

SOFTWARE ENGINEERING (Effective from the academic year 2018 -2019) SEMESTER – III			
Course Code	18CS35	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	03
CREDITS –3			
<b>Course Learning Objectives:</b> This course (18CS35) will enable students to:			
<ul style="list-style-type: none"> <li>Outline software engineering principles and activities involved in building large software programs. Identify ethical and professional issues and explain why they are of concern to software engineers.</li> <li>Explain the fundamentals of object oriented concepts</li> <li>Describe the process of requirements gathering, requirements classification, requirements specification and requirements validation. Differentiate system models, use UML diagrams and apply design patterns.</li> <li>Discuss the distinctions between validation testing and defect testing.</li> <li>Recognize the importance of software maintenance and describe the intricacies involved in software evolution. Apply estimation techniques, schedule project activities and compute pricing.</li> <li>Identify software quality parameters and quantify software using measurements and metrics. List software quality standards and outline the practices involved.</li> </ul>			
Module 1			Contact Hours
<b>Introduction:</b> Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. <b>Software Processes:</b> Models: Waterfall Model (Sec 2.1.1), Incremental Model (Sec 2.1.2) and Spiral Model (Sec 2.1.3). Process activities. <b>Requirements Engineering:</b> Requirements Engineering Processes (Chap 4). Requirements Elicitation and Analysis (Sec 4.5). Functional and non-functional requirements (Sec 4.1). The software Requirements Document (Sec 4.2). Requirements Specification (Sec 4.3). Requirements validation (Sec 4.6). Requirements Management (Sec 4.7). <b>RBT: L1, L2, L3</b>			08
Module 2			Contact Hours
What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. <b>Introduction, Modelling Concepts and Class Modelling:</b> What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. Class Modelling: Object and Class Concept; Link and associations concepts; Generalization and Inheritance; A sample class model; Navigation of class models; <b>Textbook 2: Ch 1,2,3.</b> <b>RBT: L1, L2 L3</b>			08
Module 3			Contact Hours
<b>System Models:</b> Context models (Sec 5.1). Interaction models (Sec 5.2). Structural models (Sec 5.3). Behavioral models (Sec 5.4). Model-driven engineering (Sec 5.5). <b>Design and Implementation:</b> Introduction to RUP (Sec 2.4), Design Principles (Chap 7). Object-oriented design using the UML (Sec 7.1). Design patterns (Sec 7.2). Implementation issues (Sec 7.3). Open source development (Sec 7.4). <b>RBT: L1, L2, L3</b>			08

<b>Module 4</b>	
<p><b>Software Testing:</b> Development testing (<b>Sec 8.1</b>), Test-driven development (<b>Sec 8.2</b>), Release testing (<b>Sec 8.3</b>), User testing (<b>Sec 8.4</b>). Test Automation (<b>Page no 212</b>).</p> <p><b>Software Evolution:</b> Evolution processes (<b>Sec 9.1</b>). Program evolution dynamics (<b>Sec 9.2</b>). Software maintenance (<b>Sec 9.3</b>). Legacy system management (<b>Sec 9.4</b>).</p> <p><b>RBT: L1, L2, L3</b></p>	08
<b>Module 5</b>	
<p><b>Project Planning:</b> Software pricing (<b>Sec 23.1</b>). Plan-driven development (<b>Sec 23.2</b>). Project scheduling (<b>Sec 23.3</b>): Estimation techniques (<b>Sec 23.5</b>). <b>Quality management:</b> Software quality (<b>Sec 24.1</b>). Reviews and inspections (<b>Sec 24.3</b>). Software measurement and metrics (<b>Sec 24.4</b>). Software standards (<b>Sec 24.2</b>)</p> <p><b>RBT: L1, L2, L3</b></p>	08
<b>Course Outcomes:</b> The student will be able to :	
<ul style="list-style-type: none"> <li>• Design a software system, component, or process to meet desired needs within realistic constraints.</li> <li>• Assess professional and ethical responsibility</li> <li>• Function on multi-disciplinary teams</li> <li>• Use the techniques, skills, and modern engineering tools necessary for engineering practice</li> <li>• Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems</li> </ul>	
<b>Question Paper Pattern:</b>	
<ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 20 marks</li> <li>• There will be 2 full questions (with a maximum of four sub questions) from each module.</li> <li>• Each full question will have sub questions covering all the topics under a module.</li> <li>• The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>	
<b>Textbooks:</b>	
<ol style="list-style-type: none"> <li>1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012. (Listed topics only from Chapters 1,2,3,4, 5, 7, 8, 9, 23, and 24)</li> <li>2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML, 2<sup>nd</sup> Edition, Pearson Education, 2005.</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.</li> <li>2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India</li> </ol>	

<b>DESIGN AND ANALYSIS OF ALGORITHMS</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – IV</b>			
<b>Course Code</b>	<b>18CS42</b>	<b>CIE Marks</b>	40
<b>Number of Contact Hours/Week</b>	3:2:0	<b>SEE Marks</b>	60
<b>Total Number of Contact Hours</b>	50	<b>Exam Hours</b>	03
<b>CREDITS –4</b>			
<b>Course Learning Objectives:</b> This course (18CS42) will enable students to:			
<ul style="list-style-type: none"> <li>• Explain various computational problem solving techniques.</li> <li>• Apply appropriate method to solve a given problem.</li> <li>• Describe various methods of algorithm analysis.</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>Introduction:</b> What is an Algorithm? (T2:1.1), Algorithm Specification (T2:1.2), Analysis Framework (T1:2.1), <b>Performance Analysis:</b> Space complexity, Time complexity (T2:1.3). <b>Asymptotic Notations:</b> Big-Oh notation ( $O$ ), Omega notation ( $\Omega$ ), Theta notation ( $\Theta$ ), and Little-oh notation ( $o$ ), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples (T1:2.2, 2.3, 2.4). <b>Important Problem Types:</b> Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. <b>Fundamental Data Structures:</b> Stacks, Queues, Graphs, Trees, Sets and Dictionaries. (T1:1.3,1.4).  <b>RBT: L1, L2, L3</b>			10
<b>Module 2</b>			
<b>Divide and Conquer:</b> General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum (T2:3.1, 3.3, 3.4), Merge sort, Quick sort (T1:4.1, 4.2), Strassen’s matrix multiplication (T2:3.8), Advantages and Disadvantages of divide and conquer. <b>Decrease and Conquer Approach:</b> Topological Sort. (T1:5.3).  <b>RBT: L1, L2, L3</b>			10
<b>Module 3</b>			
<b>Greedy Method:</b> General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines (T2:4.1, 4.3, 4.5). <b>Minimum cost spanning trees:</b> Prim’s Algorithm, Kruskal’s Algorithm (T1:9.1, 9.2). <b>Single source shortest paths:</b> Dijkstra’s Algorithm (T1:9.3). <b>Optimal Tree problem:</b> Huffman Trees and Codes (T1:9.4). <b>Transform and Conquer Approach:</b> Heaps and Heap Sort (T1:6.4).  <b>RBT: L1, L2, L3</b>			10
<b>Module 4</b>			
<b>Dynamic Programming:</b> General method with Examples, Multistage Graphs (T2:5.1, 5.2). <b>Transitive Closure:</b> Warshall’s Algorithm, <b>All Pairs Shortest Paths:</b> Floyd’s Algorithm, Optimal Binary Search Trees, Knapsack problem ((T1:8.2, 8.3, 8.4), Bellman-Ford Algorithm (T2:5.4), Travelling Sales Person problem (T2:5.9), Reliability design (T2:5.8).  <b>RBT: L1, L2, L3</b>			10
<b>Module 5</b>			
<b>Backtracking:</b> General method (T2:7.1), N-Queens problem (T1:12.1), Sum of subsets problem (T1:12.1), Graph coloring (T2:7.4), Hamiltonian cycles (T2:7.5). <b>Programme and Bound:</b> Assignment Problem, Travelling Sales Person problem (T1:12.2), <b>0/1 Knapsack problem (T2:8.2, T1:12.2):</b> LC Programme and Bound solution (T2:8.2), FIFO Programme and Bound solution (T2:8.2). <b>NP-Complete and NP-Hard problems:</b> Basic concepts, non-			10

deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes ( <b>T2:11.1</b> ).	
<b>RBT: L1, L2, L3</b>	
<b>Course Outcomes:</b> The student will be able to :	
<ul style="list-style-type: none"> <li>• Describe computational solution to well known problems like searching, sorting etc.</li> <li>• Estimate the computational complexity of different algorithms.</li> <li>• Devise an algorithm using appropriate design strategies for problem solving.</li> </ul>	
<b>Question Paper Pattern:</b>	
<ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 20 marks</li> <li>• There will be 2 full questions (with a maximum of four sub questions) from each module.</li> <li>• Each full question will have sub questions covering all the topics under a module.</li> <li>• The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>	
<b>Textbooks:</b>	
<ol style="list-style-type: none"> <li>1. Introduction to the Design and Analysis of Algorithms, Anany Levitin., 2rd Edition, 2009. Pearson.</li> <li>2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.</li> <li>2. Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education).</li> </ol>	

<b>MICROCONTROLLER AND EMBEDDED SYSTEMS</b> (Effective from the academic year 2018 -2019) <b>SEMESTER – IV</b>			
<b>Course Code</b>	<b>18CS44</b>	<b>CIE Marks</b>	40
<b>Number of Contact Hours/Week</b>	3:0:0	<b>SEE Marks</b>	60
<b>Total Number of Contact Hours</b>	40	<b>Exam Hours</b>	03
<b>CREDITS –3</b>			
<b>Course Learning Objectives:</b> This course (18CS44) will enable students to:			
<ul style="list-style-type: none"> <li>• Understand the fundamentals of ARM based systems, basic hardware components, selection methods and attributes of an embedded system.</li> <li>• Program ARM controller using the various instructions</li> <li>• Identify the applicability of the embedded system</li> <li>• Comprehend the real time operating system used for the embedded system</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table , Core Extensions  <b>Text book 1: Chapter 1 - 1.1 to 1.4, Chapter 2 - 2.1 to 2.5</b> <b>RBT: L1, L2</b>			08
<b>Module 2</b>			
<b>Introduction to the ARM Instruction Set :</b> Data Processing Instructions , Programme Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants  <b>ARM programming using Assembly language:</b> Writing Assembly code, Profiling and cycle counting, instruction scheduling, Register Allocation, Conditional Execution, Looping Constructs  <b>Text book 1: Chapter 3:Sections 3.1 to 3.6 ( Excluding 3.5.2), Chapter 6(Sections 6.1 to 6.6)</b> <b>RBT: L1, L2</b>			08
<b>Module 3</b>			
<b>Embedded System Components:</b> Embedded Vs General computing system, History of embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, purpose of embedded systems  Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED, 7 segment LED display, stepper motor, Keyboard, Push button switch, Communication Interface (onboard and external types), Embedded firmware, Other system components.  <b>Text book 2:Chapter 1(Sections 1.2 to 1.6),Chapter 2(Sections 2.1 to 2.6)</b> <b>RBT: L1, L2</b>			08
<b>Module 4</b>			
<b>Embedded System Design Concepts:</b> Characteristics and Quality Attributes of Embedded Systems, Operational quality attributes ,non-operational quality attributes, Embedded			08

Systems-Application and Domain specific, Hardware Software Co-Design and Program Modelling, embedded firmware design and development	
<b>Text book 2: Chapter-3, Chapter-4, Chapter-7 (Sections 7.1, 7.2 only), Chapter-9 (Sections 9.1, 9.2, 9.3.1, 9.3.2 only)</b>	
<b>RBT: L1, L2</b>	
<b>Module 5</b>	
<b>RTOS and IDE for Embedded System Design:</b> Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Multiprocessing and Multitasking, Task Communication (without any program), Task synchronization issues – Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques, target hardware debugging, boundary scan.	08
<b>Text book 2: Chapter-10 (Sections 10.1, 10.2, 10.3, 10.4 , 10.7, 10.8.1.1, 10.8.1.2, 10.8.2.2, 10.10 only), Chapter 12, Chapter-13 ( block diagram before 13.1, 13.3, 13.4, 13.5, 13.6 only)</b>	
<b>RBT: L1, L2</b>	
<b>Course Outcomes:</b> The student will be able to :	
<ul style="list-style-type: none"> <li>● Describe the architectural features and instructions of ARM microcontroller</li> <li>● Apply the knowledge gained for Programming ARM for different applications.</li> <li>● Interface external devices and I/O with ARM microcontroller.</li> <li>● Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.</li> <li>● Develop the hardware /software co-design and firmware design approaches.</li> <li>● Demonstrate the need of real time operating system for embedded system applications</li> </ul>	
<b>Question Paper Pattern:</b>	
<ul style="list-style-type: none"> <li>● The question paper will have ten questions.</li> <li>● Each full Question consisting of 20 marks</li> <li>● There will be 2 full questions (with a maximum of four sub questions) from each module.</li> <li>● Each full question will have sub questions covering all the topics under a module.</li> <li>● The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>	
<b>Textbooks:</b>	
<ol style="list-style-type: none"> <li>1. Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008.</li> <li>2. Shibu K V, “Introduction to Embedded Systems”, Tata McGraw Hill Education, Private Limited, 2<sup>nd</sup> Edition.</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Raghunandan..G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication,2019</li> <li>2. The Insider’s Guide to the ARM7 Based Microcontrollers, Hitex Ltd.,1st edition, 2005.</li> <li>3. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015.</li> <li>4. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008.</li> </ol>	

<b>COMPUTER NETWORKS AND SECURITY</b> (Effective from the academic year 2018 -2019) <b>SEMESTER – V</b>			
<b>Course Code</b>	<b>18CS52</b>	<b>CIE Marks</b>	40
<b>Number of Contact Hours/Week</b>	3:2:0	<b>SEE Marks</b>	60
<b>Total Number of Contact Hours</b>	50	<b>Exam Hours</b>	03
<b>CREDITS –4</b>			
<b>Course Learning Objectives:</b> This course (18CS52) will enable students to:			
<ul style="list-style-type: none"> <li>• Demonstration of application layer protocols</li> <li>• Discuss transport layer services and understand UDP and TCP protocols</li> <li>• Explain routers, IP and Routing Algorithms in network layer</li> <li>• Disseminate the Wireless and Mobile Networks covering IEEE 802.11 Standard</li> <li>• Illustrate concepts of Multimedia Networking, Security and Network Management</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>Application Layer:</b> Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, DNS; The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Peer-to-Peer Applications: P2P File Distribution, Distributed Hash Tables, Socket Programming: creating Network Applications: Socket Programming with UDP, Socket Programming with TCP. <b>T1: Chap 2</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 2</b>			
<b>Transport Layer :</b> Introduction and Transport-Layer Services: Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing: Connectionless Transport: UDP,UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat, Connection-Oriented Transport TCP: The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control: The Causes and the Costs of Congestion, Approaches to Congestion Control, Network-assisted congestion-control example, ATM ABR Congestion control, TCP Congestion Control: Fairness. <b>T1: Chap 3</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 3</b>			
<b>The Network layer:</b> What's Inside a Router?: Input Processing, Switching, Output Processing, Where Does Queuing Occur? Routing control plane, IPv6,A Brief foray into IP Security, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet, Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP, Broadcast Routing Algorithms and Multicast. <b>T1: Chap 4: 4.3-4.7</b> <b>RBT: L1, L2, L3</b>			10

<b>Module 4</b>	
<p>Network Security:Overview of Network Security:Elements of Network Security , Classification of Network Attacks ,Security Methods ,Symmetric-Key Cryptography :Data Encryption Standard (DES),Advanced Encryption Standard (AES) , Public-Key Cryptography :RSA Algorithm ,Diffie-Hellman Key-Exchange Protocol , Authentication :Hash Function , Secure Hash Algorithm (SHA) , Digital Signatures , Firewalls and Packet Filtering ,Packet Filtering , Proxy Server .</p> <p><b>Textbook2: Chapter 10</b>  <b>RBT: L1, L2, L3</b></p>	10
<b>Module 5</b>	
<p>Multimedia Networking: Properties of video, properties of Audio, Types of multimedia Network Applications, Streaming stored video: UDP Streaming, HTTP Streaming, Adaptive streaming and DASH, content distribution Networks</p> <p>Voice-over-IP :Limitations of the Best-Effort IP Service ,Removing Jitter at the Receiver for Audio ,Recovering from Packet Loss Protocols for Real-Time Conversational Applications , RTP , SIP</p> <p><b>Textbook11: Chap 7</b>  <b>RBT: L1, L2, L3</b></p>	10
<b>Course Outcomes:</b> The student will be able to :	
<ul style="list-style-type: none"> <li>• Explain principles of application layer protocols</li> <li>• Recognize transport layer services and infer UDP and TCP protocols</li> <li>• Classify routers, IP and Routing Algorithms in network layer</li> <li>• Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard</li> <li>• Describe Multimedia Networking and Network Management</li> </ul>	
<b>Question Paper Pattern:</b>	
<ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 20 marks</li> <li>• There will be 2 full questions (with a maximum of four sub questions) from each module.</li> <li>• Each full question will have sub questions covering all the topics under a module.</li> <li>• The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>	
<b>Textbooks:</b>	
<ol style="list-style-type: none"> <li>1. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017 .</li> <li>2. Nader F Mir, Computer and Communication Networks, 2<sup>nd</sup> Edition, Pearson, 2014.</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition</li> <li>2. Larry L Peterson and Bruce S Davie, Computer Networks, fifth edition, ELSEVIER</li> <li>3. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson</li> <li>4. Mayank Dave, Computer Networks, Second edition, Cengage Learning</li> </ol>	



<b>DATABASE MANAGEMENT SYSTEM</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – V</b>			
<b>Course Code</b>	<b>18CS53</b>	<b>CIE Marks</b>	40
<b>Number of Contact Hours/Week</b>	3:2:0	<b>SEE Marks</b>	60
<b>Total Number of Contact Hours</b>	50	<b>Exam Hours</b>	03
<b>CREDITS –4</b>			
<b>Course Learning Objectives:</b> This course (18CS53) will enable students to: <ul style="list-style-type: none"> <li>• Provide a strong foundation in database concepts, technology, and practice.</li> <li>• Practice SQL programming through a variety of database problems.</li> <li>• Demonstrate the use of concurrency and transactions in database</li> <li>• Design and build database applications for real world problems.</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>Introduction to Databases:</b> Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. <b>Overview of Database Languages and Architectures:</b> Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. <b>Conceptual Data Modelling using Entities and Relationships:</b> Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples, Specialization and Generalization. <b>Textbook 1:Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 2</b>			
<b>Relational Model:</b> Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. <b>Relational Algebra:</b> Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. <b>Mapping Conceptual Design into a Logical Design:</b> Relational Database Design using ER-to-Relational mapping. <b>SQL:</b> SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL. <b>Textbook 1: Ch4.1 to 4.5, 5.1 to 5.3, 6.1 to 6.5, 8.1; Textbook 2: 3.5</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 3</b>			
<b>SQL : Advances Queries:</b> More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. <b>Database Application Development:</b> Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop. <b>Internet Applications:</b> The three-Tier application architecture, The presentation layer, The Middle Tier <b>Textbook 1: Ch7.1 to 7.4; Textbook 2: 6.1 to 6.6, 7.5 to 7.7.</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 4</b>			
<b>Normalization: Database Design Theory –</b> Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. <b>Normalization Algorithms:</b> Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational			10

<p>Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms</p> <p><b>Textbook 1: Ch14.1 to 14.7, 15.1 to 15.6</b></p> <p><b>RBT: L1, L2, L3</b></p>	
<p><b>Module 5</b></p>	
<p><b>Transaction Processing:</b> Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. <b>Concurrency Control in Databases:</b> Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. <b>Introduction to Database Recovery Protocols:</b> Recovery Concepts, NO-UNDO/REDO recovery based on Deferred update, Recovery techniques based on immediate update, Shadow paging, Database backup and recovery from catastrophic failures</p> <p><b>Textbook 1: 20.1 to 20.6, 21.1 to 21.7, 22.1 to 22.4, 22.7.</b></p> <p><b>RBT: L1, L2, L3</b></p>	10
<p><b>Course Outcomes:</b> The student will be able to :</p>	
<ul style="list-style-type: none"> <li>• Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.</li> <li>• Use Structured Query Language (SQL) for database manipulation.</li> <li>• Design and build simple database systems</li> <li>• Develop application to interact with databases.</li> </ul>	
<p><b>Question Paper Pattern:</b></p>	
<ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 20 marks</li> <li>• There will be 2 full questions (with a maximum of four sub questions) from each module.</li> <li>• Each full question will have sub questions covering all the topics under a module.</li> <li>• The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>	
<p><b>Textbooks:</b></p>	
<ol style="list-style-type: none"> <li>1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.</li> <li>2. Database management systems, Ramakrishnan, and Gehrke, 3<sup>rd</sup> Edition, 2014, McGraw Hill</li> </ol>	
<p><b>Reference Books:</b></p>	
<ol style="list-style-type: none"> <li>1. Silberschatz Korth and Sudharshan, Database System Concepts, 6<sup>th</sup> Edition, Mc-GrawHill, 2013.</li> <li>2. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.</li> </ol>	

**APPLICATION DEVELOPMENT USING PYTHON**

[(Effective from the academic year 2018 -2019)

**SEMESTER – V**

<b>Course Code</b>	<b>18CS55</b>	<b>IA Marks</b>	40
<b>Number of Lecture Hours/Week</b>	03	<b>Exam Marks</b>	60
<b>Total Number of Lecture Hours</b>	40	<b>Exam Hours</b>	03

**CREDITS – 03**

**Course Learning Objectives:**This course (18CS55) will enable students to

- Learn the syntax and semantics of Python programming language.
- Illustrate the process of structuring the data using lists, tuples and dictionaries.
- Demonstrate the use of built-in functions to navigate the file system.
- Implement the Object Oriented Programming concepts in Python.
- Appraise the need for working with various documents like Excel, PDF, Word and Others.

**Module – 1**

**Teaching Hours**

**Python Basics**, Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program,**Flow control**, Boolean Values, Comparison Operators, Boolean Operators,Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules,Ending a Program Early with sys.exit(), **Functions**, def Statements with Parameters, Return Values and return Statements,The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number

08

**Textbook 1: Chapters 1 – 3**

**RBT: L1, L2**

**Module – 2**

**Lists**, The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples,References, **Dictionaries and Structuring Data**, The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things, **Manipulating Strings**, Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup

08

**Textbook 1: Chapters 4 – 6**

**RBT: L1, L2, L3**

**Module – 3**

**Pattern Matching with Regular Expressions**, Finding Patterns of Text Without Regular Expressions, Finding Patterns of Text with Regular Expressions,More Pattern Matching with Regular Expressions, Greedy and Nongreedy Matching, The findall() Method, Character Classes, Making Your Own Character Classes, The Caret and Dollar Sign Characters, The Wildcard Character, Review of Regex Symbols, Case-Insensitive Matching, Substituting Strings with the sub() Method, Managing Complex Regexes, Combining re .IGNORECASE, re .DOTALL, and re .VERBOSE, Project: Phone Number and Email Address Extractor, **Reading and Writing Files**, Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module,Saving Variables with the pprint.pformat() Function, Project: Generating Random Quiz Files, Project: Multiclipboard, **Organizing Files**, The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European-Style Dates,Project: Backing Up a Folder into a ZIP File, **Debugging**, Raising Exceptions, Getting the Traceback as a String, Assertions, Logging, IDLE’s Debugger.

08

**Textbook 1: Chapters 7 – 10**

<b>RBT: L1, L2, L3</b>	
<b>Module – 4</b>	
<p><b>Classes and objects</b>, Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying, <b>Classes and functions</b>, Time, Pure functions, Modifiers, Prototyping versus planning, <b>Classes and methods</b>, Object-oriented features, Printing objects, Another example, A more complicated example, The init method, The <code>__str__</code> method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation, <b>Inheritance</b>, Card objects, Class attributes, Comparing cards, Decks, Printing the deck, Add, remove, shuffle and sort, Inheritance, Class diagrams, Data encapsulation</p> <p><b>Textbook 2: Chapters 15 – 18</b>  <b>RBT: L1, L2, L3</b></p>	08
<b>Module – 5</b>	
<p><b>Web Scraping</b>, Project: MAPIT.PY with the webbrowser Module, Downloading Files from the Web with the requests Module, Saving Downloaded Files to the Hard Drive, HTML, Parsing HTML with the BeautifulSoup Module, Project: “I’m Feeling Lucky” Google Search, Project: Downloading All XKCD Comics, Controlling the Browser with the selenium Module, <b>Working with Excel Spreadsheets</b>, Excel Documents, Installing the openpyxl Module, Reading Excel Documents, Project: Reading Data from a Spreadsheet, Writing Excel Documents, Project: Updating a Spreadsheet, Setting the Font Style of Cells, Font Objects, Formulas, Adjusting Rows and Columns, Charts, <b>Working with PDF and Word Documents</b>, PDF Documents, Project: Combining Select Pages from Many PDFs, Word Documents, <b>Working with CSV files and JSON data</b>, The csv Module, Project: Removing the Header from CSV Files, JSON and APIs, The json Module, Project: Fetching Current Weather Data</p> <p><b>Textbook 1: Chapters 11 – 14</b>  <b>RBT: L1, L2, L3</b></p>	08
<b>Course Outcomes:</b> After studying this course, students will be able to	
<ul style="list-style-type: none"> <li>• Demonstrate proficiency in handling of loops and creation of functions.</li> <li>• Identify the methods to create and manipulate lists, tuples and dictionaries.</li> <li>• Discover the commonly used operations involving regular expressions and file system.</li> <li>• Interpret the concepts of Object-Oriented Programming as used in Python.</li> <li>• Determine the need for scraping websites and working with CSV, JSON and other file formats.</li> </ul>	
<b>Question paper pattern:</b>	
<ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 20 marks</li> <li>• There will be 2 full questions (with a maximum of four sub questions) from each module.</li> <li>• Each full question will have sub questions covering all the topics under a module.</li> <li>• The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Al Sweigart, “<b>Automate the Boring Stuff with Python</b>”, 1<sup>st</sup> Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at <a href="https://automatetheboringstuff.com/">https://automatetheboringstuff.com/</a>) (Chapters 1 to 18)</li> <li>2. Allen B. Downey, “<b>Think Python: How to Think Like a Computer Scientist</b>”, 2<sup>nd</sup> Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at <a href="http://greenteapress.com/thinkpython2/thinkpython2.pdf">http://greenteapress.com/thinkpython2/thinkpython2.pdf</a>) (Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above links)</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Gowrishankar S, Veena A, “<b>Introduction to Python Programming</b>”, 1<sup>st</sup> Edition, CRC Press/Taylor &amp; Francis, 2018. ISBN-13: 978-0815394372</li> </ol>	

2. Jake VanderPlas, **“Python Data Science Handbook: Essential Tools for Working with Data”**, 1<sup>st</sup> Edition, O’Reilly Media, 2016. ISBN-13: 978-1491912058
3. Charles Dierbach, **“Introduction to Computer Science Using Python”**, 1<sup>st</sup> Edition, Wiley India Pvt Ltd, 2015. ISBN-13: 978-8126556014
4. Wesley J Chun, **“Core Python Applications Programming”**, 3<sup>rd</sup> Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365

<b>WEB TECHNOLOGY AND ITS APPLICATIONS</b> (Effective from the academic year 2018 -2019) <b>SEMESTER – VI</b>			
<b>Course Code</b>	<b>18CS63</b>	<b>CIE Marks</b>	40
<b>Number of Contact Hours/Week</b>	3:2:0	<b>SEE Marks</b>	60
<b>Total Number of Contact Hours</b>	50	<b>Exam Hours</b>	03
<b>CREDITS –4</b>			
<b>Course Learning Objectives:</b> This course (18CS63) will enable students to:			
<ul style="list-style-type: none"> <li>• Illustrate the Semantic Structure of HTML and CSS</li> <li>• Compose forms and tables using HTML and CSS</li> <li>• Design Client-Side programs using JavaScript and Server-Side programs using PHP</li> <li>• Infer Object Oriented Programming capabilities of PHP</li> <li>• Examine JavaScript frameworks such as jQuery and Backbone</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
Introduction to HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling. <b>Textbook 1: Ch. 2, 3</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 2</b>			
HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks. <b>Textbook 1: Ch. 4,5</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 3</b>			
JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server’s Responsibilities, Quick Tour of PHP, Program Control, Functions <b>Textbook 1: Ch. 6, 8</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 4</b>			
PHP Arrays and Superglobals, Arrays, \$_GET and \$_POST Superglobal Arrays, \$_SERVER Array, \$_FILES Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling <b>Textbook 1: Ch. 9, 10</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 5</b>			
Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript Pseudo-Classes, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone			10

MVC Frameworks, XML Processing and Web Services, XML Processing, JSON, Overview of Web Services. <b>Textbook 1: Ch. 13, 15,17</b> <b>RBT: L1, L2, L3</b>	
<b>Course Outcomes:</b> The student will be able to :	
<ul style="list-style-type: none"> <li>Adapt HTML and CSS syntax and semantics to build web pages.</li> <li>Construct and visually format tables and forms using HTML and CSS</li> <li>Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.</li> <li>Appraise the principles of object oriented development using PHP</li> <li>Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.</li> </ul>	
<b>Question Paper Pattern:</b>	
<ul style="list-style-type: none"> <li>The question paper will have ten questions.</li> <li>Each full Question consisting of 20 marks</li> <li>There will be 2 full questions (with a maximum of four sub questions) from each module.</li> <li>Each full question will have sub questions covering all the topics under a module.</li> <li>The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>	
<b>Textbooks:</b>	
1. Randy Connolly, Ricardo Hoar, " <b>Fundamentals of Web Development</b> ", 1 <sup>st</sup> Edition, Pearson Education India. (ISBN:978-9332575271)	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>Robin Nixon, "<b>Learning PHP, MySQL &amp; JavaScript with jQuery, CSS and HTML5</b>", 4<sup>th</sup>Edition, O'Reilly Publications, 2015. (ISBN:978-9352130153)</li> <li>Luke Welling, Laura Thomson, "<b>PHP and MySQL Web Development</b>", 5<sup>th</sup> Edition, Pearson Education, 2016. (ISBN:978-9332582736)</li> <li>Nicholas C Zakas, "<b>Professional JavaScript for Web Developers</b>", 3<sup>rd</sup> Edition, Wrox/Wiley India, 2012. (ISBN:978-8126535088)</li> <li>David Sawyer Mcfarland, "<b>JavaScript &amp; jQuery: The Missing Manual</b>", 1<sup>st</sup> Edition, O'Reilly/Shroff Publishers &amp; Distributors Pvt Ltd, 2014</li> </ol>	
<b>Mandatory Note:</b>	
Distribution of CIE Marks is a follows (Total 40 Marks):	
<ul style="list-style-type: none"> <li>20 Marks through IA Tests</li> <li>20 Marks through practical assessmen</li> </ul>	
<b>Maintain a copy of the report for verification during LIC visit.</b>	
<b>Possible list of practicals:</b>	
<ol style="list-style-type: none"> <li>Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.</li> <li>Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.</li> <li>Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt.</li> <li>Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems: <ol style="list-style-type: none"> <li>Parameter: A string</li> <li>Output: The position in the string of the left-most vowel</li> </ol> </li> </ol>	

- c. Parameter: A number
  - d. Output: The number with its digits in the reverse order
5. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Programme, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
6. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
7. Write a PHP program to display a digital clock which displays the current time of the server.
8. Write the PHP programs to do the following:
  - a. Implement simple calculator operations.
  - b. Find the transpose of a matrix.
  - c. Multiplication of two matrices.
  - d. Addition of two matrices.
9. Write a PHP program named states.py that declares a variable states with value "Mississippi Alabama Texas Massachusetts Kansas". write a PHP program that does the following:
  - a. Search for a word in variable states that ends in xas. Store this word in element 0 of a list named statesList.
  - b. Search for a word in states that begins with k and ends in s. Perform a case-insensitive comparison. [Note: Passing re.I as a second parameter to method compile performs a case-insensitive comparison.] Store this word in element1 of statesList.
  - c. Search for a word in states that begins with M and ends in s. Store this word in element 2 of the list.
  - d. Search for a word in states that ends in a. Store this word in element 3 of the list.
10. Write a PHP program to sort the student records which are stored in the database using selection sort.



**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**  
(Effective from the academic year 2018 -2019)  
**SEMESTER – VII**

<b>Course Code</b>	<b>18CS71</b>	<b>CIE Marks</b>	40
<b>Number of Contact Hours/Week</b>	4:0:0	<b>SEE Marks</b>	60
<b>Total Number of Contact Hours</b>	50	<b>Exam Hours</b>	03
<b>CREDITS –4</b>			
<b>Course Learning Objectives:</b> This course (18CS71) will enable students to:			
<ul style="list-style-type: none"> <li>• Explain Artificial Intelligence and Machine Learning</li> <li>• Illustrate AI and ML algorithm and their use in appropriate applications</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
What is artificial intelligence?, Problems, problem spaces and search, Heuristic search techniques <b>Textbook 1: Chapter 1, 2 and 3</b> <b>RBT: L1, L2</b>			10
<b>Module 2</b>			
Knowledge representation issues, Predicate logic, Representaiton knowledge using rules. Concpet Learning: Concept learning task, Concpet learning as search, Find-S algorithm, Candidate Elimination Algorithm, Inductive bias of Candidate Elimination Algorithm. <b>Textbook 1: Chapter 4, 5 and 6</b> <b>Textbook2: Chapter 2 (2.1-2.5, 2.7)</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 3</b>			
Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems, ID3 algorith. Aritifical Nueral Network: Introduction, NN representation, Appropriate problems, Perceptrons, Backpropagation algorithm. <b>Textbook2: Chapter 3 (3.1-3.4), Chapter 4 (4.1-4.5)</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 4</b>			
Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting, MDL principle, Bates optimal classifier, Gibbs algorithm, Navie Bayes classifier, BBN, EM Algorithm <b>Textbook2: Chapter 6</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 5</b>			
Instance-Base Learning: Introduction, k-Nearest Neighbour Learning, Locally weighted regression, Radial basis function, Case-Based reasoning. Reinforcement Learning: Introduction, The learning task, Q-Learning. <b>Textbook 1: Chapter 8 (8.1-8.5), Chapter 13 (13.1 – 13.3)</b> <b>RBT: L1, L2, L3</b>			10
<b>Course Outcomes:</b> The student will be able to :			
<ul style="list-style-type: none"> <li>• Appaise the theory of Artificial intelligence and Machine Learning.</li> <li>• Illustrate the working of AI and ML Algorithms.</li> <li>• Demonstrate the applications of AI and ML.</li> </ul>			
<b>Question Paper Pattern:</b>			
<ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 20 marks</li> </ul>			

- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

**Textbooks:**

1. Tom M Mitchell, "**Machine Learning**", 1<sup>st</sup> Edition, McGraw Hill Education, 2017.
2. Elaine Rich, Kevin K and S B Nair, "**Artificial Intelligence**", 3<sup>rd</sup> Edition, McGraw Hill Education, 2017.

**Reference Books:**

1. Saroj Kaushik, Artificial Intelligence, Cengage learning
2. Stuart Russell, Peter Norving , Artificial Intelligence: A Modern Approach, Pearson Education 2nd Edition
3. Aurélien Geron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, Shroff/O'Reilly Media, 2017.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
5. Ethem Alpaydm, Introduction to machine learning, second edition, MIT press
6. Srinivasa K G and Shreedhar, " Artificial Intelligence and Machine Learning", Cengage

<b>BIG DATA AND ANALYTICS</b> (Effective from the academic year 2018 -2019) <b>SEMESTER – VII</b>			
<b>Course Code</b>	<b>18CS72</b>	<b>CIE Marks</b>	40
<b>Number of Contact Hours/Week</b>	4:0:0	<b>SEE Marks</b>	60
<b>Total Number of Contact Hours</b>	50	<b>Exam Hours</b>	03
<b>CREDITS –4</b>			
<b>Course Learning Objectives:</b> This course (18CS72) will enable students to:			
<ul style="list-style-type: none"> <li>• Understand fundamentals of Big Data analytics</li> <li>• Explore the Hadoop framework and Hadoop Distributed File system</li> <li>• Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data</li> <li>• Employ MapReduce programming model to process the big data</li> <li>• Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis.</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>Introduction to Big Data Analytics:</b> Big Data, Scalability and Parallel Processing, Designing Data Architecture, Data Sources, Quality, Pre-Processing and Storing, Data Storage and Analysis, Big Data Analytics Applications and Case Studies. <b>Text book 1: Chapter 1: 1.2 -1.7</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 2</b>			
<b>Introduction to Hadoop (T1):</b> Introduction, Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and Programming Model, Hadoop Yarn, Hadoop Ecosystem Tools. <b>Hadoop Distributed File System Basics (T2):</b> HDFS Design Features, Components, HDFS User Commands. <b>Essential Hadoop Tools (T2):</b> Using Apache Pig, Hive, Sqoop, Flume, Oozie, HBase. <b>Text book 1: Chapter 2 :2.1-2.6</b> <b>Text Book 2: Chapter 3</b> <b>Text Book 2: Chapter 7 (except walk throughs)</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 3</b>			
<b>NoSQL Big Data Management, MongoDB and Cassandra:</b> Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks, MongoDB, Databases, Cassandra Databases. <b>Text book 1: Chapter 3: 3.1-3.7</b> <b>RBT: L1, L2, L3</b>			10
<b>Module 4</b>			
<b>MapReduce, Hive and Pig:</b> Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hive, HiveQL, Pig. <b>Text book 1: Chapter 4: 4.1-4.6</b> <b>RBT: L1, L2, L3</b>			10

<b>Module 5</b>	
<p><b>Machine Learning Algorithms for Big Data Analytics:</b> Introduction, Estimating the relationships, Outliers, Variances, Probability Distributions, and Correlations, Regression analysis, Finding Similar Items, Similarity of Sets and Collaborative Filtering, Frequent Itemsets and Association Rule Mining.</p> <p><b>Text, Web Content, Link, and Social Network Analytics:</b> Introduction, Text mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and analyzing a Web Graph, Social Network as Graphs and Social Network Analytics:</p> <p><b>Text book 1: Chapter 6: 6.1 to 6.5</b></p> <p><b>Text book 1: Chapter 9: 9.1 to 9.5</b></p>	10
<p><b>Course Outcomes:</b> The student will be able to:</p> <ul style="list-style-type: none"> <li>• Understand fundamentals of Big Data analytics.</li> <li>• Investigate Hadoop framework and Hadoop Distributed File system.</li> <li>• Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.</li> <li>• Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.</li> <li>• Use Machine Learning algorithms for real world big data.</li> <li>• Analyze web contents and Social Networks to provide analytics with relevant visualization tools.</li> </ul>	
<p><b>Question Paper Pattern:</b></p> <ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 20 marks</li> <li>• There will be 2 full questions (with a maximum of four sub questions) from each module.</li> <li>• Each full question will have sub questions covering all the topics under a module.</li> <li>• The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>	
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Raj Kamal and Preeti Saxena, “<b>Big Data Analytics Introduction to Hadoop, Spark, and Machine-Learning</b>”, McGraw Hill Education, 2018 ISBN: 9789353164966, 9353164966</li> <li>2. Douglas Eadline, "<b>Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem</b>", 1<sup>st</sup>Edition, Pearson Education, 2016. ISBN-13: 978-9332570351</li> </ol>	
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Tom White, “<b>Hadoop: The Definitive Guide</b>”, 4<sup>th</sup> Edition, O’Reilly Media, 2015.ISBN-13: 978-9352130672</li> <li>2. Boris Lublinsky, Kevin T Smith, Alexey Yakubovich, "<b>Professional Hadoop Solutions</b>", 1<sup>st</sup>Edition, Wrox Press, 2014ISBN-13: 978-8126551071</li> <li>3. Eric Sammer, "<b>Hadoop Operations: A Guide for Developers and Administrators</b>",1<sup>st</sup>Edition, O’Reilly Media, 2012.ISBN-13: 978-9350239261</li> <li>4. Arshdeep Bahga, Vijay Madiseti, "<b>Big Data Analytics: A Hands-On Approach</b>", 1st Edition, VPT Publications, 2018. ISBN-13: 978-0996025577</li> </ol>	

**PYTHON APPLICATION PROGRAMMING**  
**(OPEN ELECTIVE)**  
**(Effective from the academic year 2018 -2019)**  
**SEMESTER – VI**

<b>Course Code</b>	<b>18CS752</b>	<b>IA Marks</b>	40
<b>Number of Lecture Hours/Week</b>	3:0:0	<b>Exam Marks</b>	60
<b>Total Number of Lecture Hours</b>	40	<b>Exam Hours</b>	03
<b>CREDITS – 03</b>			
<b>Course Learning Objectives:</b> This course (18CS752) will enable students to			
<ul style="list-style-type: none"> <li>• Learn Syntax and Semantics and create Functions in Python.</li> <li>• Handle Strings and Files in Python.</li> <li>• Understand Lists, Dictionaries and Regular expressions in Python.</li> <li>• Implement Object Oriented Programming concepts in Python</li> <li>• Build Web Services and introduction to Network and Database Programming in Python.</li> </ul>			
<b>Module – 1</b>			<b>Teaching Hours</b>
Why should you learn to write programs, Variables, expressions and statements, Conditional execution, Functions <b>Textbook 1: Chapters 1 – 4</b> <b>RBT: L1, L2, L3</b>			08
<b>Module – 2</b>			
Iteration, Strings, Files <b>Textbook 1: Chapters 5– 7</b> <b>RBT: L1, L2, L3</b>			08
<b>Module – 3</b>			
Lists, Dictionaries, Tuples, Regular Expressions <b>Textbook 1: Chapters 8 - 11</b> <b>RBT: L1, L2, L3</b>			08
<b>Module – 4</b>			
Classes and objects, Classes and functions, Classes and methods <b>Textbook 2: Chapters 15 – 17</b> <b>RBT: L1, L2, L3</b>			08
<b>Module – 5</b>			
Networked programs, Using Web Services, Using databases and SQL <b>Textbook 1: Chapters 12– 13, 15</b> <b>RBT: L1, L2, L3</b>			08
<b>Course Outcomes:</b> After studying this course, students will be able to			
<ul style="list-style-type: none"> <li>• Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.</li> <li>• Demonstrate proficiency in handling Strings and File Systems.</li> <li>• Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.</li> <li>• Interpret the concepts of Object-Oriented Programming as used in Python.</li> <li>• Implement exemplary applications related to Network Programming, Web Services and Databases in Python.</li> </ul>			
<b>Question paper pattern:</b>			
<ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 20 marks</li> </ul>			

- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**

1. Charles R. Severance, "**Python for Everybody: Exploring Data Using Python 3**", 1<sup>st</sup> Edition, CreateSpace Independent Publishing Platform, 2016. ([http://do1.dr-chuck.com/pythonlearn/EN\\_us/pythonlearn.pdf](http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf) )
2. Allen B. Downey, "**Think Python: How to Think Like a Computer Scientist**", 2<sup>nd</sup> Edition, Green Tea Press, 2015. (<http://greenteapress.com/thinkpython2/thinkpython2.pdf>) (Download pdf files from the above links)

**Reference Books:**

1. Charles Dierbach, "**Introduction to Computer Science Using Python**", 1<sup>st</sup> Edition, Wiley India Pvt Ltd, 2015. ISBN-13: 978-8126556014
2. Gowrishankar S, Veena A, "**Introduction to Python Programming**", 1<sup>st</sup> Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372
3. Mark Lutz, "**Programming Python**", 4<sup>th</sup> Edition, O'Reilly Media, 2011. ISBN-13: 978-9350232873
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "**Data Structures and Algorithms in Python**", 1<sup>st</sup> Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176
5. Reema Thareja, "**Python Programming Using Problem Solving Approach**", Oxford university press, 2017. ISBN-13: 978-0199480173

<b>INTERNET OF THINGS</b> (Effective from the academic year 2018 -2019) <b>SEMESTER – VIII</b>			
<b>Course Code</b>	<b>18CS81</b>	<b>CIE Marks</b>	40
<b>Number of Contact Hours/Week</b>	3:0:0	<b>SEE Marks</b>	60
<b>Total Number of Contact Hours</b>	40	<b>Exam Hours</b>	03
<b>CREDITS –3</b>			
<b>Course Learning Objectives:</b> This course (18CS81) will enable students to:			
<ul style="list-style-type: none"> <li>• Assess the genesis and impact of IoT applications, architectures in real world.</li> <li>• Illustrate diverse methods of deploying smart objects and connect them to network.</li> <li>• Compare different Application protocols for IoT.</li> <li>• Infer the role of Data Analytics and Security in IoT.</li> <li>• Identifysensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack. <b>Textbook 1: Ch.1, 2</b> <b>RBT: L1, L2, L3</b>			08
<b>Module 2</b>			
Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies. <b>Textbook 1: Ch.3, 4</b> <b>RBT: L1, L2, L3</b>			08
<b>Module 3</b>			
IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods. <b>Textbook 1: Ch.5, 6</b> <b>RBT: L1, L2, L3</b>			08
<b>Module 4</b>			
Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment <b>Textbook 1: Ch.7, 8</b> <b>RBT: L1, L2, L3</b>			08
<b>Module 5</b>			
IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT			08

<p>Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.</p> <p><b>Textbook 1: Ch.12</b></p> <p><b>Textbook 2: Ch.7.1 to 7.4, Ch.8.1 to 8.4, 8.6</b></p> <p><b>RBT: L1, L2, L3</b></p>	
<p><b>Course Outcomes:</b> The student will be able to :</p> <ul style="list-style-type: none"> <li>• Interpret the impact and challenges posed by IoT networks leading to new architectural models.</li> <li>• Compare and contrast the deployment of smart objects and the technologies to connect them to network.</li> <li>• Appraise the role of IoT protocols for efficient network communication.</li> <li>• Elaborate the need for Data Analytics and Security in IoT.</li> <li>• Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.</li> </ul>	
<p><b>Question Paper Pattern:</b></p> <ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 20 marks</li> <li>• There will be 2 full questions (with a maximum of four sub questions) from each module.</li> <li>• Each full question will have sub questions covering all the topics under a module.</li> <li>• The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>	
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "<b>IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things</b>", 1<sup>st</sup>Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)</li> <li>2. Srinivasa K G, "<b>Internet of Things</b>", CENGAGE Learning India, 2017</li> </ol>	
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Vijay Madiseti and ArshdeepBahga, "<b>Internet of Things (A Hands-on-Approach)</b>", 1<sup>st</sup>Edition, VPT, 2014. (ISBN: 978-8173719547)</li> <li>2. Raj Kamal, "<b>Internet of Things: Architecture and Design Principles</b>", 1<sup>st</sup> Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)</li> </ol>	
<p><b>Mandatory Note:</b></p> <p>Distribution of CIE Marks is as follows (Total 40 Marks):</p> <ul style="list-style-type: none"> <li>• 20 Marks through IA Tests</li> <li>• 20 Marks through practical assessment</li> </ul> <p><b>Maintain a copy of the report for verification during LIC visit.</b></p>	
<p><b>Possible list of practicals:</b></p> <ol style="list-style-type: none"> <li>1. Transmit a string using UART</li> <li>2. Point-to-Point communication of two Motes over the radio frequency.</li> <li>3. Multi-point to single point communication of Motes over the radio frequency.LAN (Sub-netting).</li> <li>4. I2C protocol study</li> <li>5. Reading Temperature and Relative Humidity value from the sensor</li> </ol>	