

WEB SERVICES [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – II			
Subject Code	16SCS254 / 16SSE154 / 16LNI252 / 16SIT21	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			
<ul style="list-style-type: none"> • Define and explain Web Services. • Summarize WSDL Web Services. • Analyze Web service Architecture. • Explain Building Blocks of Web services. 			
Module 1			Teaching Hours
Middleware: Understanding the middle ware, RPC and Related Middle ware, TP Monitors, Object Brokers, Message-Oriented Middleware.			10 Hours
Module 2			
Web Services: Web Services Technologies, Web Services Architecture.			10 Hours
Module 3			
Basic Web Services Technology: WSDL Web Services Description Language, UDDI Universal Description Discovery and Integration, Web Services at work interactions between the Specifications, Related Standards.			10 Hours
Module 4			
Service Coordination Protocols: Infrastructure for Coordination Protocols, WS-Coordination, WS-Transaction, Rosetta Net and Other Standards Related to Coordination Protocols.			10 Hours
Module 5			
Service Composition: Basic of Service Composition, A New Chance of Success for Composition, Services Composition Models, Dependencies between Coordination and Composition, BPEL: Business Process Execution Language for Web Services, Outlook, Applicability of the Web Services, Web services as a Problem and a Solution : AN Example.			10 Hours
Course Outcomes			
The students should be able to:			
<ul style="list-style-type: none"> • Bind and unbind services in UDDI. • Develop WSDL document • Implement web service client to call public service. • Implement a service and exposing it as public service. 			
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. Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju: Web Services(Concepts ,Architectures and Applications), Springer International Edition 2009.			
Reference Books:			
NIL			

CLOUD COMPUTING [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – II			
Subject Code	16SCS12/16SCE12 16SIT22/16SSE254 16SCN22/16LNI151	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			
<ul style="list-style-type: none"> • Define and Cloud, models and Services. • Compare and contrast programming for cloud and their applications • Explain virtualization, Task Scheduling algorithms. • Apply ZooKeeper, Map-Reduce concept to applications. 			
Module 1			Teaching Hours
Introduction, Cloud Infrastructure: Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing. Exercises and problems.			10 Hours
Module 2			
Cloud Computing: Application Paradigms.: Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The Gre The Web application, Cloud for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing.			10 Hours
Module 3			
Cloud Resource Virtualization: Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based paravirtualization, Optimization of network virtualization, vBlades, Performance comparison of virtual machines, The dark side of virtualization, Exercises and problems			10 Hours
Module 4			
Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling MapReduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems.			10 Hours
Module 5			
Cloud Security, Cloud Application Development: Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2,			10 Hours

How to launch an EC2 Linux instance and connect to it, How to use S3 in java, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Cloud based optimal FPGA synthesis .Exercises and problems.	
Course Outcomes	
The students should be able to: <ul style="list-style-type: none"> • Compare the strengths and limitations of cloud computing • Identify the architecture, infrastructure and delivery models of cloud computing • Apply suitable virtualization concept. • Choose the appropriate cloud player • Address the core issues of cloud computing such as security, privacy and interoperability • Design Cloud Services • Set a private cloud 	
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. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013.	
Reference Books: 1. Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014. 2. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013.	

MOBILE APPLICATION DEVELOPMENT [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – II			
Subject Code	16LNI23/ 16SCE23 16SCN254 / 16SIT23	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			
Course objectives: This course will enable students to <ul style="list-style-type: none"> • Analyze system requirements for mobile applications. • Apply of mobile development frameworks. • Demonstrate mobile application design. • Demonstrate and implement mobile application. 			
Module -1			Teaching Hours
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.			10 Hours
Module -2			
Fundamentals of Android Development: Introduction to Android., The Android 4.1 Jelly Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text			10 Hours

View Control, Using the Android Emulator.	
Module – 3	
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.	10 Hours
Module-4	
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.	10 Hours
Module-5	
Displaying web pages and maps, communicating with SMS and emails. Creating and using content providers: Creating and consuming services, publishing android applications	10 Hours
Course outcomes:	
The students should be able to: <ul style="list-style-type: none"> • Describe the requirements for mobile applications • Explain the challenges in mobile application design and development • Develop design for mobile applications for specific requirements • Implement the design using Android SDK • Implement the design using Objective C and iOS • Deploy mobile applications in Android and iPone marketplace for distribution 	
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. 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 - Android in Action , Third Edition-2012 DreamTech Publisher	

DATA MINING & DATA WAREHOUSING [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – II			
Subject Code	16SCE251 /16SSE251/16SIT24	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 <ul style="list-style-type: none"> • Define Data warehousing Architecture and Implementation • Explain Data mining principles and techniques and Introduce DM as a cutting edge business intelligence 			

<ul style="list-style-type: none"> • 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.	10Hours
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,	10 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	10 Hours
Module-4	
Cluster Analysis: Basic concepts and methods: Cluster Analysis, Partitioning methods, Hierarchical Methods, Density-based methods, Grid-Based Methods, Evaluation of clustering.	10 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.	10 Hours
Course outcomes:	
The students shall able to: <ul style="list-style-type: none"> • Demonstrate Storing voluminous data for online processing, Preprocess the data for mining applications • Apply the association rules for mining the data • Design and deploy appropriate classification techniques • Cluster the high dimensional data for better organization of the data • Discover the knowledge imbibed in the high dimensional system 	
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. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining Concepts and Techniques, ELSEVIER(MK) 3 rd edition 2012.	
Reference Books: NIL	

INTERNET OF THINGS [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – II			
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
CREDITS – 03			
Course objectives: This course will enable students to			
<ul style="list-style-type: none"> • Define and explain basic issues, policy and challenges in the IoT • Illustrate Mechanism and Key Technologies in IoT • Explain the Standard of the IoT • Explain resources in the IoT and deploy of resources into business • Demonstrate data analytics for IoT 			
Module -1			Teaching Hours
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.			8 Hours
Module -2			
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			8 Hours
Module – 3			
Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M, Layer 3 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.			8 Hours
Module-4			
Case Studies illustrating IoT Design-Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.			8 Hours
Module-5			
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.			8 Hours
Course outcomes:			
At the end of this course the students will be able to:			
<ul style="list-style-type: none"> • Develop schemes for the applications of IOT in real time scenarios • Manage the Internet resources • Model the Internet of things to business • Understand the practical knowledge through different case studies • Understand data sets received through IoT devices and tools used for analysis 			
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. Daniel Minoli, "Building the Internet of Things with IPV6 and MIPV6: The Evolving World of M2M Communications", Wiley, 2013.			

2. Arshdeep Bahga, Vijay Madiseti, "Internet of Things: A Hands on Approach" Universities Press., 2015

Reference Books:

1. Michael Miller," The Internet of Things", First Edition, Pearson, 2015.
2. Claire Rowland,Elizabeth Goodman et.al.," Designing Connected Products", First Edition,O'Reilly, 2015.

SOCIAL NETWORK ANALYSIS [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – II			
Subject Code	16SCN152 / 16SIT252/	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			
<ul style="list-style-type: none"> • The learning objective of the course Social Network Analysis is to discuss essential knowledge of network analysis applicable to real world data, with examples from today's most popular social networks. 			
Module 1			Teaching Hours
Introduction to social network analysis and Descriptive network analysis: Introduction to new science of networks. Networks examples. Graph theory basics. Statistical network properties. Degree distribution, clustering coefficient. Frequent patterns. Network motifs. Cliques and k-cores.			8 Hours
Module 2			
Network structure, Node centralities and ranking on network: Nodes and edges, network diameter and average path length. Node centrality metrics: degree, closeness and betweenness centrality. Eigenvector centrality and PageRank. Algorithm HITS.			8 Hours
Module 3			
Network communities and Affiliation networks: Networks communities. Graph partitioning and cut metrics. Edge betweenness. Modularity clustering. Affiliation network and bipartite graphs. 1-mode projections. Recommendation systems.			8 Hours
Module 4			
Information and influence propagation on networks and Network visualization: Social Diffusion. Basic cascade model. Influence maximization. Most influential nodes in network. Network visualization and graph layouts. Graph sampling. Low - dimensional projections			8 Hours
Module 5			
Social media mining and SNA in real world: FB/VK and Twitter analysis: Natural language processing and sentiment mining. Properties of large social networks: friends, connections, likes, re-tweets.			8 Hours
Course Outcomes			
The students should be able to:			
<ul style="list-style-type: none"> • Define notation and terminology used in network science. • Demonstrate, summarize and compare networks. • Explain basic principles behind network analysis algorithms. • Analyzing real world network. 			
Question paper pattern:			
The question paper will have ten questions.			

<p>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>Text Books:</p> <ol style="list-style-type: none"> 1. David Easley and John Kleinberg. "Networks, Crowds, and Markets: Reasoning About a Highly Connected World." Cambridge University Press 2010. 2. Eric Kolaczyk, Gabor Csardi. "Statistical Analysis of Network Data with R (Use R!)". Springer, 2014. 3. Stanley Wasserman and Katherine Faust. "Social Network Analysis. Methods and Applications." Cambridge University Press, 1994.
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. NIL

<p>CYBER SECURITY AND CYBER LAW [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER –II</p>			
Subject Code	16LNI421 / 16SIT253 / 16SCE423	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03			
<p>Course objectives: This course will enable students to</p> <ul style="list-style-type: none"> • Define the area of cybercrime and forensics. • Explain the motive and causes for cybercrime , detection and handling. • Investigate Areas affected by cybercrime. • Illustrate tools used in cyber forensic • Infer legal Perspectives in cyber security 			
Module -1			Teaching Hours
<p>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.</p>			8 Hours
Module -2			
<p>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</p>			8 Hours
Module – 3			
<p>Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan</p>			8 Hours

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).	
Module-4	
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.	8 Hours
Module-5	
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.	8 Hours
Course outcomes:	
By the end of this course the student acquire	
<ul style="list-style-type: none"> • Define cyber security, cyber law and their roles • Demonstrate cyber security cybercrime and forensics. • Infer legal issues in cybercrime, • Demonstrate tools and methods used in cybercrime and security. • Illustrate evidence collection and legal challenges 	
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:	
<ol style="list-style-type: none"> 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 2. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla, KLSI. “Introduction to information security and cyber laws”. Dreamtech Press. ISBN: 9789351194736, 2015 	
Reference Books:	
<ol style="list-style-type: none"> 1. Thomas J. Mowbray, “Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions”, Copyright © 2014 by John Wiley & Sons, Inc, ISBN: 978 -1-118 - 84965 -1 2. James Graham, Ryan Olson, Rick Howard, “Cyber Security Essentials”, CRC Press, 15-Dec-2010 	

BIOINFORMATICS			
[As per Choice Based Credit System (CBCS) scheme]			
(Effective from the academic year 2016 -2017)			
SEMESTER - II			
Subject Code	16LNI424 / 16SIT254	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			
<ul style="list-style-type: none"> • Explain domain of bioinformatics • Illustrate role of data warehousing and data mining for bioinformatics • Compare model bioinformatics based applications • Demonstrate how to deploy the pattern matching and visualization techniques in bioinformatics • Define the Microarray technologies for genome expression 			
Module -1			Teaching Hours
INTRODUCTION : Need for Bioinformatics technologies – Overview of Bioinformatics technologies – Structural bioinformatics – Data format and processing – secondary resources- Applications – Role of Structural bioinformatics - Biological Data Integration System.			8 Hours
Module -2			
DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS: Bioinformatics data – Data ware housing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture- Applications in bioinformatics.			8 Hours
Module – 3			
MODELING FOR BIOINFORMATICS : Hidden markov modeling for biological data analysis Sequence identification – Sequence classification – multiple alignment generation – Comparative modeling – Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks - Molecular modeling – Computer programs for molecular modeling.			8 Hours
Module-4			
PATTERN MATCHING AND VISUALIZATION: Gene regulation – motif recognition and motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.			8 Hours
Module-5			
MICROARRAY ANALYSIS: Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding, spot extraction, normalization, filtering – cluster analysis – gene network analysis			8 Hours
Course outcomes:			
The students should be able to:			
<ul style="list-style-type: none"> • Deploy the data warehousing and data mining techniques in Bioinformatics • Model bioinformatics based applications • Deploy the pattern matching and visualization techniques in bioinformatics • Work on the protein sequences • Use the Microarray technologies for genome expression . 			
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. Yi-Ping Phoebe Chen (Ed), “Bio Informatics Technologies”, Springer Verlag, 2014.			
Reference books : NIL			

MINIPROJECT [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – II			
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
CREDITS – 02			
Course objectives: This course will enable students to <ul style="list-style-type: none"> • Enable the student to design, develop and analyze an application development 			
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.			
Course outcomes: <ul style="list-style-type: none"> • Design, develop and to analyze an application development. • Prepare report of the project. 			
Conduction of Practical Examination: The student shall prepare the report by including: <ol style="list-style-type: none"> 1. Define project (Problem Definition) 2. Prepare requirements document <ol style="list-style-type: none"> 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.			

SEMINAR [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – II			
Subject Code	16SCE27 / 16SCN27 / 16LNI27 / 16SIT27 / 16SSE27 / 16SCS27 /	IA Marks	100

	16SFC27		
Number of Lecture Hours/Week	----	Exam Marks	-
Total Number of Lecture Hours	----	Exam Hours	-
CREDITS – 01			
Course objectives: This course will enable students to			
<ul style="list-style-type: none"> • Motivate the students to read technical article • Discover recent technology developments 			
Descriptions			
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"> 1. IEEE Transactions, journals, magazines, etc. 2. ACM Transactions, journals, magazines, SIG series, etc. 3. Springer 4. Elsevier publications etc 			
In the area of (to name few and not limited to)			
<ul style="list-style-type: none"> • Web Technology • Cloud Computing • Artificial Intelligent • Networking • Security • Data mining 			
Course Outcomes			
The students should be able to:			
<ul style="list-style-type: none"> • Conduct survey on recent technologies • Infer and interpret the information from the survey conducted • Motivated towards research 			
Conduction:			
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).			

MANAGING BIG DATA [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER - IV			
Subject Code	16LNI422 / 16SCE21 / 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
CREDITS – 04			
Course objectives: This course will enable students to			
<ul style="list-style-type: none"> • Define big data for business intelligence • Analyze business case studies for big data analytics • Explain managing of Big data Without SQL • Develop map-reduce analytics using Hadoop and related tools 			
Module -1			Teaching Hours
UNDERSTANDING BIG DATA: What is big data – why big data –.Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System ,			10Hours

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.	
Module -2	
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.	10 Hours
Module – 3	
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.	10 Hours
Module-4	
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	10 Hours
Module-5	
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.	10 Hours
Course outcomes:	
The students shall able to: <ul style="list-style-type: none"> • Describe big data and use cases from selected business domains • Explain NoSQL big data management • Install, configure, and run Hadoop and HDFS • Perform map-reduce analytics using Hadoop • Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics 	
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:	
<ol style="list-style-type: none"> 1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012. 2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012. 	
Reference Books:	
<ol style="list-style-type: none"> 1. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013. 2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012. 3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011. 4. Alan Gates, "Programming Pig", O'Reilley, 2011 	

BUSINESS INTELLIGENCE AND ITS APPLICATIONS [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – IV			
Subject Code	16SIT421 / 16SCS422	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			
<ul style="list-style-type: none"> • Evaluate the key elements of a successful business intelligence (BI) program • Apply a BI meta model that turns outcomes into actions • Extract and transform data from an operational data to a data business data • Evaluate business analytics and performance measurement tools 			
Module -1			Teaching Hours
Development Steps, BI Definitions, BI Decision Support Initiatives, Development Approaches, Parallel Development Tracks, BI Project Team Structure, Business Justification, Business Divers, Business Analysis Issues, Cost – Benefit Analysis, Risk Assessment, Business Case Assessment Activities, Roles Involved In These Activities, Risks Of Not Performing Step, Hardware, Middleware, DBMS Platform, Non Technical Infrastructure Evaluation			8 Hours
Module -2			
Managing The BI Project, Defining And Planning The BI Project, Project Planning Activities, Roles And Risks Involved In These Activities, General Business Requirement, Project Specific Requirements, Interviewing Process			8 Hours
Module – 3			
Differences in Database Design Philosophies, Logical Database Design, Physical Database Design, Activities, Roles And Risks Involved In These Activities, Incremental Rollout, Security Management, Database Backup And Recovery			8 Hours
Module-4			
Growth Management, Application Release Concept, Post Implementation Reviews, Release Evaluation Activities, The Information Asset and Data Valuation, Actionable Knowledge – ROI, BI Applications, The Intelligence Dashboard			8 Hours
Module-5			
Business View of Information technology Applications: Business Enterprise excellence, Key purpose of using IT, Type of digital data, basics f enterprise reporting, BI road ahead.			8 Hours
Course outcomes:			
Upon completion of the course, the students will be able to			
<ul style="list-style-type: none"> • Explain the complete life cycle of BI/Analytical development • Illustrate technology and processes associated with Business Intelligence framework • Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal. 			
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. Larissa T Moss and ShakuAtre – Business Intelligence Roadmap : The Complete Project Lifecycle for Decision Support Applications, Addison Wesley Information Technology Series, 2003.
2. R N Prasad, SeemaAcharya – Fundamentals of Business Analytics , Wiley India, 2011.

Reference Books:

1. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann, ISBN 1-55860-196-4.
2. Brian Larson - Delivering Business Intelligence with Microsoft SQL Server 2005, McGraw Hill, 2006.
3. Lynn Langit - Foundations of SQL Server 2008 Business Intelligence –Apress, ISBN13: 978-1-4302-3324-4, 2011

ADVANCES IN COMPUTER GRAPHICS

[As per Choice Based Credit System (CBCS) scheme]

(Effective from the academic year 2016 -2017)

SEMESTER – IV

Subject Code	16SCS154 /16SIT422	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

- Explain basic and fundamental computer graphics techniques.
- Compare and contrast image synthesis techniques.
- Examine applications of modeling, design and visualization.
- Discuss different color modeling and computer animation.
- Explain hierarchical modeling and graphing file formats.

Module 1**Teaching Hours**

Three-Dimensional Object Representations: Polyhedra, OpenGL Polyhedron Functions, Curved Surfaces, Quadric Surfaces, Super quadrics, OpenGL Quadric-Surface and Cubic-Surface Functions, Blobby Objects, Spline Representations, Cubic-Spline Interpolation Methods, Bezier Spline Curves, Bazier Surfaces B-Spline Curves, B-Spline Surfaces, Beta- Splines, Retional Splines, Conversion Between Spline Representations, Displaying Spline Curves and rfaces, OpenGL Approximation-Spline Functions, Sweep Representations, Constructive Solid –Geometry Method, Octrees, BSP T rees, Fractal-Geometry Methods, Shape Grammars and Others Procedural Methods, Particle Systems, Physically Based Modeling, Visualization Of Data Sets.

8 Hours**Module 2**

Visible-Surface Detection Methods: Classification Of Visible –Surface Detection Algorithms, Back-Face Method, Depth-Buffer Method, A-Buffer Method, Scan-Line Method, BSP-Tree Method, Area-Subdivision Method, Octree Methods, Ray-Casting Method, Comparison of Visibility –Detection Methods, Curved Surfaces, Wire-Frame Visibility –De tectction Functions

8 Hours**Module 3**

Illumination Models and Surface- Rendering Methods: Light Sources, Surface Lighting Effects, Basic Illumination Models, Transparent Surfaces, Atmospheric Effects, Shadows, Camera parameters, Displaying light intensities, Halftone patterns anddithering techniques, polygon rendering methods, ray-tracing methods, Radiosity lighting model, Environment mapping, Photon mapping, Adding surface details, Modeling surface details with polygons, Texture mapping, Bump mapping, OpenGL

8 Hours

illumination and surface-rendering functions, OpenGL texture functions.	
Module 4	
Color models, color applications and Computer animation: Properties of light, Color models, Standard primaries and the chromaticity diagram, The RGB color model, The YIQ and related color models, The CMY and CMYK color models, The HSV color model, The HLS color model, Color Selection and applications. Raster methods for computer animation, Design of animations sequences, Traditional animation techniques, General computer-animation functions, Computer-animation languages, Key-frame systems, Motion specification, Articulated figure animation, Periodic motions, OpenGL animation procedures.	8 Hours
Module 5	
Hierarchical modeling and Graphics file formats: Basic modeling concepts, Modeling packages, General hierarchical modeling methods, Hierarchical modeling using OpenGL display list, Image-File configurations, Color-reduction methods, File-compression techniques, Composition of the major file formats.	8 Hours
Course Outcomes	
The students should be able to: <ul style="list-style-type: none"> • Discuss and implement images and objects using 3D representation and OpenGL methodologies. • Design and develop surface detection using various detection methods. • Choose various illumination models for provides effective standards of objects. • Design of develop effective computer animations. 	
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: <ol style="list-style-type: none"> 1. Computer Graphics with OpenGL-Hearn Baker 4th edition, Pearson publication.2010. 2. James D Foley,Andries van dam,Steven K Feiner,John F Hughes, Computer graphics, Pearson Education 3rd edition, 2013. 	
Reference Books: <ol style="list-style-type: none"> 1. Edward Angel: Interactive Computer graphics a top-down approach with OpenGL, Addison Wesley, 6th edition 2012. 2. Advanced graphics programming using OpenGL: Tom Mc Reynolds-David Blythe. Elsevier.MK, 2005. 	

WEB ENGINEERING [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER - IV			
Subject Code	16SIT423	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 <ul style="list-style-type: none"> • Demonstrate modeling and requirements of a web application. • Develop technology-Aware Web Application. • Illustrate the web application development Process. 			

<ul style="list-style-type: none"> Analyze the performances of web applications 	
Module -1	Teaching Hours
Introduction: Motivation, Categories of web applications, Characteristics of web applications. Requirements Engineering: Introduction, Fundamentals, RE specifics in web engineering, Principles of RE for web applications, Adapting RE methods to web application development, Outlook. Modeling Web Application: Introduction, Fundamentals, Modeling specifics in web engineering, Modeling requirements, Content modeling, Hypertext modeling, Presentation modeling, Customization modeling, Methods and tools, Outlook.	8 Hours
Module -2	
Web Application Architectures: Introduction, Fundamentals, Specifics of web application architectures, Components of a generic web application architecture, Layered architectures, Data-aspect architectures. Technology-Aware Web Application Design: Introduction, Web design from an evolutionary perspective, Presentation design, Interaction design, Functional design, Outlook. Technologies for Web Applications: Introduction, Fundamentals, Client/Server communication on the web, Client side technologies, Document-specific technologies, Server-side technologies, Outlook.	8 Hours
Module – 3	
Testing Web Applications: Introduction, Fundamentals, Testing specifics in web engineering, Test approaches, Test scheme, Test methods and techniques, Test automation, Outlook. Operation and Maintenance of Web Applications: Introduction, Challenges following the launch of a web application, Content management, Usage analysis, Outlook. Web Project Management: From software project management to web project management, Challenges in web project management, Managing web teams, Managing the development process of a web application, Outlook.	8 Hours
Module-4	
The Web Application Development Process: Motivation, Fundamentals, Requirements for a web application development process, Analysis of the rational unified process, Analysis of extreme programming, Outlook. Usability of Web Applications: Motivation, What is usability? What characterizes the usability of web applications? Design guidelines, Web usability engineering methods, Web usability engineering trends, Outlook.	8 Hours
Module-5	
Performance of Web Applications: Introduction, What is performance? What characterizes performance of web applications, System definition and indicators, Characterizing the work load, Analytical techniques, Representing and interpreting results, Performance optimization methods, Outlook. Security for web Applications: Introduction, Aspects of security, Encryption, digital signatures, and certificates, Secure Client/Server interaction, Client security issues, Service provider security issues, Outlook. The Semantic Web: Fundamentals of the semantic web, Technological concepts, Specifics of semantic web applications, Tools, Outlook.	8 Hours
Course outcomes:	
Students will be able to <ul style="list-style-type: none"> Ability to Model the requirements of a web application. Contrast technology-aware Web Application. Ability to analyze the performances of web applications 	
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. Gerti Kappel, Birgit Proll, Siegfried Reich, Werner Retschitzgeer (Editors): Web Engineering, Wiley India, 2007.

Reference Books:

1. Roger Pressman, David Lowe: Web Engineering: A Practitioner's Approach, McGraw Hill, 2008.

MACHINE LEARNING TECHNIQUES [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER - IV			
Subject Code	16SCS41/16SIT424	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 <ul style="list-style-type: none"> • Explain basic concepts of learning and decision trees. • Compare and contrast neural networks and genetic algorithms • Apply the Bayesian techniques and instant based learning • Examine analytical learning and reinforced learning 			
Module -1			Teaching Hours
INTRODUCTION, CONCEPT LEARNING AND DECISION TREES Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search			8 Hours
Module -2			
NEURAL NETWORKS AND GENETIC ALGORITHMS: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.			8 Hours
Module - 3			
BAYESIAN AND COMPUTATIONAL LEARNING Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier– Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model.			8 Hours
Module-4			
INSTANT BASED LEARNING AND LEARNING SET OF RULES: K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions –Case-Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution			8 Hours
Module-5			
ANALYTICAL LEARNING AND REINFORCED LEARNING: Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning			8 Hours
Course outcomes:			
On Completion of the course, the students will be able to			

- Choose the learning techniques with this basic knowledge.
- Apply effectively neural networks and genetic algorithms for appropriate applications.
- Apply bayesian techniques and derive effectively learning rules.
- Choose and differentiate reinforcement and analytical learning 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. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (INDIAN EDITION), 2013.

Reference Books:

1. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Ed., PHI Learning Pvt. Ltd., 2013.
2. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 1st edition, 2001.