sensor Networks – An Information Processing Approach, Elsevier Publications, 2004.          |

**REFERENCE(S):**

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|----|--|
| 1. | Subir Kumar Sarkar, T G Basavaraju and C Puttamadappa, Ad Hoc Mobile Wireless Networks, Auerbach Publications, 2008. |
| 2. | Holger Karl and Andreas Willig, Protocols and Architectures for Wireless Sensor Networks, John Wiley and Sons, 2009. |
| 3. | Erdal Cayirci and Chunming Rong, Security in Wireless Ad Hoc and Sensor Networks, John Wiley and Sons, 2009.         |
| 4. | C.K. Toh, Adhoc Mobile Wireless Networks – Protocols and Systems, Pearson Education, First Edition, 2002.            |

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<b>Department</b>	<b>COMPUTER SCIENCE AND ENGINEERING</b>					<b>R 2016</b>	<b>Semester</b>	<b>VII</b>
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>	
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>			
<b>16CSE21</b>	<b>CYBER FORENSICS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>	

**Course Objective**

- Be exposed to security issues of the application layer
- Learn computer forensics
- Be familiar with forensics tools
- Learn to analyze and validate forensics data

**Course Outcomes:**

1. Discuss the security issues network layer and transport layer
2. Apply security principles in the application layer
3. Explain the basics of computer forensics
4. Use forensics tools for recovering data
5. Explain the forensics data analysis and validation

<b>Unit I</b>	<b>NETWORK LAYER SECURITY &amp; TRANSPORT LAYER SECURITY</b>	<b>9</b>
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IPSec Protocol - IP Authentication Header - IP ESP - Key Management Protocol for IPSec - Transport layer Security: SSL protocol, Cryptographic Computations – TLS Protocol

<b>Unit II</b>	<b>E-MAIL SECURITY &amp; FIREWALLS</b>	<b>9</b>
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PGP - S/MIME - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions.

<b>Unit III</b>	<b>INTRODUCTION TO COMPUTER FORENSICS</b>	<b>9</b>
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Introduction to Traditional Computer Crime - Traditional problems associated with Computer Crime - Introduction to Identity Theft & Identity Fraud - Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation - Preparation for IR: Creating response tool kit and IR team - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

<b>Unit IV</b>	<b>EVIDENCE COLLECTION AND FORENSICS TOOLS</b>	<b>9</b>
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Processing Crime and Incident Scenes – Working with Windows and DOS Systems - Current Computer Forensics Tools: Software, Hardware Tools.

<b>Unit V</b>	<b>ANALYSIS AND VALIDATION</b>	<b>9</b>
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Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

**TEXT BOOK(S):**

<b>1.</b>	Man Young Rhee — Internet Security: Cryptographic Principles—Algorithms and Protocols, Wiley Publications, 2003.
<b>2.</b>	Nelson, Phillips, Enfinger, Steuart, —Computer Forensics and InvestigationsII, Cengage Learning,India Edition, 2008.

**REFERENCE(S):**

<b>1.</b>	John R.Vacca, —Computer ForensicsII, Cengage Learning, 2005
<b>2.</b>	Richard E.Smith, —Internet CryptographyII, 3rd Edition Pearson Education, 2008
<b>3.</b>	Marjie T.Britz, —Computer Forensics and Cyber Crimell: An IntroductionII, 3rd Edition, Prentice Hall, 2013.

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<b>Department</b>	<b>COMPUTER SCIENCE AND ENGINEERING</b>				<b>R 2016</b>	<b>Semester</b>	<b>-</b>
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
<b>16CSE22</b>	<b>PARALLEL AND DISTRIBUTED COMPUTING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>

**Course Objective (s):**

- To provide students with contemporary knowledge in parallel and distributed systems.
- To equip students with skills to analyze and design parallel and distributed applications.
- To provide master skills to measure the performance of parallel and distributed algorithms.

**Course Outcomes:**

1. Explain the principles of parallel computing.
2. Enumerate the pipeline design for various parallel processing techniques.
3. Explain the concepts of distributed systems.
4. Summarize the improvements in protocols for message oriented communication.
5. Explain the working principles of process management and synchronization.

**Unit I Introduction to Parallel Computing**

**8**

Parallel Computing - Parallel Architecture - Architectural Classification Scheme - Performance of Parallel Computers - Performance Metrics for Processors - File Systems - Parallel Programming Models - Parallel Algorithms.

**Unit II Pipeline and Synchronous Parallel Processing**

**10**

Introduction - Pipeline Performance - Arithmetic Pipelines - Pipelined Instruction Processing - Pipeline Stage Design - Hazards - Dynamic Instruction Scheduling - SIMD Architecture and Programming Principles - SIMD Parallel Algorithms - Data Mapping and memory in array processors - Case studies of SIMD parallel Processors.

**Unit III Introduction to Distributed Systems**

**7**

Definition - Issues - Goals - Types of distributed systems - Distributed System Models - DFS - Hardware concepts - Software Concept - Models of Middleware - Services offered by middleware - Client Server model - Case studies of Distributed Deadlock.

**Unit IV Communication and Resource Management**

**8**

Layered Protocols - Remote Procedure Call - Remote Object Invocation - Message Oriented Communication - Stream Oriented Communication - Desirable Features of global Scheduling algorithm - Task assignment approach - Load balancing approach - load sharing approach.

**Unit V Process Management and Synchronization**

**12**

Introduction to process management - Process migration - Threads - Virtualization – Clients Servers - Code Migration - Clock Synchronization - Logical Clocks - Election Algorithms - Mutual Exclusion - Distributed Mutual Exclusion - Non Token based Algorithms: Lamport Algorithm - Ricart Agrawala's Algorithm - Token Based Algorithms : Suzuki-Kasami's Broadcast Algorithms - Singhal's Heuristic Algorithm - Raymond's Tree based Algorithm - Consistency and Replication - Replica Management.

**TEXT BOOK(S):**

- |           |   |
|-----------|---|
| <b>1.</b> | M.R. Bhujade, "Parallel Computing", 2nd edition, New Age International Publishers 2009.   |
| <b>2.</b> | Andrew S. Tanenbaum and Maarten Van Steen, "Distributed Systems: Principles and Paradigms, 2nd edition, Pearson Education, Inc., 2007, ISBN: 0-13-239227-5. |

**REFERENCE(S):**

- |           |   |
|-----------|---|
| <b>1.</b> | George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems: Concepts and Design" (4th Edition), Addison Wesley/Pearson Education. |
| <b>2.</b> | Pradeep K Sinha, "Distributed Operating Systems : Concepts and design", IEEE computer society press   |



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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CSE23	MOBILE COMPUTING	3	0	0	3	45	100
<b>Course Objective (s):</b>							
<ul style="list-style-type: none"> <li>• Describe the different modes of radio transmissions.</li> <li>• Enumerate the architecture and operations of WLANs.</li> <li>• Illustrate the functionalities of Mobile IP and optimizations.</li> <li>• Summarize the performance of TCP and WAP protocol.</li> <li>• Explain the concept of progressive mobile communications.</li> </ul>							
<b>Course Outcomes:</b>							
<ol style="list-style-type: none"> <li>1. Describe the different modes of wireless transmission and medium access control techniques.</li> <li>2. Enumerate the architecture and operational principle of various wireless local area network technologies.</li> <li>3. Illustrate the functionalities of Mobile IP and optimizations in mobile routing protocols.</li> <li>4. Summarize the improvements in TCP for mobile communication and the architectural components of Wireless Application protocol.</li> <li>5. Explain the working concept and improvements of progressive generations in mobile communications.</li> </ol>							
<b>Unit I</b>	<b>WIRELESS TRANSMISSION</b>						<b>9</b>
Frequencies for radio transmission – Signal Propagation – Multiplexing – Modulation – Spread spectrum – Cellular Systems – Medium access control : SDMA – FDMA – TDMA – CDMA – Satellite systems – Broadcast systems.							
<b>Unit II</b>	<b>WIRELESS LAN</b>						<b>9</b>
Infrastructure and Adhoc Network – IEEE 802.11 : Architecture – MAC Management – Newer Developments – HiperLAN – Bluetooth – Sensor Networks – Zigbee Technology.							
<b>Unit III</b>	<b>MOBILE IP</b>						<b>9</b>
Mobile IP – Agent Discovery – Registration – Tunneling – Optimizations – IPV6 for mobile – DHCP – Mobile Adhoc Networks – Routing – Destination Sequence Distance Vector – Dynamic Source Routing – Alternative Metrics.							
<b>Unit IV</b>	<b>MOBILE TCP AND WAP</b>						<b>9</b>
MOBILE TCP : Traditional TCP – Classical TCP improvements – TCP over 2.5/3G wireless networks – Performance enhancing proxies. Wireless Application Protocol – Architecture – Transport Layer Security – Transaction and Session protocols – Application Environment – WML and Script – Telephony Application – WAP 2.0.							
<b>Unit V</b>	<b>COMMUNICATION TECHNOLOGIES</b>						<b>9</b>
GSM : Architecture – Subsystems – Mobility Management – GPRS – UTMS and HSPA – 4G – Long Term Evolution and LTE – Advanced : 5G System concept and Architecture.							

**TEXT BOOK(S):**

1.	Jochen Schiller, "Mobile Communications", Second Edition, Pearson India, 2009.
2.	Martin Sauter, "From GSM to LTE – Advanced", Second Edition, John Wiley & Sons, 2014.

**REFERENCE(S):**

1.	Afif Osseiran, Jose F.Monserrat and Patrick Marsch, "5G Mobile and Wireless Communications Technology", Cambridge University Press, 2016.
2.	Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing : Technology, Applications and Service Creation", Second Edition, Tata McGraw Hill, 2010.
3.	William Stallings, "Wireless Communications and Networks", Second Edition, Pearson, 2009.

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<b>Department</b>	<b>Computer Science and Engineering</b>					<b>R 2016</b>	<b>Semester</b>	<b>-</b>
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>	
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>			
<b>16CSE24</b>	<b>FREE AND OPEN SOURCE SOFTWARE</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>	

**Course Objective (s):**

- To understand the basics of open source software
- To gain the knowledge of working with Linux platform and different Linux distributions
- To be familiar with different programming concepts in Linux

**Course Outcomes:**

1. Explore the Linux Operating System and its commands
2. Install and configure the Linux software
3. Apply networking concepts in Linux
4. Illustrate the process of compiling and debugging
5. Develop programs in python, perl, ruby, GTK, QT

<b>Unit I</b>	<b>INTRODUCTION TO LINUX</b>	<b>9</b>
Introduction to Linux Operating System - Basic UNIX Commands - File Filters - Processes in Linux – Shell Programming		
<b>Unit II</b>	<b>CONFIGURING LINUX SERVICES</b>	<b>9</b>
Debian Linux Installation - Redhat Fedora Core 4 Installation - Apache The Web Server Installation - Samba Installation and Configuration - SMTP Mail Server Installation - Common Unix printing System (CUPS) Installation		
<b>Unit III</b>	<b>NETWORKS IN LINUX</b>	<b>9</b>
Installing squid proxy and firewalls – User and Account Management - System Logging: Logging – Accounting – Graphical tools		
<b>Unit IV</b>	<b>COMPILING AND DEBUGGING</b>	<b>9</b>
Compiling C and C++ program – GNU Debugger – Make: Syntax of makefiles – Automake and Autoconf		
<b>Unit V</b>	<b>PROGRAMMING IN LINUX</b>	<b>9</b>
Python – Perl – Ruby – X windows architecture and GUI programming: GTK Programming – QT programming		

**TEXT BOOK(S):**

<b>1.</b>	N. B. Venkateshwarlu, 'Introduction to Linux: Installation and Programming', B S Publishers; 2011
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**REFERENCE(S):**

<b>1.</b>	Steve Suchring, 'MySQL Bible', John Wiley,2015
<b>2.</b>	Wesley J.Chun, 'Core Python Programming', Prentice Hall,2010
<b>3.</b>	Martin C.Brown, 'Perl: The Complete Reference', 2 <sup>nd</sup> Edition, Tata McGrawHill Publishing Company Limited, Indian Reprint 2009
<b>4.</b>	Steven Holzner, 'PHP: The Complete Reference', 2 <sup>nd</sup> Edition, Tata McGrawHill Publishing Company Limited, Indian Reprint 2009

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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CSE25	LINUX INTERNALS	3	0	0	3	45	100

**Course Objective (s):**

- To Introduce Linux Server and Various Distributions.
- To Understand User Administration and make Use of Internet and Intranet Services.
- To Learn Linux Process Control and Shell Programming.

**Course Outcomes(CO):**

- Describe the installation of linux and how it is different from other operating system.
- Explain the techniques for single-host administration.
- Understand the internet services available in Linux
- Explain about intranet services supported by Linux operating system.
- Illustrate the process control of linux OS and can write simple shell programming.

<b>Unit I</b>	<b>INSTALLING LINUX AS A SERVER</b>	<b>9</b>
Linux Distributions – Open Source Software and GNU – Difference Between Windows and Linux – Installing Linux in a Server Configuration – GNOME and KDE – X Window System – Managing Software.		
<b>Unit II</b>	<b>SINGLE – HOST ADMINISTRATION</b>	<b>9</b>
Managing Users – User Text Files – User Management Tools – Command Line – Boot Loaders – File Systems – Core System Services – Compiling Linux Kernel – Linux Firewall.		
<b>Unit III</b>	<b>INTERNET SERVICES</b>	<b>9</b>
DNS – FTP – Mechanics – Installing and Customizing the Server – Setting up Web Server using Apache – SMTP – Install – Configure and Run Postfix Server – POP and IMAP – SSH – Public Key Cryptography – Creating a Secure Tunnel.		
<b>Unit IV</b>	<b>INTRANET SERVICES</b>	<b>9</b>
NFS – Enable and Configure NFS Server and Client – NIS – Configuring Master and Secondary NIS Server and Client – NIS Tools – SAMBA – Administration – Printing – Install Cups – Add and Manage Print Jobs – DHCP – Virtualization.		
<b>Unit V</b>	<b>LINUX PROCESS CONTROL &amp; SHELL PROGRAMMING</b>	<b>9</b>
Linux Process Environment – Login Process – Parent Child Relationship – Process Variable – Process Monitoring – Invoking Foreground and Background Process – Terminating Process – Daemons – Introduction to Shell Programming – Shell scripts– Executing Shell Scripts – Creating Scripts – Simple Examples.		

**TEXT BOOK(S):**

1.	Wale Soyinka, "Linux Administration A Beginners Guide", 7th edition, Tata McGraw-Hill, 2009. Ch1-9,13,16-24,26-28) for Unit I-IV
2.	Mc Kinnon, "Installing and Administrating Linux", 2nd edition,Wiley, 2004. (Ch12,13) for Unit-V

**REFERENCE(S):**

1.	Richard Petersen, "Linux:The Complete Reference", 6th edition, Tata McGraw-Hill, 2007.
2.	Mark G. Sobell. "Practical Guide to Fedora and Red HatEnterpriseLinux",6th Edition, Prentice Hall, 2011.
3.	www.linuxhomenetworking.com
4.	www.linux.org
5.	www.linux.com
6.	http://www.oreillynet.com/linux/cmd/

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Department	Computer Science and Engineering					R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
<b>16CSE26</b>	<b>SOCIAL NETWORK ANALYSIS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>	
<b>Course Objective (s):</b>								
<ul style="list-style-type: none"> <li>• To Understand the concept of semantic web and related applications.</li> <li>• To Learn knowledge representation using ontology.</li> <li>• To Understand human behaviour in social web and related communities.</li> <li>• To Learn visualization of social networks.</li> </ul>								
<b>Course Outcomes:</b>								
<ol style="list-style-type: none"> <li>1. Develop semantic web related applications.</li> <li>2. Represent knowledge using ontology.</li> <li>3. Understand the extraction and mining communities in social networks</li> <li>4. Predict human behavior in social web and related communities.</li> <li>5. Visualize social networks.</li> </ol>								
<b>Unit I</b>	<b>INTRODUCTION</b>							<b>9</b>
Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks - Blogs and online communities – Web based networks - Applications of Social Network Analysis.								
<b>Unit II</b>	<b>MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION</b>							<b>9</b>
Ontology and their role in the Semantic Web - Ontology based knowledge Representation - Ontology languages for the Semantic Web - Resource Description Framework - Web Ontology Language - Modeling and aggregating social network data – State of the art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.								
<b>Unit III</b>	<b>EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS</b>							<b>9</b>
Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.								
<b>Unit IV</b>	<b>PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES</b>							<b>9</b>
Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.								
<b>Unit V</b>	<b>VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS</b>							<b>9</b>
Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.								

**TEXT BOOK(S):**

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010

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<b>REFERENCE(S):</b>	
<b>1.</b>	Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011
<b>2.</b>	Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008
<b>3.</b>	Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009
<b>4.</b>	John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CSE27	DISASTER MANAGEMENT	3	0	0	3	45	100	
<b>Course Objective (s):</b>								
<ul style="list-style-type: none"> <li>• To understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.</li> <li>• To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)</li> <li>• To enhance awareness of institutional processes in the country</li> <li>• To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.</li> </ul>								
<b>Course Outcomes(CO):</b>								
<ol style="list-style-type: none"> <li>1. Differentiate the types of disasters, causes and their impact on environment and society</li> <li>2. Classify the various methods of risk reduction measures as well as mitigation</li> <li>3. Understand vulnerability and relationship between disasters and development</li> <li>4. Identify the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management</li> <li>5. Use the disaster management for different Applications, case studies and Field Works</li> </ol>								
<b>Unit I</b>	<b>INTRODUCTION TO DISASTERS</b>							<b>9</b>
Definition: Disaster – Hazard – Vulnerability – Resilience - Risks –Types of disasters: Earthquake – Landslide – Flood – Drought – Fire - Classification – Causes – Impacts : social – economic – political – environmental – health – psychosocial. Differential impacts: caste – class – gender – age – location – disability – Global trends in disasters – urban disasters – pandemics - complex emergencies – Climate change - Dos and Don'ts during various types of Disasters.								
<b>Unit II</b>	<b>APPROACHES TO DISASTER RISK REDUCTION</b>							<b>9</b>
Disaster cycle – Phases – Culture of safety – prevention – mitigation and preparedness community based DRR – Structural – nonstructural measures – Roles and responsibilities of community – Panchayati Raj Institutions – Urban Local Bodies (PRIs/ULBs) – States – Centre and other stake-holders – Institutional Processes and Framework at State and Central Level – State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.								
<b>Unit III</b>	<b>INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT</b>							<b>9</b>
Factors affecting Vulnerabilities – differential impacts – impact of Development projects: dams – embankments – changes in Land use – Climate Change Adaptation – IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge – appropriate technology and local resources.								
<b>Unit IV</b>	<b>DISASTER RISK MANAGEMENT IN INDIA</b>							<b>9</b>
Hazard and Vulnerability profile of India - Components of Disaster Relief: Water – Food – Sanitation – Shelter – Health - Waste Management - Institutional arrangements: Mitigation- Response and Preparedness - Disaster Management Act and Policy - Other related policies – plans - programmes and legislation – Role of GIS and Information Technology Components in Preparedness - Risk Assessment - Response and Recovery Phases of Disaster – Disaster Damage Assessment.								
<b>Unit V</b>	<b>DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS</b>							<b>9</b>
Landslide Hazard Zonation: Case Studies - Earthquake Vulnerability Assessment of Buildings and Infrastructure - Drought Assessment - Coastal Flooding - Storm Surge Assessment - Floods: Fluvial and Pluvial Flooding - Forest Fire - Man Made disasters - Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.								

<b>TEXT BOOK(S):</b>	
1.	Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2.	Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3.	Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4.	Kapur Anu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010

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<b>REFERENCE(S):</b>	
<b>1.</b>	Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
<b>2.</b>	Government of India, National Disaster Management Policy,2009

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<b>Department</b>	<b>Computer Science and Engineering</b>				<b>R 2016</b>	<b>Semester</b>	<b>-</b>
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>
		<b>L</b>	<b>T</b>	<b>P</b>			
<b>16CSE28</b>	<b>AGILE METHODOLOGY</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>

**Course Objective (s):**

- To understand the basic concepts of Agile Software Process.
- To gain knowledge in the area of various Agile Methodologies.
- To develop Agile Software Process
- To know the principles of Agile Testing

**Course Outcomes:**

1. Explain the fundamentals of agile software process
2. Summarize the concepts of Agile Scrum Framework
3. Explain the various agile testing methods and its process.
4. Design and development of agile software
5. Identify the industrial trends of agile technologies for project development

**Unit I FUNDAMENTALS OF AGILE**

**9**

The Genesis of Agile - Introduction and background - Agile Manifesto and Principles - Overview of Scrum - Extreme Programming - Feature Driven development - Lean Software Development - Agile project management - Design and development practices in Agile projects - Test Driven Development - Continuous Integration – Refactoring - Pair Programming - Simple Design - User Stories

**Unit II AGILE SCRUM FRAMEWORK**

**9**

Introduction to Scrum - Project phases - Agile Estimation - Planning game - Product backlog - Sprint backlog - Iteration planning - User story definition - Characteristics and content of user stories - Acceptance tests and Verifying stories - Project velocity - Burn down chart - Sprint planning and retrospective - Daily scrum - Scrum roles - Product Owner - Scrum Master - Scrum Team - Scrum case study - Tools for Agile project management

**Unit III AGILE TESTING**

**9**

The Agile lifecycle and its impact on testing - Test-Driven Development (TDD) - xUnit framework and tools for TDD - Testing user stories - acceptance tests and scenarios - Planning and managing testing cycle - Exploratory testing - Risk based testing - Regression tests - Test Automation - Tools to support the Agile tester

**Unit IV AGILE SOFTWARE DESIGN AND DEVELOPMENT**

**9**

Agile design practices - Role of design Principles including Single Responsibility Principle - Open Closed Principle - Liskov Substitution Principle - Interface Segregation Principles - Dependency Inversion Principle in Agile Design - Need and significance of Refactoring - Refactoring Techniques - Continuous Integration - Automated build tools - Version control

**Unit V INDUSTRY TRENDS**

**9**

Market scenario and adoption of Agile - Agile ALM - Roles in an Agile project - Agile applicability - Agile in Distributed teams - Business benefits - Challenges in Agile - Risks and Mitigation - Agile projects on Cloud - Balancing Agility with Discipline - Agile rapid development technologies

**TEXT BOOK(S):**

<b>1.</b>	Ken Schawber, Mike Beedle, " Agile Software Development with Scrum", Pearson Edition 1, 2008.
<b>2.</b>	Lisa Crispin, Janet Gregory, " Agile Testing: A Practical Guide for Testers and Agile Teams", Addison Wesley, 2008.
<b>3.</b>	Robert C. Martin, " Agile Software Development, Principles, Patterns and Practices", Pearson Edition 1, 2013.

**REFERENCE(S):**

<b>1.</b>	Richard Fairley, "Software Engineering Concepts"–, Tata Mcgraw Hill, 2008.
<b>3.</b>	Alistair Cockburn, "Agile Software Development", Second Edition, Pearson Education Asia, 2006.



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<b>Department</b>	<b>Computer Science and Engineering</b>				<b>R 2016</b>	<b>Semester</b>	<b>-</b>
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
<b>16CSE29</b>	<b>GPU PROGRAMMING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>100</b>

**Course Objective (s):**

- To learn parallel programming with graphics processing units (GPUs)
- To gain knowledge in GPU Programming concepts
- To implement the programs on GPUs

**Course Outcomes:**

1. Outline the concepts involved in parallel programming and implementation of programs on GPUs
2. Explain about the memory hierarchy and allocation strategies
3. Summarize the Synchronization issues across CPU and GPU
4. Explain the debugging and profiling parallel program concepts
5. Infer the case studies related to GPU Programming

<b>Unit I</b>	<b>INTRODUCTION TO GPU PROGRAMMING</b>	<b>9</b>
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Introduction : History, graphics processors, graphics processing units, GPGPUs - Clock speeds - CPU / GPU comparisons - heterogeneity - Accelerators - parallel programming - CUDA / OpenCL / OpenACC - Hello World  
 Computation : Kernels, launch parameters, thread hierarchy, warps / wavefronts, thread blocks / workgroups, streaming multiprocessors, 1D / 2D / 3D thread mapping, device properties, simple programs

<b>Unit II</b>	<b>MEMORY AND SYNCHRONIZATION</b>	<b>9</b>
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Memory : Memory hierarchy, DRAM / global, local / shared, private / local, textures, constant memory - Pointers - parameter passing - arrays and dynamic memory - multi-dimensional arrays - Memory allocation - memory copying across devices - Programs with matrices - performance evaluation with different memories

<b>Unit III</b>	<b>SYNCHRONIZATION</b>	<b>9</b>
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Memory consistency - Barriers (local versus global) - atomics - memory fence - Prefix sum - reduction - Programs for concurrent data structures such as worklists - linked-lists - Synchronization across CPU and GPU

<b>Unit IV</b>	<b>FUNCTIONS AND SUPPORT</b>	<b>9</b>
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Device functions - host functions - kernels - Using libraries (such as Thrust) - developing libraries - Debugging GPU programs - Profiling - profile tools - performance aspects

<b>Unit V</b>	<b>STREAMS AND CASE STUDIES</b>	<b>9</b>
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Asynchronous processing - tasks - task-dependence - Overlapped data transfers - default stream - synchronization with streams - Events - event-based-synchronization - overlapping data transfer and kernel execution - pitfalls - Case studies : Image processing, Graph algorithms, Simulations, Deep learning

**TEXT BOOK(S):**

1.	David Kirk, Wen-mei Hwu, " Programming Massively Parallel Processors: A Hands-on Approach", Morgan Kaufmann, 2010.
2.	Shane Cook, " CUDA Programming: A Developer's Guide to Parallel Computing with GPUs", Morgan Kaufmann, 2012.

**REFERENCE(S):**

1.	<a href="https://www.cse.iitm.ac.in/course_details.php?arg=MTlw">https://www.cse.iitm.ac.in/course_details.php?arg=MTlw</a> (IIT MADRAS)
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Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CSE30	SOFTWARE PROJECT MANAGEMENT	3	0	0	3	45	100	

**Course Objective (s):**

- To understand the basics of software quality
- To learn various metrics of software quality
- To introduce concept behind designing of test cases

**Course Outcomes(CO):**

1. Describe overview of project planning strategies Describe standards involved in measuring quality and reliability of a software
2. Illustrate entire life cycle of a project along with effort needed for its completion
3. Explain complete activities involved in planning a project and estimate risk factors along with cost criterion involved
4. Infer monitoring techniques associated with project, managing methods available in a project development
5. Interpret manual assistance required to develop a complete project

<b>Unit I</b>	<b>PROJECT EVALUATION AND PROJECT PLANNING</b>	<b>9</b>
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Introduction Of Software Project Management – Activities Methodologies – Categorization Of Software Projects – Setting Objectives – Management Principles – Management Control – Project Portfolio Management – Cost-Benefit Evaluation Technology – Risk Evaluation – Strategic Program Management – Stepwise Project Planning.

<b>Unit II</b>	<b>PROJECT LIFE CYCLE AND EFFORT ESTIMATION</b>	<b>9</b>
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Software Process And Process Models – Choice Of Process Models – Rapid Application Development – Agile Methods – Extreme Programming – SCRUM – Managing Iterative Processes –Software Effort Estimation: Basics Of Software Estimation – Effort And Cost Estimation Techniques – COSMIC Full Function Points – COCOMO II- A Parametric Productivity Model - Staffing Pattern.

<b>Unit III</b>	<b>ACTIVITY PLANNING AND RISK MANAGEMENT</b>	<b>9</b>
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Objectives Of Activity Planning – Project Schedules – Activities – Sequencing And Scheduling – Network Planning Models – Forward Pass & Backward Pass Techniques – Critical Path (CRM) Method – Risk Identification – Assessment – Monitoring – PERT Technique – Monte Carlo Simulation – Resource Allocation: Creation Of Critical Path – Cost Schedules

<b>Unit IV</b>	<b>PROJECT MONITORING AND MANAGEMENT CONTROL</b>	<b>9</b>
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Framework– Collection Of Data Project Termination – Visualizing Progress – Cost Monitoring – Earned Value Analysis-Change Control- Software Configuration Management – Managing Contracts – Contract Management.

<b>Unit V</b>	<b>STAFFING IN SOFTWARE PROJECTS</b>	<b>9</b>
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Introduction – Organizational Behavior – Best Methods Of Staff Selection – Motivation - Decision Making – Team Structures – Virtual Teams – Communications Genres – Communication Plans-Project Management Tools.

**TEXT BOOK(S):**

1.	Bob Hughes, Mike Cotterell and Rajib Mall 'Software Project Management' – Fifth Edition, Tata McGraw Hill, New Delhi, 2012
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**REFERENCE(S):**

1.	Robert K. Wysocki 'Effective Software Project Management' – Wiley Publication, 2011.
2.	Walker Royce 'Software Project Management'- Addison Wesley, 1998.

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CSE31	SOFTWARE QUALITY AND TESTING	3	0	0	3	45	100	

**Course Objective (s):**

- To understand the basics of software quality
- To learn various metrics of software quality
- To introduce concept behind designing of test cases

**Course Outcomes(CO):**

1. Illustrate basics of software quality principles
2. Describe standards involved in measuring quality and reliability of a software
3. Explain the design criterion available to frame a test case
4. Illustrate testing principles in detail to develop a testing crew for managing test cases
5. Use Software Quality monitoring techniques to maintain the software quality

<b>Unit I</b>	<b>INTRODUCTION TO SOFTWARE QUALITY</b>	<b>9</b>
Software Quality – TQM Principles – Software Development Process Models – Process Maturity Framework And Quality Standards – Basic Measures – Levels Of Management.		
<b>Unit II</b>	<b>SOFTWARE QUALITY METRICS AND RELIABILITY</b>	<b>9</b>
Product Quality Metrics – Process Quality Metrics – Metrics For Software Maintenance – Examples Of Metrics Programs – Reliability And Validity – Measurement Errors – Criteria For Casualty.		
<b>Unit III</b>	<b>TEST CASE DESIGN</b>	<b>9</b>
Testing As An Engineering Activity – Testing Fundamentals – Defects – Strategies And Methods For Black Box Test Case Design – Strategies And Methods For White-Box Test Case Design – Test Adequacy Criteria – Evaluating Test Adequacy Criteria – Levels Of Testing And Different Types Of Testing – OO Testing.		
<b>Unit IV</b>	<b>TEST MANAGEMENT</b>	<b>9</b>
Testing And Debugging Goals And Policies – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – Reporting Test Results – The Role Of Three Groups In Test Planning And Policy Development – Process And The Engineering Disciplines – Introducing The Test Specialist – Skills Needed By A Test Specialist – Building A Testing Group.		
<b>Unit V</b>	<b>CONTROLLING AND MONITORING</b>	<b>9</b>
Measurement And Milestones For Controlling And Monitoring – Status Meetings – Reports And Control Issues – Criteria For Test Completion – SCM – Types Of Reviews – Developing A Review Program – Components Of Review Plans – Reporting Review Results.		

**TEXT BOOK(S):**

1.	Ilene Burnstein 'Practical Software Testin' - Springer International Edition, 2003
2.	Stephen Kan, 'Metrics and Models in Software Quality' – Addison Wesley – Second Edition, 2004

**REFERENCE(S):**

1.	Milind Limaye 'Software Quality Assurance'- McGraw Hill, 2011.
2.	M G Limaye 'Software Testing Principles' - Techniques and ToolsII, McGraw Hill, 2011.

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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CSE32	FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	3	0	0	3	45	100

**Course Objective (s):**

- To understand the global trends and development methodologies of various types of products and services
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To gain knowledge of the Innovation & Product Development process in the Business Context

**Course Outcomes(CO):**

1. To understand the global trends with development methodologies and various types of products services
2. To understand the requirement engineering for new product development with system design
3. To understand the fundamentals of system design and testing with an integrated products
4. To understand the sustenance engineering and End –of-Life (EOL) support
5. To gain the knowledge of the innovation and product development process in Business Context

**Unit I FUNDAMENTALS OF PRODUCT DEVELOPMENT**

**9**

Global Trends Analysis and Product decision - Social Trends- Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends - Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle - Product Development Planning and Management

**Unit II REQUIREMENTS AND SYSTEM DESIGN**

**9**

Requirement Engineering - Types of Requirements - Requirement Engineering - Traceability Matrix and Analysis - Requirement Management - System Design & Modeling - Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design

**Unit III DESIGN AND TESTING**

**9**

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines - Concept Screening & Evaluation - Detailed Design - Component Design and Verification – Mechanical, Electronics and Software Subsystems - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Prototyping - Introduction to Rapid Prototyping and Rapid Manufacturing - System Integration, Testing, Certification and Documentation.

**Unit IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT**

**9**

Introduction to Product verification processes and stages - Introduction to Product validation processes and stages - Product Testing standards and Certification - Product Documentation - Sustenance - Maintenance and Repair – Enhancements - Product EoL - Obsolescence Management - Configuration Management - EoL Disposal

**Unit V BUSINESS DYNAMICS ENGINEERING SERVICES INDUSTRY**

**9**

The Industry - Engineering Services Industry - Product development in Industry versus Academia - The IPD Essentials - Introduction to vertical specific product development processes - Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and S/W systems – Product development Trade-offs - Intellectual Property Rights and Confidentiality - Security and configuration management.

**TEXT BOOK(S):**

1. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", TataMcGraw Hill, Fifth Edition, New Delhi, 2011.
2. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, New Delhi, 2005.

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<b>REFERENCE(S):</b>	
<b>1.</b>	Hiriyappa B, "Corporate Strategy – Managing the Business", Authorhouse, USA, 2013.
<b>2.</b>	Peter F Drucker, "People and Performance", Butterworth – Heinemann [Elsevier], Oxford, UK, 2004.
<b>3.</b>	Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", Prentice Hall India, New Delhi, 2003.
<b>4.</b>	Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, New Delhi, 2013.

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Department	Computer Science and Engineering				R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
16CSE33	INTERNET OF THINGS	3	0	0	3	45	100
<b>Course Objective (s):</b>							
<ul style="list-style-type: none"> <li>To provide a basic understanding of Internet of Things.</li> <li>To provide hands on training for building simple applications using appropriate sensors, microcontroller board and other components</li> </ul>							
<b>Course Outcomes:</b>							
<ol style="list-style-type: none"> <li>Explain Internet of Things and the protocols of IoT</li> <li>Identify the various IoT components such as sensors, shields (Arduino, Raspberry Pi, Bluetooth, WiFi)</li> <li>Experiment various problems related with IoT using controllers and processors.</li> <li>Explain the role of cloud and security in IoT</li> <li>Outline Data Analytics and IoT platforms</li> </ol>							
<b>Unit I</b>	<b>IOT INTRODUCTION AND ITS PROTOCOLS</b>						<b>9</b>
Evolution of Internet - IoT Architecture – Web 3.0 View of IoT – Protocol Standardisation for IoT – Protocols for IoT: IEEE 802.15.1 – IEEE 802.15.4 – BACNet Protocol – Modbus – KNX – Zigbee Architecture							
<b>Unit II</b>	<b>PROGRAMMING MICROCONTROLLER FOR IOT</b>						<b>9</b>
Basics of microcontroller – Setting up – Programming the Board – Reading from Sensors – Connecting Microcontroller with Mobile Devices – Communication via Bluetooth and USB – Connection with Internet via WIFI/Ethernet							
<b>Unit III</b>	<b>PROGRAMMING MICROPROCESSOR FOR IOT</b>						<b>9</b>
Installation and Setting up of the Microprocessor board – Programming the Microprocessor – Communication via Bluetooth and USB – Connection with Internet via WIFI/Ethernet							
<b>Unit IV</b>	<b>IOT IN CLOUD AND SECURITY</b>						<b>9</b>
Internet of Things (IoT) as Interconnection of Threats (IoT) – Privacy Preservation for IoT used in Smart Buildings – Preventing Unauthorized Access to Sensor Data – Authentication in IoT – Security Protocols for IoT Access Networks - Cloud and IoT – Drivers for Integration – Cloud Platforms – Applications							
<b>Unit V</b>	<b>IOT ANALYTICS AND PLATFORMS</b>						<b>9</b>
IoT Analytics: Role of Analytics in IOT - Data visualization Techniques - Introduction to R Programming - Statistical Methods - IoT Platforms - Future Trends of IoT							

<b>TEXT BOOK(S):</b>	
1.	Charalampos Doukas, 'Building Internet of Things with the Arduino', Create space, April 2012.
2.	Donald Norris, 'The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black', Mc.Graw Hill, 2015.
3.	Fei Hu, 'Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations', CRC press, 2016

<b>REFERENCE(S):</b>	
1.	Dieter Uckelmann, Mark Harrison, Florian Michahelles, 'Architecting the Internet of Things', Springer, 2011
2.	Donald Norris, 'The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black', Mc.Graw Hill, 2015
3.	Cuno Pfister, 'Getting Started with the Internet of Things, O'Reilly Media', Inc., 2011
4.	Honbo Zhou, 'The Internet of Things in the Cloud: A Middleware Perspective', CRC Press, 2012
5.	'Architecting the Internet of Things', Springer publications. Author(s): Dieter Uckelmann, Mark Harrison, Florian Michahelles
6.	'Internet of Things with Arduino Cookbook', Packt Publications. Author(s): Marco Schwatz
7.	Olivier Hersent, David Boswarthick, Omar Elloumi, 'The Internet of Things, Key applications and Protocols', Wiley, 2012
8.	Dieter Uckelmann et.al, 'Architecting the Internet of Things', Springer, 2011.
9.	'The Internet of Things: Applications and Protocols', Wiley publications. Author(s): Oliver Hersent, David Boswarthick, Omar Elloumi
10.	<a href="https://www.raspberrypi.org/">https://www.raspberrypi.org/</a>

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11.	<a href="https://developer.ibm.com/iot/">https://developer.ibm.com/iot/</a>
12.	<a href="http://www.microsoft.com/en-in/server-cloud/internet-of-things.aspx">http://www.microsoft.com/en-in/server-cloud/internet-of-things.aspx</a>

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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	IV
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CSY01	HARDWARE AND TROUBLE SHOOTING	0	0	2	1	15	100	

**Course Objective (s):**

- This course is designed to enable the students to get a detailed knowledge of all the hardware components that make up a computer and to understand the different interfaces required for connecting these hardware devices.

**Course Outcomes:**

- Understand the operations of basic trouble shooting in hardware
- Demonstrate the various storage devices
- Explain printers and floppy drive
- Illustrate the components of trouble shooting
- Implement the trouble shooting technologies

**LIST OF EXPERIMENTS:**

- Study and identification of standard desktop personal computer
- Understanding of Motherboard and its interfacing components
- Install and configure computer drivers and system components.
- Disk formatting, partitioning and Disk operating system commands
- Install, upgrade and configure Windows operating systems.
- Remote desktop connections and file sharing.
- Identify, install and manage network connections Configuring IP address and Domain name system
- Install, upgrade and configure Linux operating systems.
- Installation Antivirus and configure the antivirus.
- Installation of printer and scanner software.
- Disassembly and Reassembly of hardware.
- Troubleshooting and Managing Systems

**REFERENCE(S):**

1.	Craig Zacker& John Rourke, "The complete reference:PC hardware", Tata McGrawHill, NewDelhi,2001
2.	Mike Meyers, "Introduction to PC Hardware and Troubleshooting", Tata McGrawHill, New Delhi,2003.



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Department	COMPUTER SCIENCE AND ENGINEERING				R 2016	Semester	
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
16CSY02	PYTHON PROGRAMMING				1	15	100

**Course Objective (s):**

- To understand the concepts of datatypes, I/O and operators in python programming.
- To demonstrate the concepts of looping and conditional constructs.
- To experiment with advanced concepts in python programming.

**Course Outcomes(CO):**

1. Create python programming with the data flow and control structures.
2. Understand the concepts of looping and conditional statements in python.
3. Illustrate the working of strings in python
4. Demonstrate the working of files and dictionaries in python.
5. Experiment with file operations, Exception handling and database connectivity

1. Introduction to Programming Using Python
2. Keywords, Identifiers, Statements & Comments
3. Python Variables, Datatypes. Type Conversion
4. Python I/O and Import, Operators, Namespace
5. Variables, Statement, Operators and User Input
6. Looping Technique
7. Conditional Constructs
8. Python Function
9. Flow Control and String Data Type
10. Working with Files
11. Exception Handling
12. List and Dictionaries
13. Tuples
14. DataBase
15. Basic Data-Base Connectivity with Sample Programs

**REFERENCE(S):**

1.	A Whirlwind Tour of Python-DescriptoinJake VanderPlas
2.	How to Make Mistakes in Python, by Mike Pirnat
3.	Functional Programming in Python-David Mertz

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<b>Department</b>	<b>COMPUTER SCIENCE AND ENGINEERING</b>					<b>R 2012</b>	<b>Semester</b>	<b>-</b>
<b>Course Code</b>	<b>Course Name</b>	<b>Hours / Week</b>			<b>Credit</b>	<b>Total Hours</b>	<b>Maximum Marks</b>	
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>			
<b>16CSY03</b>	<b>3D Animation</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>15</b>	<b>100</b>	

**Course Objective (s):**

- To Learn and implement the 3 D Animation techniques

**Course Outcomes(CO):**

1. Implement different selection tools, filters, motion tweening and layers
2. Apply Build 3D models, Design virtual worlds, and create animations, Character creation
3. Execute walk cycles, 3D modeling and texturing, and keyframe animation, visual effects applications

<b>Unit I</b>	<b>INTRODUCTION</b>	<b>5</b>
Selection tools - Filters - Motion tweening - Masking of layers		
<b>Unit II</b>	<b>3D MODELS</b>	<b>5</b>
Build 3D models - Design virtual worlds - create animations - Character creation		
<b>Unit III</b>	<b>ANIMATION</b>	<b>5</b>
Walk cycles - 3D modeling and texturing - Keyframe animation - visual effects applications		

**TEXT BOOK(S):**

<b>1.</b>	3D Animation Essentials 1st Edition by Andy Beane, Publisher: Sybex
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Department	COMPUTER SCIENCE AND ENGINEERING					R 2016	Semester	-
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
16CSY07	Project Management Tools	0	0	2	1	15	100	
<b>Course Objective (s):</b> <ul style="list-style-type: none"> <li>To understand the concepts of datatypes, I/O and operators in python programming.</li> <li>To demonstrate the concepts of looping and conditional constructs.</li> <li>To experiment with advanced concepts in python programming.</li> </ul>								
<b>Course Outcomes(CO):</b> <ol style="list-style-type: none"> <li>1. Illustrate how to create and manage projects in tools.</li> <li>2. Understand how to track and report scheduling of a project.</li> <li>3. Describe how to create project groups.</li> <li>4. Explain the collaboration of projects and tasks.</li> <li>5. Solve the backlog and overcome issues in project.</li> </ol>								
<ol style="list-style-type: none"> <li>1. Introduction to project management tools</li> <li>2. Create project plans</li> <li>3. Tracking and reporting scheduling</li> <li>4. Create project groups</li> <li>5. Issue tracking</li> <li>6. Project Collaboration</li> <li>7. Task Collaboration</li> <li>8. Manage backlog</li> <li>9. Tack issues and risks.</li> </ol>								

<b>REFERENCE(S):</b>	
1.	<a href="https://www.visual-paradigm.com/features/project-management-lifecycle-guide-through/">https://www.visual-paradigm.com/features/project-management-lifecycle-guide-through/</a>
2.	<a href="https://www.smartsheet.com/project-management-tools">https://www.smartsheet.com/project-management-tools</a>
3.	<a href="https://www.businessphrases.net/project-management-tools/">https://www.businessphrases.net/project-management-tools/</a>