

<b>MANAGING BIG DATA</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2016 -2017)</b> <b>SEMESTER - II</b>			
Subject Code	16LNI422 / <b>16SCE21</b> / 16SCN24 / 16SCS21 / 16SIT41 / 16SSE422	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Define big data for business intelligence</li> <li>• Analyze business case studies for big data analytics</li> <li>• Explain managing of Big data Without SQL</li> <li>• Develop map-reduce analytics using Hadoop and related tools</li> </ul>			
<b>Module -1</b>			<b>Teaching Hours</b>
UNDERSTANDING BIG DATA: What is big data – why big data –.Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System , Grid Computing, Volunteer Computing, convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.			<b>10Hours</b>
<b>Module -2</b>			
NOSQL DATA MANAGEMENT: Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – shading — version – map reduce – partitioning and combining – composing map-reduce calculations.			<b>10 Hours</b>
<b>Module – 3</b>			
BASICS OF HADOOP: Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures.			<b>10 Hours</b>
<b>Module-4</b>			
MAPREDUCE APPLICATIONS: MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats			<b>10 Hours</b>
<b>Module-5</b>			
HADOOP RELATED TOOLS: Hbase – data model and implementations – Hbase clients – Hbase examples –praxis. Cassandra – Cassandra data model – Cassandra examples – Cassandra clients –Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.			<b>10 Hours</b>
<b>Course outcomes:</b>			
The students shall able to: <ul style="list-style-type: none"> <li>• Describe big data and use cases from selected business domains</li> <li>• Explain NoSQL big data management</li> <li>• Install, configure, and run Hadoop and HDFS</li> <li>• Perform map-reduce analytics using Hadoop</li> </ul>			

<ul style="list-style-type: none"> <li>Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics</li> </ul>
<p><b>Question paper pattern:</b>  The question paper will have ten questions.  There will be 2 questions from each module.  Each question will have questions covering all the topics under a module.  The students will have to answer 5 full questions, selecting one full question from each module.</p>
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.</li> <li>Eric Sammer, "Hadoop Operations", O'Reilley, 2012.</li> </ol>
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.</li> <li>E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.</li> <li>Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.</li> <li>Alan Gates, "Programming Pig", O'Reilley, 2011</li> </ol>

<b>WIRELESS NETWORKS AND MOBILE COMPUTING</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2016 -2017)</b> <b>SEMESTER – II</b>			
Subject Code	16SCE22 / 16SCS424	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			
<p><b>Course objectives:</b> This course will enable students to</p> <ul style="list-style-type: none"> <li>Define concepts of wireless communication.</li> <li>Compare and contrast propagation methods, Channel models, capacity calculations multiple antennas and multiple user techniques used in the mobile communication.</li> <li>Explain CDMA, GSM. Mobile IP, Wimax and Different Mobile OS</li> <li>Illustrate various Markup Languages CDC, CLDC, MIDP; Programming for CLDC, MIDlet model and security concerns</li> </ul>			
<b>Module -1</b>			<b>Teaching Hours</b>
Mobile Computing Architecture: Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing. Wireless Networks : Global Systems for Mobile Communication ( GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications, GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS, Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.			10Hours
<b>Module -2</b>			<b>10 Hours</b>
Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6			
<b>Module – 3</b>			<b>10 Hours</b>
Mobile OS and Computing Environment : Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing			

phase, Deployment phase, Development Tools, Device Emulators	
<b>Module-4</b>	
Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.	<b>10 Hours</b>
<b>Module-5</b>	
J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.	<b>10 Hours</b>
<b>Course outcomes:</b>	
The students shall able to: <ul style="list-style-type: none"> <li>• Explain state of art techniques in wireless communication.</li> <li>• Discover CDMA, GSM. Mobile IP, Wimax</li> <li>• Demonstrate program for CLDC, MIDP let model and security concerns</li> </ul>	
<b>Question paper pattern:</b>	
The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Ashok Talukder, Roopa Yavagal, Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2nd Edition, Tata McGraw Hill, 2010.</li> <li>2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley India, 2003</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Raj kamal: Mobile Computing, Oxford University Press, 2007.</li> <li>2. Iti Saha Misra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.</li> </ol>	

<b>MOBILE APPLICATION DEVELOPMENT</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2016 -2017)</b> <b>SEMESTER – II</b>			
Subject Code	16LNI23/ <b>16SCE23</b> 16SCN254 / 16SIT23	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Analyze system requirements for mobile applications.</li> <li>• Apply of mobile development frameworks.</li> <li>• Demonstrate mobile application design.</li> <li>• Demonstrate and implement mobile application.</li> </ul>			
<b>Module -1</b>			<b>Teaching Hours</b>
Introduction to mobile communication and computing: Introduction to mobile computing, Novel applications, limitations and GSM architecture, Mobile services, System architecture, Radio interface, protocols, Handover and security. Smart phone operating systems and smart phones applications.			<b>10 Hours</b>
<b>Module -2</b>			
Fundamentals of Android Development: Introduction to Android., The Android 4.1 Jelly			<b>10 Hours</b>

Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator.	
<b>Module – 3</b>	
The Intent of Android Development, Four kinds of Android Components: Activity, Service, Broadcast Receiver and Content Provider. Building Blocks for Android Application Design, Laying Out Controls in Containers. Graphics and Animation: Drawing graphics in Android, Creating Animation with Android's Graphics API.	<b>10 Hours</b>
<b>Module-4</b>	
Creating the Activity, Working with views: Exploring common views, using a list view, creating custom views, understanding layout. Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments. Multimedia: Playing Audio, Playing Video and Capturing Media. Advanced Android Programming: Internet, Entertainment, and Services.	<b>10 Hours</b>
<b>Module-5</b>	
Displaying web pages and maps, communicating with SMS and emails. Creating and using content providers: Creating and consuming services, publishing android applications	<b>10 Hours</b>
<b>Course outcomes:</b>	
The students should be able to: <ul style="list-style-type: none"> <li>• Describe the requirements for mobile applications</li> <li>• Explain the challenges in mobile application design and development</li> <li>• Develop design for mobile applications for specific requirements</li> <li>• Implement the design using Android SDK</li> <li>• Implement the design using Objective C and iOS</li> <li>• Deploy mobile applications in Android and iPhone marketplace for distribution</li> </ul>	
<b>Question paper pattern:</b>	
The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.	
<b>Text Books:</b>	
1. Mobile Computing: (technologies and Applications-N. N. Jani S chand 2. B.M.Hirwani- Android programming Pearson publications-2013 3. W. Frank Ableson, Robi Sen and C. E. Ortiz - <b>Android in Action</b> , Third Edition-2012 DreamTech Publisher	

<b>MULTI-CORE ARCHITECTURE AND PROGRAMMING</b> [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) <b>SEMESTER - II</b>			
Subject Code	16SCE24 / 16SCN153	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS - 04</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Define technologies of multicore architecture and performance measures</li> <li>• Demonstrate problems related to multiprocessing</li> <li>• Illustrate windows threading, posix threads, openmp programming</li> </ul>			

<ul style="list-style-type: none"> <li>Analyze the common problems in parallel programming</li> </ul>	
<b>Module -1</b>	<b>Teaching Hours</b>
Introduction to Multi-core Architecture Motivation for Concurrency in software, Parallel Computing Platforms, Parallel Computing in Microprocessors, Differentiating Multi-core Architectures from Hyper- Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms Understanding Performance, Amdahl's Law, Growing Returns: Gustafson's Law. System Overview of Threading : Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization.	<b>10 Hours</b>
<b>Module -2</b>	
Fundamental Concepts of Parallel Programming :Designing for Threads, Task Decomposition, Data Decomposition, Data Flow Decomposition, Implications of Different Decompositions, Challenges You'll Face, Parallel Programming Patterns, A Motivating Problem: Error Diffusion, Analysis of the Error Diffusion Algorithm, An Alternate Approach: Parallel Error Diffusion, Other Alternatives. Threading and Parallel Programming Constructs: Synchronization, Critical Sections, Deadlock, Synchronization Primitives, Semaphores, Locks, Condition Variables, Messages, Flow Control- based Concepts, Fence, Barrier, Implementation-dependent Threading Features	<b>10 Hours</b>
<b>Module – 3</b>	
Threading APIs :Threading APIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft. NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking.	<b>10 Hours</b>
<b>Module-4</b>	
OpenMP: A Portable Solution for Threading : Challenges in Threading a Loop, Loop-carried Dependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, Performance-oriented Programming, Using Barrier and No wait, Interleaving Single-thread and Multi-thread Execution, Data Copy-in and Copy-out, Protecting Updates of Shared Variables, Intel Task queuing Extension to OpenMP, OpenMP Library Functions, OpenMP Environment Variables, Compilation, Debugging, performance	<b>10 Hours</b>
<b>Module-5</b>	
Solutions to Common Parallel Programming Problems : Too Many Threads, Data Races, Deadlocks, and Live Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions for Heavily Contended Locks, Non-blocking Algorithms, ABA Problem, Cache Line Ping-ponging, Memory Reclamation Problem, Recommendations, Thread-safe Functions and Libraries, Memory Issues, Bandwidth, Working in the Cache, Memory Contention, Cache-related Issues, False Sharing, Memory Consistency, Current IA-32 Architecture, Itanium Architecture, High-level Languages, Avoiding Pipeline Stalls on IA-32,Data Organization for High Performance.	<b>10 Hours</b>
<b>Course outcomes:</b>	
The students shall able to: <ul style="list-style-type: none"> <li>Identify the limitations of ILP and the need for multicore architectures</li> <li>Define fundamental concepts of parallel programming and its design issues</li> <li>Solve the issues related to multiprocessing and suggest solutions</li> <li>Make out the salient features of different multicore architectures and how they exploit parallelism</li> <li>Demonstrate the role of OpenMP and programming concept</li> </ul>	
<b>Question paper pattern:</b>	

The question paper will have ten questions.  
 There will be 2 questions from each module.  
 Each question will have 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. Multicore Programming , Increased Performance through Software Multi-threading by Shameem Akhter and Jason Roberts , Intel Press , 2006

**Reference Books:** NIL

**DATA MINING & DATA WAREHOUSING**  
**[As per Choice Based Credit System (CBCS) scheme]**  
**(Effective from the academic year 2016 -2017)**  
**SEMESTER – II**

Subject Code	<b>16SCE251</b> /16SSE251/16SIT24	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

**CREDITS – 03**

**Course objectives:** This course will enable students to

- Define Data warehousing Architecture and Implementation
- Explain Data mining principles and techniques and Introduce DM as a cutting edge business intelligence
- Interpret association rule mining for handling large data
- Classification for the retrieval purposes
- Explain clustering techniques in details for better organization and retrieval of data

**Module -1**

**Teaching Hours**

Introduction and Data Preprocessing :Why data mining, What is data mining, What kinds of data can be mined, What kinds of patterns can be mined, Which Technologies Are used, Which kinds of Applications are targeted, Major issues in data mining .Data Preprocessing: An overview, Data cleaning, Data integration, Data reduction, Data transformation and data discretization.

**8 Hours**

**Module -2**

Data warehousing and online analytical processing: Data warehousing: Basic concepts, Data warehouse modeling: Data cube and OLAP, Data warehouse design and usage, Data warehouse implementation, Data generalization by attribute-oriented induction,

**8 Hours**

**Module – 3**

Classification: Basic Concepts: Basic Concepts, Decision tree induction, Bays Classification Methods, Rule-Based classification, Model evaluation and selection, Techniques to improve classification accuracy

**8 Hours**

**Module-4**

Cluster Analysis: Basic concepts and methods: Cluster Analysis, Partitioning methods, Hierarchical Methods, Density-based methods, Grid-Based Methods, Evaluation of clustering.

**8 Hours**

**Module-5**

Data mining trends and research frontiers: Mining complex data types, other methodologies of data mining, Data mining applications, Data Mining and society.

**8 Hours**

**Course outcomes:**

The students shall able to:

- Demonstrate Storing voluminous data for online processing, Preprocess the data for mining applications
- Apply the association rules for mining the data

<ul style="list-style-type: none"> <li>• Design and deploy appropriate classification techniques</li> <li>• Cluster the high dimensional data for better organization of the data</li> <li>• Discover the knowledge imbibed in the high dimensional system</li> </ul>
<p><b>Question paper pattern:</b>  The question paper will have ten questions.  There will be 2 questions from each module.  Each question will have questions covering all the topics under a module.  The students will have to answer 5 full questions, selecting one full question from each module.</p>
<p><b>Text Books:</b>  1. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining Concepts and Techniques, ELSEVIER(MK) 3<sup>rd</sup> edition 2012.</p>
<p><b>Reference Books:</b> NIL</p>

<b>PATTERN RECOGNITION</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2016 -2017)</b> <b>SEMESTER - II</b>			
Subject Code	16SCE252/ 16SCS252	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03			
<p><b>Course objectives:</b> This course will enable students to</p> <ul style="list-style-type: none"> <li>• Explain various Image processing and Pattern recognition techniques.</li> <li>• Illustrate mathematical morphology necessary for Pattern recognition.</li> <li>• Demonstrate Image Representation and description and feature extraction.</li> <li>• Explain principles of decision trees and clustering in pattern recognition.</li> </ul>			
<b>Module -1</b>			<b>Teaching Hours</b>
Introduction: Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems			<b>8 Hours</b>
<b>Module -2</b>			
Representation: Data structures for PR, Representation of clusters, proximity measures, size of patterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation			<b>8 Hours</b>
<b>Module – 3</b>			
Nearest Neighbor based classifiers & Bayes classifier: Nearest neighbor algorithm, variants of NN algorithms, use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Bayessian belief network			<b>8 Hours</b>
<b>Module-4</b>			
Naive Bayes classifier, Bayessian belief network, Decision Trees: Introduction, DT for PR, Construction of DT, Splitting at the nodes, Over fitting & Pruning, Examples, Hidden Markov models: Markov models for classification, Hidden Markov models and classification using HMM			<b>8 Hours</b>
<b>Module-5</b>			
Clustering: Hierarchical (Agglomerative, single/complete/average linkage, wards, Partitional (Forgy’s, k-means, Isodata), clustering large data sets, examples, An application: Handwritten Digit recognition			<b>8 Hours</b>
<b>Course outcomes:</b>			
The students shall able to:			

<ul style="list-style-type: none"> <li>• Explain pattern recognition principals</li> <li>• Develop algorithms for Pattern Recognition.</li> <li>• Develop and analyze decision tree.</li> <li>• Design the nearest neighbor classifier.</li> <li>• Apply Decision tree and clustering techniques to various applications</li> </ul>
<p><b>Question paper pattern:</b>  The question paper will have ten questions.  There will be 2 questions from each module.  Each question will have questions covering all the topics under a module.  The students will have to answer 5 full questions, selecting one full question from each module.</p>
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Pattern Recognition ( An Introduction) , V Susheela Devi, M Narsimha Murthy, 2011 Universities Press, ISBN 978-81-7371-725-3</li> <li>2. Pattern Recognition &amp; Image Analysis, Earl Gose, Richard Johnsonbaugh, Steve Jost. PH ISBN-81-203-1484-0, 1996.</li> </ol>
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000.</li> </ol>

<p><b>INTERNET OF THINGS</b>  <b>[As per Choice Based Credit System (CBCS) scheme]</b>  <b>(Effective from the academic year 2016 -2017)</b>  <b>SEMESTER – II</b></p>			
Subject Code	16LNI253 /16SCE253 /16SCN151 /16SCS24 /16SIT251 /16SSE421	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS – 03</b>			
<p><b>Course objectives:</b> This course will enable students to</p> <ul style="list-style-type: none"> <li>• Define and explain basic issues, policy and challenges in the IoT</li> <li>• Illustrate Mechanism and Key Technologies in IoT</li> <li>• Explain the Standard of the IoT</li> <li>• Explain resources in the IoT and deploy of resources into business</li> <li>• Demonstrate data analytics for IoT</li> </ul>			
<b>Module -1</b>			<b>Teaching Hours</b>
<p>What is The Internet of Things? Overview and Motivations, Examples of Applications, IPV6 Role, Areas of Development and Standardization, Scope of the Present Investigation. Internet of Things Definitions and frameworks-IoT Definitions, IoT Frameworks, Basic Nodal Capabilities. Internet of Things Application Examples- Overview, Smart Metering/Advanced Metering Infrastructure-Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking, Over-The-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications.</p>			<b>8 Hours</b>
<b>Module -2</b>			
<p>Fundamental IoT Mechanism and Key Technologies-Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies. Evolving IoT Standards- Overview and Approaches, IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol, Representational State Transfer, ETSI M2M, Third Generation Partnership Project Service Requirements for Machine-Type Communications, CENELEC, IETF IPv6 Over Lowpower WPAN, Zigbee IP(ZIP), IPSO</p>			<b>8 Hours</b>
<b>Module – 3</b>			
<p>Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M, Layer 3</p>			<b>8 Hours</b>



Connectivity :IPv6 Technologies for the IoT:Overview and Motivations.Address Capabilities,IPv6 Protocol Overview, IPv6 Tunneling, IPsec in IPv6,Header Compression Schemes,Quality of Service in IPv6, Migration Strategies to IPv6.	
<b>Module-4</b>	
Case Studies illustrating IoT Design-Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.	<b>8 Hours</b>
<b>Module-5</b>	
Data Analytics for IoT – Introduction, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study.	<b>8 Hours</b>
<b>Course outcomes:</b>	
At the end of this course the students will be able to: <ul style="list-style-type: none"> <li>• Develop schemes for the applications of IOT in real time scenarios</li> <li>• Manage the Internet resources</li> <li>• Model the Internet of things to business</li> <li>• Understand the practical knowledge through different case studies</li> <li>• Understand data sets received through IoT devices and tools used for analysis</li> </ul>	
<b>Question paper pattern:</b>	
The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications", Wiley, 2013.</li> <li>2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands on Approach" Universities Press., 2015</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Michael Miller," The Internet of Things", First Edition, Pearson, 2015.</li> <li>2. Claire Rowland,Elizabeth Goodman et.al.," Designing Connected Products", First Edition,O'Reilly, 2015.</li> </ol>	

<b>NATURAL LANGUAGE PROCESSING AND TEXT MINING</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2016 -2017)</b> <b>SEMESTER – II</b>			
Subject Code	<b>16SCE254</b>	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS – 03</b>			
<b>Course objectives:</b> This course will enable students to The student should be able to: <ul style="list-style-type: none"> <li>• Learn the techniques in natural language processing.</li> <li>• Be familiar with the natural language generation.</li> <li>• Be exposed to Text Mining.</li> <li>• Analyze the information retrieval techniques</li> </ul>			
<b>Module -1</b>			<b>Teaching Hours</b>
<b>OVERVIEW AND LANGUAGE MODELING:</b> Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications- Information Retrieval. Language Modeling: Various Grammar- based Language Models- Statistical Language Model.			<b>8 Hours</b>
<b>Module -2</b>			
<b>WORD LEVEL AND SYNTACTIC ANALYSIS:</b> Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction- Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.			<b>8 Hours</b>
<b>Module - 3</b>			
<b>Extracting Relations from Text: From Word Sequences to Dependency Paths:</b> Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation. Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations. A Case Study in Natural Language Based Web Search: InFact System Overview, The GlobalSecurity.org Experience.			<b>8 Hours</b>
<b>Module-4</b>			
<b>Evaluating Self-Explanations in iSTART: Word Matching, Latent Semantic Analysis, and Topic Models:</b> Introduction, iSTART: Feedback Systems, iSTART: Evaluation of Feedback Systems, Textual Signatures: Identifying Text-Types Using Latent Semantic Analysis to Measure the Cohesion of Text Structures: Introduction, Cohesion, Coh-Matrix, Approaches to Analyzing Texts, Latent Semantic Analysis, Predictions, Results of Experiments. Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modeling: Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results. Evolving Explanatory Novel Patterns for Semantically-Based Text Mining: Related Work, A Semantically Guided Model for Effective TextMining.			<b>8 Hours</b>
<b>Module-5</b>			
<b>INFORMATION RETRIEVAL AND LEXICAL RESOURCES:</b> Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net-Stemmers-POS Tagger- Research Corpora.			<b>8 Hours</b>
<b>Course outcomes:</b> Upon completion of the course, the student should be able to:			

- Analyze the natural language text.
- Generate the natural language.
- Demonstrate Text mining.
- Apply information retrieval techniques.

**Question paper pattern:**

The question paper will have ten questions.

There will be 2 questions from each module.

Each question will have 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. Tanveer Siddiqui, U.S. Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.
2. Anne Kao and Stephen R. Poteet (Eds), “Natural Language Processing and Text Mining”, Springer-Verlag London Limited 2007.

**Reference Books:**

1. Daniel Jurafsky and James H Martin, “Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, 2nd Edition, Prentice Hall, 2008.
2. James Allen, “Natural Language Understanding”, 2nd edition, Benjamin/Cummings publishing company, 1995.
3. Gerald J. Kowalski and Mark.T. Maybury, “Information Storage and Retrieval systems”, Kluwer academic Publishers, 2000.
4. Steven Bird, Ewan Klein, Edward Loper, “Natural Language Processing with Python,” Publisher: O’Reilly Media, June 2009
5. Christopher D.Manning and Hinrich Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press, 1999.

<b>MINIPROJECT</b> [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) <b>SEMESTER – II</b>			
Laboratory Code	16LNI26/ 16SCE26 / 16SCN26 /16SCS26 /16SFC26 / 16SIT26 / 16SSE26	IA Marks	20
Number of Lecture Hours/Week	03 hours of lab	Exam Marks	80
Total Number of Lecture Hours	-----	Exam Hours	03
<b>CREDITS – 02</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Enable the student to design, develop and analyze an application development</li> </ul>			
The student will carry out a mini project relevant to the course. The project must be development of an application (Hardware/Software). It is preferable if the project is based on mobile application development.			
<b>Course outcomes:</b>			
<ul style="list-style-type: none"> <li>• Design, develop and to analyze an application development.</li> <li>• Prepare report of the project.</li> </ul>			
<b>Conduction of Practical Examination:</b>			
The student shall prepare the report by including:			
<ol style="list-style-type: none"> <li>1. Define project ( Problem Definition)</li> </ol>			

2. Prepare requirements document
  - a. Statement of work
  - b. Functional requirements
  - c. Software / Hardware requirements
3. Develop use cases
4. Research, analyze and evaluate existing learning materials on the application
5. Develop user interface and implement code
6. Prepare for final demo

**Evaluation:**

Evaluation shall be taken up at the end of the semester. Project work evaluation and viva-voce examination shall be conducted. Internal evaluation shall be carried by the Guide and Head of the department for 20 marks. Final examination which includes demonstration of the project and viva-voce shall be conducted for 80 Marks viz report + Outputs of the project + presentation = 30+30+20 = 80 marks.

<b>SEMINAR</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2016 -2017)</b> <b>SEMESTER – II</b>			
Subject Code	16SCE27 / 16SCN27 / 16LNI27 / 16SIT27 / 16SSE27 / 16SCS27 / 16SFC27	IA Marks	100
Number of Lecture Hours/Week	----	Exam Marks	-
Total Number of Lecture Hours	----	Exam Hours	-
<b>CREDITS – 01</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Motivate the students to read technical article</li> <li>• Discover recent technology developments</li> </ul>			
<b>Descriptions</b>			
The students should read a recent technical article (try to narrow down the topic as much as possible) from any of the leading reputed and refereed journals like: <ol style="list-style-type: none"> <li>1. IEEE Transactions, journals, magazines, etc.</li> <li>2. ACM Transactions, journals, magazines, SIG series, etc.</li> <li>3. Springer</li> <li>4. Elsevier publications etc</li> </ol> In the area of (to name few and not limited to) <ul style="list-style-type: none"> <li>• Web Technology</li> <li>• Cloud Computing</li> <li>• Artificial Intelligent</li> <li>• Networking</li> <li>• Security</li> <li>• Data mining</li> </ul>			
<b>Course Outcomes</b>			
The students should be able to: <ul style="list-style-type: none"> <li>• Conduct survey on recent technologies</li> <li>• Infer and interpret the information from the survey conducted</li> <li>• Motivated towards research</li> </ul>			
<b>Conduction:</b>			
The students have to present at least ONE technical seminar on the selected topic and submit a report for internal evaluation.			

**Marks Distribution: Literature Survey + Presentation (PPT) + Report + Question & Answer + Paper: 20 + 30 + 30 + 20 (100).**

**ARM PROCESSORS**  
**[As per Choice Based Credit System (CBCS) scheme]**  
**(Effective from the academic year 2016 -2017)**  
**SEMESTER - IV**

Subject Code	<b>16SCE41</b>	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

**CREDITS - 04**

**Course objectives:** This course will enable students to

- Describe the programmer's model of ARM processor and create and test assembly level programming.
- Analyze various types of coprocessors and design suitable co-processor interface to ARM processor.
- Analyze floating point processor architecture and its architectural support for higher level language.
- Become aware of the Thumb mode of operation of ARM.
- Identify the architectural support of ARM for operating system and analyze the function of memory Management unit of ARM.

**Module -1**

**Teaching Hours**

An Introduction to Processor Design: Processor architecture and organization. Abstraction in hardware design. A simple processor. Instruction set design. Processor design trade-offs. The Reduced Instruction Set Computer. Design for low power consumption. The ARM Architecture: The Acorn RISC Machine. Architectural inheritance. The ARM programmer's model. ARM development tools.

**10Hours**

**Module -2**

ARM Assembly Language Programming: Data processing instructions. Data transfer instructions. Control flow instructions. Writing simple assembly language programs. ARM Organization and Implementation: 3-stage pipeline ARM organization. 5-stage pipeline ARM organization. ARM instruction execution. ARM implementation. The ARM coprocessor interface.

**10 Hours**

**Module - 3**

The ARM Instruction Set: Introduction. Exceptions. Conditional execution. Branch and Branch with Link (B, BL) Branch, Branch with Link and exchange instructions (BX, BLX). Software Interrupt (SWI). Data processing instructions. Multiply instructions. Count leading zeros (CLZ - architecture v5T only). Single word and unsigned byte data transfer instructions. Half-word and signed byte data transfer instructions. Multiple register transfer instructions. Swap memory and register instructions (SWP). Status register to general register transfer instructions . General register to status register transfer instructions. Coprocessor instructions. Coprocessor data operations . Coprocessor data transfers. Coprocessor register transfers. Breakpoint instruction (BRK - architecture v5T only). Unused instruction space. Memory faults. ARM architecture variants. Architectural Support for High-Level Languages: Abstraction in software design. Data types. Floating-point data types. The ARM floating-point architecture. Expressions . Conditional statements. Loops. Functions and procedures. Use of memory. Run-time environment.

**10 Hours**

**Module-4**

The Thumb Instruction Set: The Thumb bit in the CPSR .The Thumb programmer's model. Thumb branch instructions. Thumb software interrupts instruction. Thumb data processing instructions. Thumb single register data transfer instructions. Thumb multiple register data transfer instructions. Thumb breakpoint instruction. Thumb implementation. Thumb applications. Architectural Support for System Development: The ARM memory

**10 Hours**

interface. The Advanced Microcontroller Bus Architecture (AMBA). The ARM reference peripheral specification. Hardware system prototyping tools. The JTAG boundary scan test architecture. The ARM debug architecture. Embedded Trace. Signal processing support.	
<b>Module-5</b>	
ARM Processor Cores: ARM7TDMI. ARM8. ARM9TDMI.ARM10TDMI Memory Hierarchy: Memory size and speed. On-chip memory. Memory management. Architectural Support for Operating Systems. An introduction to operating systems. The ARM system control coprocessor. CP15 protection unit registers. ARM protection unit. CP15 MMU registers. ARM MMU architecture. Synchronization. Context switching. Input / Output.	<b>10 Hours</b>
<b>Course outcomes:</b>	
The students shall able to: <ul style="list-style-type: none"> <li>• Categorize the hardware and software issues related to the design of a Microcontroller based system catering to the needs of medium and higher end applications.</li> <li>• Explain the architecture and programming of the 32-bit ARM Cortex Processors</li> <li>• Demonstrate thumb instruction sets</li> <li>• Design and develop ARM specific applications</li> </ul>	
<b>Question paper pattern:</b>	
The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.	
<b>Text Books:</b>	
1. Steve Furber: <i>ARM System on Chip Architecture</i> by S.B Fuber 2 <sup>nd</sup> Edition, Pearson 2013.	
<b>Reference Books:</b>	
1. Joseph Yiu: <i>The definitive guide to ARM Cortex M3 M4 processors</i> , Elsevier Newnes 3 <sup>rd</sup> edition 2014	

<b>WIRELESS AD-HOC NETWORKS</b> [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) <b>SEMESTER - IV</b>			
Subject Code	16LNI251 / 16SCE421 / 16SCN11	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS – 03</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Explain fundamental principles of Ad-hoc Networks</li> <li>• Discuss a comprehensive understanding of Ad-hoc network protocols</li> <li>• Outline current and emerging trends in Ad-hoc Wireless Networks.</li> <li>• Analyze energy management in ad-hoc wireless networks.</li> </ul>			
<b>Module -1</b>			<b>Teaching Hours</b>
Ad-hoc Wireless Networks Introduction, Issues in Ad-hoc Wireless Networks, Ad-hoc Wireless Internet; MAC Protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a MAC Protocol, Design Goals of MAC Protocols, Classification of MAC protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based Protocols with Scheduling Mechanisms, MAC Protocols that Use Directional Antennas.			<b>8 Hours</b>
<b>Module -2</b>			

Routing Protocols for Ad-hoc Wireless Networks Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks; Classification of Routing Protocols; Table Driven Routing Protocols; On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols and Power-Aware Routing Protocols.	<b>8 Hours</b>
<b>Module – 3</b>	
Multicast Routing in Ad-hoc Wireless Networks Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols and Mesh-Based Multicast Routing Protocols.	<b>8 Hours</b>
<b>Module-4</b>	
Transport Layer and Security Protocols for Ad-hoc Networks: Introduction, Issues in Designing a Transport Layer Protocol; Design Goals of a Transport Layer Protocol; Classification of Transport Layer Solutions; TCP over Transport Layer Solutions; Other Transport Layer Protocols for Ad-hoc Networks; Security in Ad-hoc Wireless Networks, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management and Secure Touting Ad-hoc Wireless Networks.	<b>8 Hours</b>
<b>Module-5</b>	
Quality of Service and Energy Management in Ad-hoc Wireless Networks: Introduction, Issues and Challenges in Providing QoS in Ad-hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions; Energy Management in Ad-hoc Wireless Networks: Introduction, Need for Energy Management in Ad-hoc Wireless Networks, Classification of Energy Management Schemes, Battery Management Schemes, Transmission Management Schemes, System Power Management Schemes.	<b>8 Hours</b>
<b>Course outcomes:</b>	
The students shall able to: <ul style="list-style-type: none"> <li>• Design their own wireless network</li> <li>• Evaluate the existing network and improve its quality of service</li> <li>• Choose appropriate protocol for various applications</li> <li>• Examine security measures present at different level</li> <li>• Analyze energy consumption and management</li> </ul>	
<b>Question paper pattern:</b>	
The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.	
<b>Text Books:</b>	
1. C. Siva Ram Murthy & B. S. Manoj: Ad-hoc Wireless Networks, 2 <sup>nd</sup> Edition, Pearson Education, 2011	
<b>Reference Books:</b>	
1. Ozan K. Tonguz and Gianguigi Ferrari: Ad-hoc Wireless Networks, John Wiley, 2007. 2. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du: Ad-hoc Wireless Networking, Kluwer Academic Publishers, 2004. 3. C.K. Toh: Ad-hoc Mobile Wireless Networks- Protocols and Systems, Pearson Education, 2002	

<b>DECISION SUPPORT SYSTEMS</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2016 -2017)</b> <b>SEMESTER - IV</b>			
Subject Code	<b>16SCE422</b>	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS – 03</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Explain the fundamentals of decision making and problem solving, mathematical modeling.</li> <li>• Utilize an electronic spreadsheet as a mathematical model.</li> <li>• How artificial intelligence emerged as a computer application, and its main areas.</li> <li>• Define four basic parts of an expert system.</li> <li>• what a group decision support system (GDSS) is and the different environmental settings that can be used</li> </ul>			
<b>Module -1</b>			<b>Teaching Hours</b>
Introduction to decision support systems: DSS Defined, History of decision support systems, Ingredients of a DSS, Data and model management, DSS Knowledge base, User interfaces, The DSS user, Categories and classes of DSSs, Chapter Summary. Decision makers: who are they, Decision styles, Decision effectiveness, How can a DSS help?, A Typology of decisions, Decision theory and simon’s model of problem solving, Bounded decision making, The process of choice, Cognitive processes, Biases and heuristics in decision making, Chapter summary.			<b>8 Hours</b>
<b>Module -2</b>			
Decisions in the organization: Understanding the organization, Organizational culture. Modeling decision processes: Defining the problem and its structures, Decision models, Types of probability, Techniques for forecasting probabilities, Calibration and sensitivity, Chapter summary			<b>8 Hours</b>
<b>Module – 3</b>			
Group decision support and groupware technologies: Group Decision making, the problem with groups, MDM support technologies, Managing MDM activities, the virtual workspace, chapter summary. Executive information systems: What exactly is an EIS, Some EIS history, Why area top executives so different?, EIS components, Making the EIS work, The future of executive decision making and the EIS, chapter summary			<b>8 Hours</b>
<b>Module-4</b>			
Designing and building decision support systems: Strategies for DSS analysis and design, The DSS developer, DSS user interface issues, chapter summary. Implementing and integrating decision support systems: DSS implementation, System evaluation, The importance of integration, chapter summary.			<b>8 Hours</b>
<b>Module-5</b>			
Creative decision making and problem solving What is creativity?, Creativity defined, The occurrence of creativity, Creative problem solving techniques, Creativity and the role of technology, chapter summary.			<b>8 Hours</b>
<b>Course outcomes:</b>			
The students shall able to: <ul style="list-style-type: none"> <li>• Recognize the relationship between business information needs and decision making</li> <li>• Appraise the general nature and range of decision support systems</li> <li>• Appraise issues related to the development of DSS</li> <li>• Select appropriate modeling techniques</li> </ul>			



<ul style="list-style-type: none"> <li>Analyze, design and implement a DSS</li> </ul>
<p><b>Question paper pattern:</b>  The question paper will have ten questions.  There will be 2 questions from each module.  Each question will have questions covering all the topics under a module.  The students will have to answer 5 full questions, selecting one full question from each module.</p>
<p><b>Text Books:</b>  1. George M.Marakas: DECISION SUPPORT SYSTEM, PHI.2011.</p>
<p><b>Reference Books:</b> NIL</p>

<p align="center"><b>CYBER SECURITY AND CYBER LAW</b>  [As per Choice Based Credit System (CBCS) scheme]  (Effective from the academic year 2016 -2017)  <b>SEMESTER -IV</b></p>			
Subject Code	16LNI421 / 16SIT253 / <b>16SCE423</b>	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
<p align="center"><b>CREDITS – 03</b></p>			
<p><b>Course objectives:</b> This course will enable students to</p> <ul style="list-style-type: none"> <li>Define the area of cybercrime and forensics.</li> <li>Explain the motive and causes for cybercrime , detection and handling.</li> <li>Investigate Areas affected by cybercrime.</li> <li>Illustrate tools used in cyber forensic</li> <li>Infer legal Perspectives in cyber security</li> </ul>			
<b>Module -1</b>			<b>Teaching Hours</b>
Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens. Cyberoffenses: How Criminals Plan Them: How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.			<b>8 Hours</b>
<b>Module -2</b>			<b>Teaching Hours</b>
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops			<b>8 Hours</b>
<b>Module – 3</b>			<b>Teaching Hours</b>
Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).			<b>8 Hours</b>
<b>Module-4</b>			

Understanding Computer Forensics: Introduction, Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics.	<b>8 Hours</b>
<b>Module-5</b>	
Introduction to Security Policies and Cyber Laws: Need for An Information Security Policy, Information Security Standards – Iso, Introducing Various Security Policies and Their Review Process, Introduction to Indian Cyber Law, Objective and Scope of the it Act, 2000, Intellectual Property Issues, Overview of Intellectual - Property - Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License.	<b>8 Hours</b>
<b>Course outcomes:</b>	
By the end of this course the student acquire	
<ul style="list-style-type: none"> <li>• Define cyber security, cyber law and their roles</li> <li>• Demonstrate cyber security cybercrime and forensics.</li> <li>• Infer legal issues in cybercrime,</li> <li>• Demonstrate tools and methods used in cybercrime and security.</li> <li>• Illustrate evidence collection and legal challenges</li> </ul>	
<p>Question paper pattern:  The question paper will have ten questions.  There will be 2 questions from each module.  Each question will have questions covering all the topics under a module.  The students will have to answer 5 full questions, selecting one full question from each module.</p>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Sunit Belapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives”, Wiley India Pvt Ltd, ISBN: 978-81-265-21791, Publish Date 2013</li> <li>2. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla, KLSI. “Introduction to information security and cyber laws”. Dreamtech Press. ISBN: 9789351194736, 2015</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Thomas J. Mowbray, “Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions”, Copyright © 2014 by John Wiley &amp; Sons, Inc, ISBN: 978 -1-118 - 84965 -1</li> <li>2. James Graham, Ryan Olson, Rick Howard, “Cyber Security Essentials”, CRC Press, 15-Dec-2010</li> </ol>	

<b>ENTERPRISE APPLICATION PROGRAMMING</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2016 -2017)</b> <b>SEMESTER – IV</b>			
Subject Code	16SIT11 / <b>16SCE424</b> / 16SSE22	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS – 03</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Explain Web Application Development and related terminologies</li> <li>• Demonstrate persistent framework and other ORM tools.</li> <li>• Illustrate solutions using Design Patterns</li> <li>• Outline latest WEB frameworks</li> </ul>			
<b>Module 1</b>			<b>Teaching Hours</b>
<b>Web application and java EE 6:</b> Exploring the HTTP Protocol, Introducing web applications, describing web containers, exploring web architecture models, exploring the MVC architecture. <b>Working with servlets 3.0</b> Exploring the features of java servlet, Exploring new features in servlet 3.0, Exploring the servlet API, explaining the servlet life cycle, creating a sample servlet, creating a servlet by using annotation, working with servlet config and servlet context objects, working with the HTTP servlet request and HTTP servlet response interfaces, Exploring request delegation and request scope, implementing servlet collaboration.			<b>8 Hours</b>
<b>Module 2</b>			
<b>Handling sessions in servlet 3.0:</b> Describing a session, introducing session tracking, Exploring the session tracking, mechanisms, using the java servlet API for session tracking, creating login application using session tracking. <b>Implementing event handling</b> Introducing events, Introducing event handling, working with the servlet events, developing the online shop web application. <b>Working with java server pages:</b> Introducing JSP technology, Exploring new features of JSP2.1, listing advantages of JSP over java servlet, Exploring the architecture of a JSP page, Describing the life cycle of a JSP page, working with JSP basic tags and implicit objects, working with the action tags in JSP, exploring the JSP unified EL, using functions with EL.			<b>8 Hours</b>
<b>Module 3</b>			
<b>Implementing JSP tag extensions:</b> Exploring the elements of tag extensions, Working with classic tag handlers, Exploring the tag extensions, Working with simple tag handlers. <b>Implementing java server pages standard tag library 1.2:</b> Introducing JSTL, Exploring the tag libraries JSTL, working with the core tag library. <b>Implementing filters:</b> Exploring the need of filters, exploring the working of filters, exploring filters API, configuring a filter, creating a web application using filters, using initializing parameter in filters.			<b>8 Hours</b>
<b>Module 4</b>			
<b>Persistence Management and Design Patterns: Implementing java persistence using hibernate</b> Introducing hibernate, exploring the architecture of hibernate, downloading hibernate, exploring HQL, understanding hibernate O/R mapping, working with hibernate, Implementing O/R mapping with hibernate. <b>Java EE design patterns:</b> Describing the java EE application architecture, Introducing a design patterns, discussing the role of design patterns, exploring types of patterns.			<b>8 Hours</b>
<b>Module 5</b>			
<b>Web Frameworks: Working with struts 2</b> Introducing struts 2, understanding actions in struts 2. <b>Working with java server faces 2.0:</b> Introducing JSF, Explaining the			<b>8 Hours</b>

<p>features of JSF, Exploring the JSF architecture, describing JSF elements, Exploring the JSF request processing life cycle. <b>Working with spring 3.0:</b> Introducing features of the spring framework, exploring the spring framework architecture, exploring dependency injection &amp; inversion of control, exploring AOP with spring, managing transactions. <b>Securing java EE 6 applications:</b> Introducing security in java EE 6, exploring security mechanisms, implementing security on an application server.</p>	
<p><b>Course Outcomes</b></p>	
<p>The students should be able to:</p> <ul style="list-style-type: none"> <li>• Explain WEB basics and their functionalities</li> <li>• Develop JAVA support and API skills</li> <li>• Build a WEB application.</li> <li>• Build Security mechanisms</li> </ul>	
<p><b>Question paper pattern:</b>  The question paper will have ten questions.  There will be 2 questions from each module.  Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.</p>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Kogent learning solution: JAVA SERVER PROGRAMMING JAVA EE6(J2EE 1.6), Dreamtech press 2014</li> </ol>	
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. NIL</li> </ol>	