

**CURRICULUM
FOR THE ACADEMIC YEAR 2020-2021**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
FOR
B.E. VIII SEMESTER**



For the academic year 2020-2021

**POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING
(An autonomous college under VTU)
KALABURAGI**

About the institution:The Hyderabad Karnataka Education (HKE) society founded by Late Shri Mahadevappa Rampure, a great visionary and educationist. The HKE Society runs 46 educational institutions. Poojya Doddappa Appa College of Engineering, Gulbarga is the first institution established by the society in 1958. The college is celebrating its golden jubilee year, setting new standards in the field of education and achieving greater heights. The college was started with 50% central assistance and 50% state assistance, and a desire to impart quality technical education to this part of Karnataka State. The initial intake was 120 with degree offered in three branches of engineering viz, Civil, Mechanical and Electrical Engineering. Now, it houses 11 undergraduate courses, 10 post Graduate courses and 12 Research centers, established in Civil Engg., Electronics & Communication Engg, Industrial & Production Engg, Mechanical Engg, Electrical Engg., Ceramic Cement Tech., Information Science & Engg., Instrumentation Technology, Automobile Engg., Computer Sc. and Engg., Mathematics and Chemistry All the courses are affiliated to Visveswaraya Technological University, Belgaum. At present the total intake at UG level is 980 and PG level 193.

The college receives grant in aid funds from state government. A number of projects have been approved by MHRD /AICTE, Govt. of India for modernization of laboratories. KSCST, Govt. of Karnataka is providing financial assistance regularly for the student's projects.

The National Board of Accreditation, New Delhi, has accredited the College in the year 2005-08 for 09 UG Courses out of which 08 courses are accredited for three years and 01 course is accredited for five years. And second time accredited for Six Course in the year 2009-2012

Our college is one among the 14 colleges selected under TEQIP, sponsored by World Bank. It has received a grant of Rs 10.454 Crores under this scheme for its development. The institution is selected for TEQIP phase II in year 2011 for four years. Institution is receiving a grant of Rs 12.50 Crores under TEQIP Phase -II scheme for its development and selected for TEQIP-III as mentoring Institute for BIET Jhansi(UP).

Recognizing the excellent facilities, faculty, progressive outlook, high academic standards and record performance, the VTU Belgaum reposed abundant confidence in the capabilities of the College and the College was conferred Autonomous Status from the academic year 2007-08, to update its own programme and curriculum, to devise and conduct examinations, and to evaluate student's performance based on a system of continuous assessment. The academic programmers are designed and updated by a Board of Studies at the department level and Academic Council at the college level. These statutory bodies are constituted as per the guidelines of the VTU Belgaum. A separate examination section headed by a Controller of Examinations conducts the examinations.

At present the college has acquired the Academic autonomous status for both PG and UG courses from the academic year 2007-08 and it is one among the six colleges in the state of Karnataka to have autonomous status for both UG and PG courses.

One of the unique features of our college is, it is the first college in Karnataka State to start the Electronics and Communication Engineering branch way back in the year 1967, to join NIT Surathkal and IISc, Bangalore. Also, it is the only college in the state and one among the three colleges across the country, offering a course in Ceramic and Cement Technology. This is the outcome of understanding by faculty and management about the basic need of this region, keeping in view of the available raw material and existing Cement Industries.

Bharatiya Vidya Bhavan National Award for an Engineering College having Best Overall Performance for the year 2017 by ISTE(Indian Society for Technical Education). In the year 2000, the college was awarded as Best College of the year by KSCST, Bangalore in the state level students projects exhibition.

The college campus is spread over 71 acres of land on either side of Mumbai-Chennai railway track and has a sprawling complex with gardens and greenery all around.

About the department: The Computer Science and Engineering department was started in the year 1984 with an intake of 40 students for UG. The department has seen phenomenal growth and now the department has increased UG intake to 120 students and offering two Post Graduation programmes : PG (Computer Science and Engineering with an intake of 25 students) and PG(Computer Network and Engineering with an intake of 18 students). The department is offering research program under its recognized research center. The department is having state-of-the-art computing facilities with high speed internet facilities and laboratories. The department library provides useful resources like books and journals. The department has well qualified and experienced teaching faculty. The department has been conducting several faculty development programs and student training programs.

Vision of the institution:

- To be recognised as premier institute in the field of technical for its contributions towards national development and society.

Mission of the institution:

- Teaching: To provide a high quality educational experience for students with value and ethics that enables them to become leaders in their chosen profession.
- Research: To create , explore and develop innovations in engineering and science through research and development activities.
- Service: To provide beneficial service to the national and multinational industries and communities through educational, technical and professional activities.

Department Vision

To Become Pioneer in Computer Education and Research and to prepare highly competent IT professionals of International Repute.

Department Mission

M1: To Emphasise on fundamental knowledge in Computer science and Engineering and deliver high quality professional education.

M2: To Promote research in cutting edge technology to adopt ever-changing industry requirements.

M3: To inculcate professional behaviour with ethical values and leadership abilities.

Program Educational Objectives (PEOs) are

PEO1: To enable the graduates to acquire strong foundation in mathematics, science and engineering disciplines.

PEO2: To prepare for successful career in software industry or related fields and contribute to the profession with ethical responsibility.

PEO3: To involve in research and engage in sustained learning and adapt to ever changing technological and societal requirements.

PEO4: Engage in multidisciplinary projects leading to entrepreneurship.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigation of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for, sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Demonstrate understanding of the principles and working of the hardware and software aspects of Computer systems and manage storage of voluminous data.
2. Ability to apply mathematical methodologies to solve computation task. Model real world problem using appropriate data structures and suitable algorithms and evolving trends in computer communication. Ability to understand the structure and development methodologies of software systems.
3. Possess professional skills and knowledge of software design process ethically, leadership quality, learn cutting edge technologies to identify open research issues by critical thinking and cooperative learning. Familiarity and practical competence with a broad range of programming languages and open source platforms.

PDA COLLEGE OF ENGINEERING, KALABURAGI
Autonomous College under VTU

SCHEME OF TEACHING FOR VIII SEMESTER 2020-2021

B.E. (COMPUTER SCIENCE AND ENGINEERING)

Code No.	Course	Hours/Week				Maximum Marks		
		Lecture	Tutorial	Practical	Credits	CIE	SEE	Total
SEMESTER VIII								
THEORY								
16HU81	Entrepreneurship Management and Finance	3	0	0	3	50	50	100
16CS8OE	Open Elective	3	0	0	3	50	50	100
16CS83	Seminar	0	0	1	1	50	--	50
16CS84	Project Phase-II Lab	0	0	2	18	50	50	100
16CSRNP	NPTL	0	0	0	1	--	--	--
	Total	6	0	3	26	200	150	350

OPEN ELECTIVE :

1 Android Programming 16CS8OE

VIII SEMESTER

Course Title: ENTREPRENEURSHIP, MANAGEMENT AND FINANCE		
Subject Code: 16CS81	Credits : 3	CIE: 50
Number of Lecture Hours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites:		
Course Objectives: <ul style="list-style-type: none"> To understand the fundamentals of storage centric and server centric systems To understand the metrics used for Designing storage area networks To understand the RAID concepts To enable the students to understand how data centre's maintain the data with the concepts of backup mainly remote mirroring concepts for both simple and complex systems. To understand domains of storage security along with covering security. 		
Modules		Teaching Hours
Module - I		
ENTREPRENEUR : Meaning of Entrepreneur; Functions of an Entrepreneur; Characteristics of an entrepreneur , Types of Entrepreneur; Intrapreneurs – an emerging class ; Role of Entrepreneurs in economic development; Barriers to entrepreneurship, Government Support for Innovation and Entrepreneurship in India - Startup-India, Make-in-India, PMMY, AIM , STEP, BIRAC, Stand-up India, TREAD.		08 Hrs
Module – II		
MANAGEMENT: Introduction – Meaning – nature and characteristics of Management, Scope and functional areas of management, Roles of Management, Levels of Management, Henry Fayol - 14 Principles to Management , Engineers Social responsibility and Ethics.		08 Hrs
Module -III		
PREPARATION OF PROJECT AND SOURCE OF FINANCE: PREPARATION OF PROJECT: Meaning of project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents;		
SOURCE OF FINANCE: Long Term Sources (Equity, Preference, Debt Capital, Debentures, loan from Financial Institutions etc) and Short Term Source (Loan from commercial banks, Trade Credit, Customer Advances etc).		08 Hrs
Module -IV		
FUNDAMENTALS OF FINANCIAL ACCOUNTING: Definition, Scope and Functions of Accounting, Accounting Concepts and Conventions: Golden rules of Accounting, Final Accounts - Trading and Profit and Loss Account, Balance sheet.		09 Hrs
Module - V		

PERSONNEL MANAGEMENT, MATERIAL MANAGEMENT AND INVENTORY CONTROL: PERSONNEL MANAGEMENT: Functions of Personnel Management, Recruitment, Selection and Training, Wages, Salary and Incentives MATERIAL MANAGEMENT AND INVENTORY CONTROL: Meaning, Scope and Objects of Material Management. Inventory Control- Meaning and Functions of Inventory control ; Economic Order Quantity(EOQ) and various stock level (Re-order level, Minimum level, Maximum level, Average level and Danger level).		09 Hrs
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.		
Text Books : 1. Financial Accounting -B S RAMAN- United Publishers Manglore, Maheswar S N & Maheswari S K-Vikas Publishing House. 2. Management & Entrepreneurship- K R Phaneesh- Sudha Publications ,Prof Manjunatha & Amit kumar G – Laxmi Publication, Veerbhadrappa Havina l-New Age International publications. 3. Principles of Management First Edition (English, G. Murugesan), Laxmi Publications – New Delhi		
Reference Books : 1. Industrial Organization & Engineering Economics-T R Banga & S C Sharma- Khanna Publishers, Dehli.		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
16CS81	CO1	Demonstrate skills in identifying and defining an engineering problem.
	CO2	Create analysis and feasibility reports of the project.
	CO3	Create projects based on the conceptual project idea into a working model.
	CO4	Apply the knowledge into project design and implementation.
	CO5	Demonstrate their skills in project presentation and report generation.

Course Title: ANDROID PROGRAMMING		
Subject Code: 16CS8OE1	Credits :3	CIE: 50
Number ofLectureHours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Pre-Requisite: Programming in Java language, basics of mobile application		
Course objectives: <ul style="list-style-type: none"> • Get an understanding about mobile services • Get an understanding about Android operating system. • Understand about designing various design layouts in Aps. • Incorporating special services like SMS, Maps and web pages. 		
MODULE		Teaching Hours
MODULE -I		
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 View Control, Using the Android Emulator. Basic Widgets: Understanding the Role of Android Application Components, Event Handling , Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit Text Control.		09 Hrs
Module – II		
Menus and Storing Data : Creating Interactive Menus and ActionBars – Menus and their types, Creating Menus through XML, Creating Menus through coding, Applying a context menu to a ListView, using ActionBar, Replacing a Menu with the ActionBar, Creating Tabbed ActionBar, Creating a DropDown List ActionBar. Using Databases – Using the SQLiteOpenHelper Class, Accessing Databases with the ADB, Creating a Data Entry Form.		09 Hrs
Module -III		
Displaying web pages and maps: Displaying web pages, Using WebViewClient Class, Using Google Maps: Obtaining a Google Maps API key, Installing a Google Maps API, AVDs for Map Based Applications, Creating a Google Maps-Based Application, Using Location –Based Services.		08 Hrs
Module -IV		
Supplying Latitude and Longitude Values Through DDMS, Sending GPS Locations Manually, Passing Locations in GPX/KML Format, Displaying Map Locations, Printing the GPS Location Address, displaying Map Markers, Using ItemizedOverlay.		08 Hrs
Module - V		
Communicating with SMS and emails: Understanding Broadcast Receivers, Using the Notification System, Sending SMS Messages with Java Code, Receiving SMS Messages, Sending Email, Working with the Telephony Manager. Publishing android applications: Setting Versioning Information of an Application, Generating a Certificate, Digitally Signing the Android Applications and Generating APK, Distributing Applications with Google play.		08 Hrs

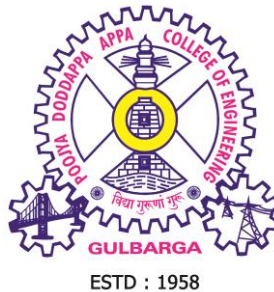
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.			
Text Books : 1. Android programming B.M. Harwani, Pearson publications-2013.			
Reference Books : 1. Mobile Communications, Jochen Schiller, Third Edition, Pearson Education - 2011			
Course outcomes: On completion of the course, the student will have the ability to:			
Course Code	CO #	Course Outcome (CO)	Blooms Level
16CS8OE1	CO1	Describe Mobile Services, Smart phone OS and Applications.	C1
	CO2	Present fundamental concepts of Android OS.	C1
	CO3	Design various Layouts, Menus and Database and assess the suitable layout for android application in hand.	C3,C6
	CO4	Experiment methods for displaying web pages and maps, sending and receiving SMS, Publishing android Applications.	C4,P4
	CO5	Discuss development of secured applications and publishing them.	C2

Course Title: SEMINAR		
Subject Code : 16CS83	Credits : 1	CIE: 50
Number of Lecture Hours/Week	2 Hrs (Practical)	SEE: 50
		SEE Hours: 03
Prerequisite:		
Course objectives:		
<ol style="list-style-type: none"> 1. Construct a piece of writing through the process of revision in order to advance their ideas and communicate more effectively with their readers. 2. Evaluate the knowledge of contemporary issues through literature surveys. 3. Identify ,formulate and solve problems of computer science and engineering 4. Apply the knowledge individually in multidisciplinary domains with ethical standards. 5. Defend/Work as a professional to function as an individual and as a member or leader in diverse or multi disciplinary teams 6. Recognize the level of confidence in terms of eye contact and body language in oral presentation 		
Course outcomes:		
On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
16CS83	CO1	Apply effective strategies for searching literature survey.
	CO2	Identify, understand and discuss current technology.
	CO3	Apply principles of ethics while preparing the report.
	CO4	Develop oral and written communication skill.
	CO5	Prepare well designed documentation and present effectively

Course Title: PROJECT PHASE - II		
Subject Code : 16CS84	Credits : 18	CIE: 50
Number of Lecture Hours/Week	2 Hrs (Practical)	SEE: 50
		SEE Hours: 03
Prerequisite:		
Course objectives:		
<ul style="list-style-type: none"> • 		
<ol style="list-style-type: none"> 1. Gain and revise the knowledge of contemporary issues through literature surveys. 2. Formulate, design and implement the solutions to real world problems. 3. Apply programming skills to bring out solutions to global, economic, environmental and societal problems. 4. Apply modern technologies and engineering tools. 5. Effectively communicate verbally and literally. 6. Work individually and as a team member in multidisciplinary domains with ethical standards. 		
Course outcomes:		
On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
16CS84	CO1	Apply the domain knowledge to design and implement problems from multi-disciplinary domains and co-ordinate within a group.
	CO2	Develop a solution using state-of-art tools to meet societal needs meeting ethical standards.
	CO3	Develop oral, communication skills and exhibit leadership qualities.
	CO4	Implement problems leading to life-long learning.
	CO5	Write a well organized report and develop research skills by writing technical papers and publication of same.

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PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigation of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
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PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Demonstrate understanding of the principles and working of the hardware and software aspects of Computer systems and manage storage of voluminous data.
2. Ability to apply mathematical methodologies to solve computation task. Model real world problem using appropriate data structures and suitable algorithms and evolving trends in computer communication. Ability to understand the structure and development methodologies of software systems.
3. Possess professional skills and knowledge of software design process ethically, leadership quality, learn cutting edge technologies to identify open research issues by critical thinking and cooperative learning. Familiarity and practical competence with a broad range of programming languages and open source platforms.

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SCHEME OF TEACHING FOR VII SEMESTER 2020-2021

B.E. (COMPUTER SCIENCE AND ENGINEERING)

	Course	Hours/Week				Maximum Marks		
		Lecture	Tutorial	Practical	Credits	CIE	SEE	Total
SEMESTER VII								
THEORY								
16CS71	Web Application Development	3	0	0	3	50	50	100
16CS72	Data Mining and Data Warehousing	4	0	0	4	50	50	100
16CS73	Internet of Things	3	2	0	4	50	50	100
16CS74X	Elective – D	3	0	0	3	50	50	100
16CS75X	Elective – E	3	0	0	3	50	50	100
16CS76X	Elective – F	3	0	0	3	50	50	100
PRACTICAL								
16CS77	Data Mining Lab	0	0	2	1	50	50	100
16CS78	Web Programming Lab	0	0	2	1	50	50	100
16CS79	Project Phase-I	0	0	2	2	50	50	100
	Total	19	2	6	24	450	450	900

Elective – D

1. Wireless Network and Mobile Computing 16CS741
2. Machine Learning 16CS742
3. Compiler Design 16CS743
4. Network Management System 16CS744

Elective –E

1. Probability Statistics and Queuing Theory 16CS751
2. Cloud Computing 16CS752
3. System Simulation and Modeling 16CS753
4. Cyber Security 16CS754

Elective – F

1. Social Network Analysis 16CS761
2. Big Data and Analytics 16CS762
3. Software Architecture 16CS763
4. Storage Area Network 16CS764

AUTONOMOUS SYLLABUS FOR B.E VII SEMESTER 2020-2021

Course Title: WEB APPLICATION DEVELOPMENT		
Subject Code : 16CS71	Credits : 3	CIE: 50
Number of Lecture Hours/Week	3 (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Pre-requisite: Java Object oriented concepts, Java Basics, Multithreading and Exception Handling, Java Annotations and IO, Generics and Collection Classes, HTML, CSS, PHP, Javascript, Mysql to start with web development		
Course objectives: <ul style="list-style-type: none"> • Provide the principles and practical programming skills of developing Internet and Web applications. • Enables students to develop skills for client / server programming and database applications. 		
Modules		Teaching Hours
Module-I Fundamentals of Web, XHTML-1: Internet, WWW, Web Browsers, and Web servers; URLs; MIME; HTTP, Security; The Web Programmers Toolbox, XHTML; Origins and Evolution of HTML and XHTML; Basic Syntax; Standard XHTML document Structure; Basic text Markup. XHTML2: Images; Hypertext Links; Lists; Tables; Forms; Frames; Syntactic Differences between HTML. CSS: Introduction ; Levels of Style Sheets; Style Specification formats; Selector Forms; Property value forms; Font properties; List Properties; Color; Alignment of Text; The Box Model; Background Images; The and <div> tags; Conflict Resolution.		08 Hrs
Module-II JavaScript: Overview of JavaScript; Object Orientation and JavaScript; General syntactic characteristics; Primitives, operations, and Expressions; Screen output and keyboard input; Control statements; Object creation and modification Arrays; Functions; Constructor, Pattern Matching using regular expression; Errors in Scripts; Examples. JavaScript and HTML Documents: The JavaScript Execution Environment; The Document Object Model; Element Access in JavaScript; Events and event handling; Handling Events from the Body Elements, Button Elements, Text box and Password elements; The DOM 2 event model; The Navigator object; DOM 2 event model; the navigator object; DOM tree traversal and modification.		09 Hrs
Module-III Dynamic Documents With Java script: Introduction to dynamic documents; Positioning elements; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor, reaching to mouse click; Slow Movement of elements; Dragging and		08 Hrs

dropping elements.			
<p align="center">Module-IV</p> <p>XML: Introduction; Syntax; Document structure, Document Type definitions; Namespaces ; XML schemas ; Displaying raw XML documents ; Displaying XML documents with CSS ; XSLT style sheets ; XML Processors ; Web services.</p> <p>Perl, CGI Programming: Origins and uses of Perl; Scalars and their Operations; Assignment statements and simple input and output; Control statements; Fundamentals of arrays; Hashes; References; Function ; Pattern matching; File input and output; Examples.</p>			09 Hrs
<p align="center">Module-V</p> <p>The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies, RUBY, Introduction to REST and RESTful API.</p>			08 Hrs
<p>Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from 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. Robert W. Sebsta, "<i>Programming the World Wide Web</i>"- 4th Edition, Pearson Education, 2008. 2. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", Pearson Education India, 1st Edition, 2016 3. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 1st Edition, 2006. 			
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. M Deitel, P.J. Deitel, A.B Goldberg, "<i>Internet & World Wide Web How to H Program</i>"- 3rd Edition, Pearson Education/PHI, 2004 2. Chris Bates, "<i>Web Programming Building Internet Applications</i>"- 3rd Edition, WileyIndia, 2006. 3. Xue Bai Et al, Thomson, "<i>The Web Warrior Guide to Web Programming</i>"- 2003. 			
<p>Course outcomes: On completion of the course, the student will have the ability to:</p>			
Course Code	CO #	Course Outcome (CO)	
16CS71	CO1	Apply the knowledge of HTML tags and CSS to design web pages.	
	CO2	Create dynamic web application using Java script and Document object model	
	CO3	Create dynamic documents using Java Scripting	
	CO4	Experiment on use of XML documents with CSS, XSLT and Illustrate use of XML processors, web services, PERL and CGI programming	
	CO5	Attempt to apply CGI.pm module in web applications and demonstrate use of RUBY, REST and RESTful APIs	

Course Title: DATA MINING AND DATA WAREHOUSING		
Subject Code : 16CS72	Credits: 4	CIE: 50
Number of Lecture Hours/Week	4 (Theory)	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
Prerequisite: Basic Knowledge about Data base, Engineering Mathematics and Statistics.		
Course objectives: <ul style="list-style-type: none"> Understanding the fundamentals of data mining and useful patterns from random data Visualizing the information patterns from data collected from various domains Ability to create predictive models 		
Modules		Teaching Hours
Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization		11 Hrs
Module II Data Warehouse and Online Analytical Processing: Data Warehouse, Data Warehouse Modeling for Data cube and OLAP, Data Warehouse Implementation. Data Generalization by Attribute-Oriented Induction.		10 Hrs
Module III Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting-Pattern Evaluation. Classification Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Lazy Learners.		11 Hrs
Module IV Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods. Cluster Analysis: Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.		10 Hrs
Module V Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web. Applications and Trends in Data Mining: Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining and Social Impacts of Data Mining.		10 Hrs
Question paper pattern: The question paper will have ten questions.		

There will be 2 questions from each module, covering all the topics from 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*” - Morgan Kaufmann Publishers, 3rd Edition, 2012.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “*Introduction to Data Mining*” Pearson education, 2006.
3. Anil Maheshwari, “*Data Analytics*”- McGraw Hill Education, 2017

REFERENCES:

1. Paulraj Ponnaiah John Wiley & Sons, “*Data Warehousing Fundamentals –Inc* “, Student Edition, 2001.
2. Margaret H Dunham, “*Data Mining Introductory and advanced topics*” –Pearson education, 2003.
3. Arun K Pujari, “*Data Mining Techniques*” –University Press, Private Limited, 2013.
4. C.C. Aggarwal, “*Data Mining*” Springer International Publishing Switzerland 2016.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
16CS72	CO1	Identify the scope and necessity of Data Mining and Warehousing for the Society.
	CO2	Experiment the designing of data warehousing for the problems solving.
	CO3	Infer the tool of Data warehousing and their technique to solve the real time problems.
	CO4	Ability to develop various algorithms based on data mining tools.
	CO5	Demonstrate the application and current research areas in data mining.

Course Title: INTERNET OF THINGS		
Subject Code : 16CS73	Credits : 4	CIE: 50
Number of Lecture Hours/Week	3Hrs (Theory) +2(Tut) Hrs	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
Pre-requisites: <ul style="list-style-type: none"> Basic electronics, embedded systems, sensors and networking , C and python programming languages. 		
Course Objectives: <ul style="list-style-type: none"> To Understand State of the Art - IoT Architecture. To classify Real World IoT Design Constraints, Industrial Automation in IoT. To Implement Data and Knowledge Management and use of Devices in IoT Technology 		
Modules		Teaching Hours
Module - I What is IoT : What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures.		10 Hrs
Module - II A Simplified IoT Architecture: The Core IoT Functional Stack, IoT Data Management and Compute Stack. Smart Objects: Sensors, Actuators, and Smart Objects: Sensor, Sensor types, Actuators and classification of actuators, Micro-Electro-Mechanical systems (MEMS), Smart Objects: Trends in smart objects. Sensor Networks, Wireless sensor networks.		11 Hrs
Module - III Connecting Smart Objects: Communications Criteria: Range, Frequency bands, Power consumption, Topology, Constrained devices, Constrained-node networks. IoT Access Technologies: 802.16.4, 802.16.4g, 802.16.4e, IEEE1901.2a, IEEE802.11ah, LoRaWAN, NB-IoT and other LTE versions, LTE Cat, LTE-M.		11 Hrs
Module - IV IP as the IoT Network Layer: The Business Case for IP, Adoption of the internet protocol, The need for Optimization: Constrained nodes, IP Versions, Optimizing IP for IoT. Profiles and compliances. Application protocols for IoT: The transport layer, IoT application transport methods.		10 Hrs
Module - V IoT Physical Devices and Endpoints - Introduction to Arduino, Exploring Arduino UNO Learning board, Installing the Software, Fundamentals of Arduino Programming. Fundamentals of Arduino UNO Programming, Introduction to communications, Example modules on Arduino.		10 Hrs
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.		
Text Books:		

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 st Edition, Pearson. 2017 (Chapters 1 to 6 for Modules 1 to 4). 2. Srinivasa K G, Siddesh G.M. and Hanumantha Raju R. "Internet of Things", CENGAGE Learning India, 2017 (Chapter 7).		
Reference Books: 1. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands -on-Approach)", 1 st Edition, VPT, 2014. 2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1 st Edition, McGraw Hill Education, 2017. 3. Websource: www.arduino.cc (for Module V)		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
16CS73	CO1	Discuss IoT technology, challenges, network architecture, IoT stack and its data management.
	CO2	Describe IoT sensors, actuators, smart objects, sensor networks, IoT access technologies.
	CO3	Identify and explain need for optimizing IP for IoT, application protocols for IoT and Transport layer.
	CO4	Describe Big data Analytics, Machine Learning and IoT security.
	CO5	Demonstrate different IoT devices and end points, IoT hardware, IoT programming and constructing IoT applications.

Course Title: Wireless Network and Mobile Computing		
Subject Code : 16CS741	Credits : 3	CIE: 50
Number of Lecture Hours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: Computer Networks and Data Communication		
Course Objectives <ul style="list-style-type: none"> To understand rapidly emerging wireless communications systems and know the services provided to mobile users To understand the opportunities and limitations of wireless and mobile computing, Insight the knowledge of the underlying networking technologies, architectures and protocols. 		
Modules		Teaching Hours
Module - I Mobile Computing Architecture and Wireless Networks – 1: GSM and SMS: Types of Networks, Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing, 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, application.		09 Hrs
Module - II Wireless Networks – 2: GPRS, CDMA, 3G and WiMAX : 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		08 Hrs
Module – III 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 .		08 Hrs
Module - IV Building smart client Application: 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.		08 Hrs
Module - V Building, Mobile Internet Applications and J2ME : 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, Introduction to J2ME, CDC, CLDC, MIDP; Programming for		09 Hrs

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.		
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.		
Text book : <ol style="list-style-type: none"> 1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing, Technology Applications and Service Creation" Second Edition, Mc Graw Hill.2016. 2. Martyn Mallick."mobile and wireless Design Essentials",wiley 2003 		
Reference Books: <ol style="list-style-type: none"> 1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2009. 2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772 3. UWE Hansmann, Lothar Merk, Martin S. Nicklaus, Thomas Stober, "Principles of Mobile Computing," Second Edition, Springer. 		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
16CS741	CO1	Describe GSM architecture and mobile computing architecture design.
	CO2	Discuss wireless network architectures like GPRS,CDMA,IS-95 and WiMAX
	CO3	Describe features of mobile phones and mobile IP.
	CO4	Analyze different Mobile Client and Mobile OS.
	CO5	Develop Mobile applications.

Course Title: MACHINE LEARNING		
Subject Code : 16CS742	Credits :3	CIE: 50
Number ofLectureHours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisite: Statistics		
Course Objectives: <ul style="list-style-type: none"> Acquiring the fundamentals of machine learning Usage of various learning methods to develop an intelligent machine. 		
Modules		Teaching Hours
Module – I Introduction: Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.		08 Hrs
Module - II Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.		
Module - III Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptrons, Multilayer networks and the Back propagation algorithm.		08 Hrs
Module - IV Evaluating Hypothesis: Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms. Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, case-based reasoning.		08 Hrs
Module – V Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm.		09 Hrs
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.		
Text book: <ol style="list-style-type: none"> Tom M. Mitchell, “<i>Machine Learning</i>”, Indian Edition Paperback 2017, McGraw Hill Education. 		
Reference Books: <ol style="list-style-type: none"> Trevor “<i>The Elements of Statistical Learning</i>”, 2nd edition, 2017, Springer series in statistics. Hastie, Robert Tibshirani, Jerome Friedman 		

2. Ethem Alpaydın, “*Introduction to machine learning*”, Third Edition, PHI Learning Pvt. Ltd. 2016

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
16CS742	CO1	Identify the problems for machine learning.
	CO2	Apply supervised/ unsupervised learning for the given problem.
	CO3	Explain theory of probability and statistics related to machine learning.
	CO4	Investigate concept learning, ANN, Baye’s classifier.
	CO5	Estimate target function using Instance based learning.

COURSE TITLE: COMPILER DESIGN		
Subject Code : 16CS743	Credits :3	CIE: 50
Number ofLectureHours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisite : Finite Automata and Formal Languages.		
Course Objectives : <ul style="list-style-type: none"> Understand the Process involved in compiler. Understand syntax analysis various types of parsers, intermediate code generation. 		
Modules		Teaching Hours
Module I		
Introduction: Need for compilers, Programs Related to compilers, Translation process, and Major Data structure in compiler, Bootstrapping and porting Lexical analysis: Scanning process, Regular Expressions, Finite Automata, From regular expressions to DFA, Specifications of Tokens, Recognition of Tokens.		08 Hrs
Module II		
Syntax Analysis: Parsing process, context free grammars, parse tree ,ambiguity Top-down Parsing: Recursive descent parsing, LL(1) parsing. Bottom-up Parsing: Overview of Bottom-up Parsing, Simple LR Parser(SLR(1)		08 Hrs
Module III		
More powerful parsers: LR(1), LALR(1) parsing Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, case-based reasoning.		09 Hrs
Module IV		
Semantic Analysis : Attributes and Attributes grammars, Algorithm for attribute computation, Symbol table, data types and Data checking		08 Hrs
Module V		
Code Generation : Intermediate Code and data structure for code generation, Code generation of data structure references, code generation of control statements and expressions.		09 Hrs
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.		
Text book: <ol style="list-style-type: none"> Kenneth C Louden: Compiler Construction Principles & Practice, Cengage Learning, 1997 Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman: Compilers - Principles, Techniques and Tools, 2nd Edition, Pearson, 2007. 		
Reference Books: <ol style="list-style-type: none"> Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, 1997 Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson, 1991. 		

3. Peter Linz: An Introduction to formal languages and Automata, IV edn, Narosa,2009

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
16CS743	CO1	Identify different stages of compiler and explain lexical analyzers.
	CO2	Develop syntax tree and evaluate ambiguity in parsers
	CO3	Design and develop LR, LALR and SLR parsers
	CO4	Analyze semantics of data types and attributes and develop algorithms for symbol table generation and data checking
	CO5	Develop code generation of Data structures, control statements and expressions.

Course Title: NETWORK MANAGEMENT SYSTEM		
Subject Code : 16CS744	Credits :3	CIE: 50
Number ofLectureHours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisite: Computer Network		
Course Objectives <ul style="list-style-type: none"> Understand general concepts and architecture behind standards of network management Understand concepts and terminology with SNMP and TMN Get the knowledge of advanced information processing techniques. 		
MODULES		Teaching Hours
MODULE -I Introduction: Analogy of Telephone Network Management, Data and Telecommunication Network Distributed computing Environments, TCP/IP-Based Networks: The Internet and Intranets, Communications. Protocols and Standards-. Communication Architectures, Protocol Layers and Services; Case Histories of Networking and Management - The Importance of topology, Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions-Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management.		09 Hrs
MODULE -II Basic Foundations: Standards, Models, And Language : Network Management Standards, Network Management Model, Organization Model, Information Model -Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1-Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model. SNMPVL Network Management-1: Organization:Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, and System Overview.		08 Hrs
MODULE -III SNMPVL Network Management-2: Information, Communication and Functional Model: The Information Model: Introduction, The Structure of Management Information, Managed Objects, Management Information Base. The SNMP Communication Model - The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations, SNMP MIB Group, Functional Model. SNMP Management- RMON: Remote Monitoring, RMON SMI and MIB, RMON1- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring, Extension Groups, RMON2 - TheRMON2 Management Information Base, RMON2 Conformance Specifications; ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON.		09 Hrs
MODULE -IV Broadband Network Management: Broadband Access Networks and Technologies-Broadband Access Networks, Broadband access Technology; HFCT Technology-The Broadband LAN, The Cable Modem, The Cable Modem		08 Hrs

Termination System, The HFC Plant, The RF Spectrum for Cable Modem; Data Over Cable Reference Architecture; HFC Management – Cable Modem and CMTS Management, HFC Link Management, RF Spectrum Management, DSL Technology; Asymmetric Digital Subscriber Line Technology – Role of the ADSL Access Network in an Overall Network, ADSL Architecture, ADSL Channeling Schemes, ADSL Encoding Schemes; ADSL Management – ADSL Network Management Elements, ADSL Configuration Management, ADSL Fault Management, ADSL Performance Management, SNMP-Based ADSL Line MIB, MIB Integration with Interfaces Groups in MIB-2, ADSL Configuration Profiles.			
MODULE -V Network Management Applications: Configuration Management- Network 1 Provisioning, Inventory Management, Network Topology, -Fault Management- Fault Detection, Fault Location and Isolation Techniques, Performance Management Performance Metrics, Data Monitoring; Problem Isolation, Performance Statistics; Event Correlation Techniques -Rule-Based Reasoning, Model-Based Reasoning, Case-Based Reasoning, Codebook correlation Model, State Transition Graph' Model, Finite State Machine Model, Security Management Policies and Procedures, Security Breaches-and the Resources Needed to: Prevent Them, Firewalls, Cryptography, Authentication and Authorization, Client/Server Authentication Systems, Messages Transfer Security, Protection of Networks from' Virus Attacks, Accounting Management, Report Management, Policy-Based Management, Service Level Management.			08 Hrs
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.			
Text book: 1. Tom M. Mitchell, Machine Learning, Indian Edition Paperback 2017, McGraw Hill Education.			
Reference Books: 1. Trevor The Elements of Statistical Learning, 2nd edition, 2017, Springer series in statistics. Hastie, Robert Tibshirani, Jerome Friedman 2. Ethem Alpaydın, Introduction to machine learning, Third Edition, PHI Learning Pvt. Ltd. 2016			
Course outcomes: On completion of the course, the student will have the ability to:			
Course Code	CO #	Course Outcome (CO)	
16CS744	CO1	Describe the basic concepts of communication protocols standards and architecture.	
	CO2	Identify the network management standards and models.	
	CO3	Explain the remote network management and ATM network concepts.	
	CO4	Categorize the broadband access networks and technologies.	
	CO5	Discuss the applications of network management.	

Course Title: PROBABILITY, STATISTICS AND QUEUING THEORY		
Subject Code : 16CS751	Credits : 3	CIE: 50
Number of Lecture Hours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: Engineering Mathematics		
Course Objectives: Foundations of probability and statistical analysis used in various engineering and science applications.		
Modules		Teaching Hours
Module-I		
Probability, Random Variables: The concept of probability, The axioms of probability, Some important theorems on probability, Assignment of probabilities, Conditional Probability, Theorems on conditional probability, Independent events, Bayer's Theorem. Random Variables, Discrete probability distributions, Distribution functions for discrete random variables.		08 Hrs
Module-II		
Probability Distributions, Mathematical Expectation: Continuous probability distributions, Distribution functions for continuous random variables, Joint distributions, Independent random variables, Definition, Functions of random variables, Some theorems on Expectation, The Variance and Standard Deviation, Moments, Moment Generating Functions, Covariance, Correlation, Coefficient.		09 Hrs
Module-III		
Special Probability Distributions, Sampling Theory: The Binomial Distribution, The Normal Distribution, The Poisson Distribution, Relations between different distributions, Central limit theorem, Uniform distribution, Chi-square Distribution, Exponential distribution, Population and Sample, Sampling with and without replacement, The sample mean, Sampling distribution of means, proportions, differences and sums, The sample variance, The sample distribution of variances.		09 Hrs
Module-IV		
Tests of Hypotheses and Significance: Statistical Decisions, Statistical hypotheses, Null hypotheses, Tests of hypotheses and significance, Type I and Type II error level of significance, Tests involving the Normal distribution, One-Tailed and Two-Tailed tests, Special tests of significance for large and small samples, The Chi-square test for goodness of fit.		08 Hrs
MODULE –V		
Discrete-Parameter Markov Chains, Queuing Theory: Introduction, Computation of n-step Transition Probabilities, State Classification and Limiting Distributions, The M/G/I Queuing system, Discrete-Parameter Birth-Death processes, Finite Markov Chains with absorbing series, Queue		08 Hrs

description, Characteristics of queuing model, Study state solutions of M/M/1:α Model, M/M/1;N Model.		
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.		
Text book: <ol style="list-style-type: none"> 1. Murray R Spiegel, “<i>Probability and Statistics</i>”, McGraw Hill, Schaum’s Outline Series. 2. Kishore S Trivedi, “<i>Probability and Statistics with Reliability, Queuing and Computer Science Applications</i>”, Prentice Hall of India, 2000. 		
REFERENCE BOOKS <ol style="list-style-type: none"> 1. A. Papoulis and S. Unnikrishna Pillai, “<i>Probability, Random Variables and Stochastic Processes</i>”, McGraw-Hill, 4th Edition 2002. 2. Richard A. Johnson, “<i>Probability and Statistics for Engineers</i>”, Pearson Education/Prentice Hall, India 2002. 3. A.M.Natrajan & A.Tamilarasi, “<i>Probability, Random Processes & Queuing Theory</i>” New Edge International Publishers, II Edition -2005. 		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
16CS751	CO1	Illustrate standard distributions which can describe real life phenomena.
	CO2	Develop skills to handle multiple random variable and its functions.
	CO3	Identify and characterize phenomena which evolve with respect to time in a probabilistic manner.
	CO4	Demonstrate the tests of hypotheses and significance.
	CO5	Develop skills in analyzing queuing models.

Course Title: CLOUD COMPUTING		
Subject Code : 16CS752	Credits : 3	CIE: 50
Number of Lecture Hours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: Practical exposure related to basic concepts of operating systems, basic concepts of computer networking.		
Course objectives: <ul style="list-style-type: none"> To understand Virtualization and learn Cloud Services To implement Task Scheduling algorithms. Apply Map-Reduce concept. 		
Modules		Teaching Hours
Module - I Introduction : Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjrasoft Aneka Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology.		09 Hrs
Module - II Cloud Computing Architecture, Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects Aneka: Cloud Application Platform, Framework Overview, Anatomy of the Aneka Container, From the Ground Up: Platform Abstraction Layer, Fabric Services, foundation Services, Application Services, Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode, Cloud Programming and Management, Aneka SDK, Management Tools.		09 Hrs
Module - III Concurrent Computing: Thread Programming, Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, What is a Thread?, Thread APIs, Techniques for Parallel Computation with Threads, Multithreading with Aneka, Introducing the Thread Programming Model, Aneka Thread vs. Common Threads, Programming Applications with Aneka Threads, Aneka Threads Application Model, Domain Decomposition: Matrix Multiplication, Functional Decomposition: Sine, Cosine, and Tangent. High-Throughput Computing: Task Programming, Task Computing, Characterizing a		08 Hrs

Task, Computing Categories, Frameworks for Task Computing, Task-based Application Models, Embarrassingly Parallel Applications, Parameter Sweep Applications, MPI Applications, Workflow Applications with Task Dependencies, Aneka Task-Based Programming, Task Programming Model, Developing Applications with the Task Model, Developing Parameter Sweep Application, Managing Workflows.			
Module - IV Data Intensive Computing: Map-Reduce Programming, What is Data-Intensive Computing?, Characterizing Data-Intensive Computations, Challenges Ahead, Historical Perspective, Technologies for Data-Intensive Computing, Storage Systems, Programming Platforms, Aneka MapReduce Programming, Introducing the MapReduce Programming Model, Example Application.			08 Hrs
Module - V Cloud Platforms in Industry, Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google AppEngine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance. Cloud Applications Scientific Applications, Healthcare: ECG Analysis in the Cloud, Social Networking, Media Applications, Multiplayer Online Gaming.			08 Hrs
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.			
Text Book: 1. International Edition -- Rajkumar Buyya, Christian Vecchiola, and Thamarai selvi, Mastering Cloud Computing, Morgan Kaufmann, ISBN: 978-0-12-411454-8, Burlington, Massachusetts, USA, May 2013.			
REFERENCE BOOKS 1. Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, 1st edition, 2014, Morgan Kaufmann Publishers, Inc., San Francisco. ISBN-13: 978-0124166752, ISBN-10: 012416675X 2. T. Erl, R. Puttini, and Z. Mahmood, Cloud Computing: Concepts, Technology & Architecture ISBN-10: 0133387526 • ISBN-13: 9780133387520 ©2013 • Prentice Hall • Cloth, 528 pp			
Course outcomes: On completion of the course, the student will have the ability to:			
Course Code	CO #	Course Outcome (CO)	
16CS752	CO1	Discuss Cloud computing setup and applications using different architectures.	
	CO2	Apply Virtualization concept and management of Cloud Resource.	
	CO3	Develop and deploy cloud application using popular cloud platforms.	
	CO4	Design different workflows according to requirements and apply map reduce programming model.	
	CO5	Describe the importance of cloud computing driven commercial systems.	

Course Title: SYSTEM SIMULATION AND MODELING		
Subject Code : 16CS753	Credits :3	CIE: 50
Number ofLectureHours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: Engineering Mathematics, Probability Theory		
Course objectives: <ul style="list-style-type: none"> • To introduce simulation and modeling methods. • To highlight the use of simulation as a tool for various applications. • To solve real world problems using simulation 		
Modules		Teaching Hours
Module-I Introduction And General Principles: When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of simulation; Areas of application; system and System environment; Components of a system; Discrete and continuous systems; Model of system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation study. Simulation examples; Simulation of queuing systems; Simulation of inventory systems; other examples of simulation. Concepts in Discrete-Event Simulation; The Event-Scheduling / Time –Advance Algorithm, World views, Manual simulation using Event scheduling.		09 Hrs
Module-II Statistical And Queuing Models In Simulation: Review of terminology and concepts; Useful statistical models; discrete distributions; Continuous distributions; Poisson process; Empirical distributions. Characteristics of queuing system; Queuing notation; Long-run measures of performance of queuing systems.		08 Hrs
Module-III Random-Number, Random- Variate Generation: Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random numbers.		09 Hrs
Module-IV Input Modeling, Verification And Validation Of Simulation Models, Optimization: Data collection; Identifying the distribution with data; Parameter estimation; Goodness of fit tests; Fitting a non-stationary Poisson process; Selecting input models without data. Model building, verification and validation; Verification of simulation models; Calibration and validation of models. Optimization via simulation.		08 Hrs

Module-V		08 Hrs
Output Analysis For A Single Model: Types of simulation with respect to output analysis; stochastic nature of output data; Measures of performance and their estimation; Output analysis for terminating simulations.		
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.		
Text book: 1. Jerry Banks, John S. Carson II, Barry L Nelson, David M. Nicol, Discrete-Event System Simulation –4 th Edition, Pearson Education, 2007		
Reference Books: 1. Discrete-Event Simulation: A first course – Lawrence M. Leemis, Stephen K. Park, Pearson Education/Prentice-Hall India, 2006. 2. Simulation- Sheldon M. Ross, 4 th edition, Elsevier, 2006. 3. Simulation Modeling and Analysis- Averill M. Law, 4 th edition Tata McGraw-Hill, 2007. 4. System Simulation With Digital Computer – Nasingh Deo , Prentice- Hall of India 5. System Simulation- Geoffery Gordoan, Prentice- Hall of India		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
16CS753	CO1	Describe important elements of simulation and modeling, and develop simulation models for various Application.
	CO2	Apply statistical methods for problem solving and develop simulation of Queuing systems.
	CO3	Solve problems on random number and random variate generation and perform tests on random number.
	CO4	Explain Data generation strategies and the effectiveness of simulation results.
	CO5	Describe the output analysis of discrete-event simulation systems.

Course Title: CYBER SECURITY		
Subject Code : 16CS754	Credits :3	CIE: 50
Number ofLectureHours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Pre-requisites: Engineering Mathematics		
Course Objectives: <ul style="list-style-type: none"> To provide an understanding of principle concepts, major issues, technologies and basic approaches in cyber security. Gain familiarity with prevalent network and distributed system attacks, defenses against them and forensics to investigate the results. Develop basic understanding of cryptography , security policies as well as protocols to Implement such policies. 		
Modules		Teaching Hours
Module I Cyber Security Fundamentals: Network and Security Concepts: Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS) , Firewalls, Virtualization, Radio-Frequency Identification. Microsoft Windows Security Principles: Windows Tokens, Window Messaging, Windows Program Execution, The Windows Firewall.		08 Hrs
Module II Attacker Techniques and Motivations: How Hackers Cover Their Tracks (Anti-forensics). Tunneling Techniques: HTTP, DNS, ICMP, Intermediaries, steganography and other concepts, detection and prevention. Fraud Techniques: Phishing, Smishing, Vishing and Mobile Malicious Code, Rogue Anti-Virus, ClickFraud Threat Infrastructure: Botnets , Fast-Flux , Advanced Fast-Fl.		08 Hrs
Module III Exploitation : Techniques to Gain a Foothold : Shellcode , Integer Overflow Vulnerabilities, Stack-Based Buffer Overflows , Format-String Vulnerabilities, SQL Injection, Malicious PDF Files, Race Conditions , Web Exploit Tools Contd.DoS Conditions Brute-Force and Dictionary Attacks .Misdirection, Reconnaissance and Disruption Methods:Cross-Site Scripting (XSS), Social Engineering WarXing , DNS Amplification Attacks.		09 Hrs
Module IV Malicious Code : Self-Replicating Malicious Code : Worms , Viruses .Evading Detection and Elevating Privileges: Obfuscation ,Virtual Machine Obfuscation , Persistent Software Techniques , Rootkits , Spyware , Attacks against Privileged User Accounts and Escalation of Privileges , Token Kidnapping . Contd. Virtual Machine Detection, Stealing Information and Exploitation :		09 Hrs

Form Grabbing , Man-in-the-Middle Attacks , DLL Injection , Browser Helper Objects.			
Module V Defense and Analysis Techniques: Memory Forensics, Why Memory Forensics Is important , Capabilities of Memory Forensics , Memory Analysis Frameworks , Dumping Physical Memory. Contd. Installing and Using Volatility ,Finding Hidden Processes , Volatility Analyst Pack, Honeypots ,Malicious Code Naming,Automated Malicious Code Analysis Systems : Passive Analysis , Active Analysis , physical or Virtual Machines. Intrusion Detection Systems.			08 Hrs
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.			
Text book: 1. Cyber SecurityEssentials , JamesGraham,RyanOlson,Rick Howard Auerbach Publications, CRC PRESS book, Edition:1,2010			
Reference Books: 1. Computer SecurityHandbook, Seymour Bosworth, M. E. Kabay, Eric Whyne, John Wiley &Sons,2009 2. Cyber security:TheEssential BodyofKnowledge ,DanShoemaker, Cengage Learning ,2011 3. Security in Computing, CharlesB.Pfleeger,ShariLawrencePfleeger, Third Edition, Pearson Education,2003.			
Course outcomes: On completion of the course, the student will have the ability to:			
Course Code	CO #	Course Outcome (CO)	
16CS754	CO1	Explain fundamentals of network security concepts.	
	CO2	Illustrate anti-forensics, fraud techniques and threat infrastructures.	
	CO3	Identify system vulnerabilities and network attacks.	
	CO4	Describe techniques of software exploitation.	
	CO5	Discuss memory forensics and automated malicious code analysis systems.	

Course Title: SOCIAL NETWORK ANALYSIS		
Subject Code : 16CS761	Credits : 3	CIE: 50
Number of Lecture Hours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites : Basic programming.		
Course Objectives: <ul style="list-style-type: none"> Modeling the Networks of Organizations Understanding Customer Interaction Development of Information Systems. 		
Modules		Teaching Hours
Module - I Introduction: Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.		09 Hrs
Module - II Modelling, Aggregating And Knowledge Representation : Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.		08 Hrs
Module - III Extraction And Mining Communities In Web Social Networks : Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.		09 Hrs
Module - IV Predicting Human Behaviour And Privacy Issues : Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.		08 Hrs
Module - V Visualization And Applications Of Social Networks : Graph theory -		08 Hrs

Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.		
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from 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. Peter Mika, “Social Networks and the Semantic Web”, , First Edition, Springer 2007. 2. Borko Furht, “Handbook of Social Network Technologies and Applications”, 1st Edition, Springer, 2010. 		
REFERENCES: <ol style="list-style-type: none"> 1. Guandong Xu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, First Edition Springer, 2011. 2. Dion Goh and Schubert Foo, “Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008. 3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling”, IGI Global Snippet, 2009. 4. John G. Breslin, Alexandre Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2009. 		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
16CS761	CO1	Describe the concept of semantic web and related applications.
	CO2	Develop knowledge representation using ontology.
	CO3	Analyse human behavior in social web and related communities.
	CO4	Attempt Predicting Human Behaviors and Privacy Issues.
	CO5	Summarize visualization of social networks.

Course Title: BIG DATA ANALYTICS		
Subject Code : 16CS762	Credits: 3	CIE: 50
Number ofLectureHours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisite: Java, Database Management System		
Course objectives: <ul style="list-style-type: none"> Understand Hadoop Distributed File system and examine MapReduce Programming Explore Hadoop tools and manage Hadoop with Ambari Hadoop Security Structure 		
Modules		Teaching Hours
Module – I		
Big Data Hadoop Background and Concepts: Defining Big Data, Defining Apache Hadoop, Hadoop as a Data Lake, Using Hadoop as Administrator, User, or Both, First There was MapReduce, Moving Beyond MapReduce with Hadoop V2, The Apache Hadoop Project Ecosystem. Hadoop Distributed File System Basics: Hadoop Distributed File System Design Features, HDFS Components, HDFS User Commands, Using HDFS in Programs.		08 Hrs
Module – II		
Running Example Programs and Benchmarks: Running MapReduce Examples, Running Basic Hadoop Benchmarks. Hadoop MapReduce Framework: The MapReduce Model, MapReduce Parallel Data Flow, Fault Tolerance and Speculative Execution MapReduce Programming: Compiling and Running the Hadoop, WordCount Example, Using the Streaming Interface, Compiling and Running the Hadoop Grep Chaining, Debugging MapReduce.		09 Hrs
Module – III		
Essential Hadoop Tools: Using Apache Pig, Using Apache Hive, Using Apache Sqoop to Acquire Relational Data, Using Apache Flume to Acquire Data Streams, Managing Hadoop Workflows eith Apache Oozie, Using Apache HBase. Hadoop YARN Applications: YARN Distributed-Shell, Using the YARN Distributed-Shell, Structure of YARN Applications, YARN Application FrameWorks. Managing Hadoop with Apache Ambari: Quick Tour of Apache Ambari, Managing Hadoop Services, Changing Hadoop Properties.		09 Hrs
Module – IV		
Basic Hadoop Administration Procedures: Basic Hadoop YARN Administration, Basic HDFS Administration, Capacity Schedule Background, Hadoop Version 2 MapReduce Compatibility Hadoop Security: Security Overview, Hadoop Security a Brief History, Hadoop Components and EcoSystem, Hadoop Security Architecture.		08 Hrs

Module – V		
Securing Distributed Systems: Threat Categories, Threat and Risk Assessment, Vulnerabilities, Defense in Depth. System Architecture: Operating Environment, Network Security, Hadoop Roles and Separation Strategies, Operating System Security.		08 Hrs
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.		
Text Books: 1. Douglas Eadline, "Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1st Edition, Pearson Education, 2016. ISBN: 978-9332570351 2. Joey Echeverria, Ben Spivey, "Hadoop Security", O'Reilly Media, Inc., 2016. ISBN: 9781491900987		
Reference Books: 1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media, 2016. 2. Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1 st Edition, Wrox Press, 2014. 3. Eric Sammer, "Hadoop Operations: A Guide for Developers and Administrators", 1 st Edition, O'Reilly Media, 2012.		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
16CS762	CO1	State the concepts of HDFS and MapReduce framework.
	CO2	Construct Various Benchmark Programs and Develop MapReduce Programs.
	CO3	Analyze Hadoop, YARN and Apache Ambari related tools for Big Data Analytics.
	CO4	Investigate basic Hadoop Administration, Hadoop Components and Ecosystem.
	CO5	Evaluate Hadoop Security for distributed system and its System Architecture .

Course Title: SOFTWARE ARCHITECTURE		
Subject Code : 16CS763	Credits :3	CIE: 50
Number ofLectureHours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisite: Software Engineering		
Course Objective : <ul style="list-style-type: none">• Design and motivate software architecture for large-scale software systems.• Identify and assess the quality attributes of a system at the architectural level.• Motivate the architectural concerns for designing and evaluating a system's architecture.		
Modules		Teaching Hours
Module – I INTRODUCTION: The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; What makes a “good” architecture? What software architecture is and what it is not; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views.		08 Hrs
Module –II ARCHITECTURAL STYLES AND CASE STUDIES: Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures. Case Studies: Keyword in Context; Instrumentation software; Mobile robotics; Cruise control; Three vignettes in mixed style.		08 Hrs
Module – III QUALITY: Functionality and architecture; Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities. Achieving Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics; Relationship of tactics to architectural patterns; Architectural patterns and styles.		08 Hrs
Module - IV ARCHITECTURAL PATTERNS – 1: Introduction; from mud to structure: Layers, Pipes and Filters, Blackboard. ARCHITECTURAL PATTERNS – 2: Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction-Control. ARCHITECTURAL PATTERNS – 3: Adaptable Systems: Microkernel; Reflection.		09 Hrs

<p align="center">Module – V</p> <p>SOME DESIGN PATTERNS: Structural decomposition: Whole – Part; Organization of work: Master – Slave; Access Control: Proxy.</p> <p>DESIGNING AND DOCUMENTING SOFTWARE ARCHITECTURE: Architecture in the life cycle; Designing the architecture; Forming the team structure; Creating a skeletal system. Uses of architectural documentation; Views; Choosing the relevant views; Documenting a view; Documentation across views.</p>		09 Hrs
<p>Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from 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. Software Architecture in Practice - Len Bass, Paul Clements, Rick Kazman, 2nd Edition, Pearson Education, 2003. 2. Pattern-Oriented Software Architecture A System of Patterns, Volume 1 - Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, John Wiley and Sons, 2006 		
<p>References:</p> <ol style="list-style-type: none"> 1. Software Architecture- Perspectives on an Emerging Discipline - Mary Shaw and David Garlan, Prentice-Hall of India, 2007. 		
<p>E books and online course materials:</p>		
<p>Course outcomes: On completion of the course, the student will have the ability to:</p>		
Course Code	CO #	Course Outcome (CO)
16CS763	CO1	Describe the importance and role of software architecture in large-scale software systems.
	CO2	Recognize major software architectural styles, design patterns, and frameworks.
	CO3	Describe a software architecture using various documentation approaches and architectural description languages.
	CO4	Use well-understood patterns for designing new systems.
	CO5	Discuss and evaluate the current trends and technologies such as model-driven and service-oriented architectures.

Course Title: STORAGE AREA NETWORK		
Subject Code : 16CS764	Credits : 3	CIE: 50
Number ofLectureHours/Week	3Hrs (Theory)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: DBMS Concepts		
Course Objectives: <ul style="list-style-type: none"> To understand the fundamentals of storage centric and server centric systems To understand the metrics used for Designing storage area networks To understand the RAID concepts To enable the students to understand how data centre's maintain the data with the concepts of backup mainly remote mirroring concepts for both simple and complex systems. To understand domains of storage security along with covering security. 		
Modules		Teaching Hours
Module – I Teaching Hours Storage System Introduction to evolution of storage architecture, key data center elements, virtualization, and cloud computing. Key data center elements – Host (or compute), connectivity, storage, and application in both classic and virtual environments. RAID implementations, techniques, and levels along with the impact of RAID on application performance. Components of intelligent storage systems and virtual storage provisioning and intelligent storage system implementations.		08 Hrs
Module – II Storage Networking Technologies and Virtualization Fibre Channel SAN components, connectivity options, and topologies including access protection mechanism ‘zoning’, FC protocol stack, addressing and operations, SAN-based virtualization and VSAN technology, iSCSI and FCIP protocols for storage access over IP network, Converged protocol FCoE and its components, Network Attached Storage (NAS) - components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.		08 Hrs
Module – III Backup, Archive, and Replication This unit focuses on information availability and business continuity solutions in both virtualized and non-virtualized environments. Business continuity terminologies, planning and solutions, Clustering and multipathing architecture to avoid single points of failure, Backup and recovery - methods, targets and topologies, Data deduplication and backup in virtualized environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.		09 Hrs
Module – IV Cloud Computing Characteristics and benefits This unit focuses on the business drivers, definition, essential characteristics, and phases of journey to the Cloud. ,Business drivers for Cloud computing, Definition of Cloud computing, Characteristics of Cloud computing, Steps involved in transitioning from Classic data center to Cloud computing environment Services and deployment models, Cloud infrastructure components, Cloud migration considerations.		08 Hrs

<p align="center">Module – V</p> <p>Securing and Managing Storage Infrastructure This chapter focuses on framework and domains of storage security along with covering security. Implementation at storage networking. Security threats, and countermeasures in various domains Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments, Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle management (ILM) and storage tiering, Cloud service management activities.</p>			09 Hrs
<p>Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from 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. Information Storage and Management, Author:EMC Education Services, Publisher: Wiley ISBN: 9781118094839 2. Storage Virtualization, Author: Clark Tom, Publisher: Addison Wesley Publishing Company ISBN : 9780321262516 			
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Robert Spalding: “Storage Networks The Complete Reference”, Tata McGraw-Hill, 2011. 2. Marc Farley: Storage Networking Fundamentals – An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems, Cisco Press, 2005. 3. Richard Barker and Paul Massiglia : “Storage Area Network Essentials A Complete Guide to understanding and Implementing SANs”, Wiley India, 2006. 			
<p>Course outcomes: On completion of the course, the student will have the ability to:</p>			
Course Code	CO #	Course Outcome (CO)	
16CS764	CO1	Describe the storage architecture, Key data center elements and RAID implementations.	
	CO2	Identify key challenges in managing information and analyze different storage networking technologies and virtualization.	
	CO3	Discuss the concepts of Backup, Archive, Replication, information availability and business continuity solutions in both virtualized and non-virtualized environments components.	
	CO4	Analyse the business drivers, definition, essential characteristics, and phases of journey to the Cloud.	
	CO5	Illustrate framework and domains of storage security along with covering security.	

Course Title: DATA WAREHOUSING AND MINING LAB		
Subject Code : 16CS7L77	Credits : 1	CIE: 50
Number ofLectureHours/Week	2 Hrs (Practical)	SEE: 50
		SEE Hours: 03
Pre-requisites: Data mining techniques and basics of statistics.		
Course objectives: <ul style="list-style-type: none"> • Understanding the useful patterns from random data • Visualizing the information patterns from data collected from various domains • Ability to create predictive models 		
List of Programs		Teaching Hours
<p>1. Open the Weka Tool and load the built-in data-sets like, weather, iris etc. and records the number of attributes, attribute types, number of instances, max value, min value etc. Then open any of the data set file (eg. Weather.arff) using Notepad and study the format. Create your own data set file using Notepad and load it in Weka and observe statistical nature of data set created.</p> <p>2. Repeat the experiment no. 1 by creating a file in CSV format.</p> <p>3. Create a Google Form and collect a survey data (eg. Age and percentage of hairfall data) load it into Weka for preliminary statistical analysis and present data in graphical format.</p> <p>4. Create a raw data set of 20 instances with attributes name, age, sex, yearly income in Attribute-Relation File Format (ARFF) using a notepad like tool. Filter the raw data and make it free from null values, choose instances of data set with age between 18 and 60.</p> <p>5. Create a house price Regression Model to determine house rent by varying different test attributes. Build the data set (relation) of house price in the Attribute-Relation File Format (ARFF) format for Weka mining tool with attributes, house Size NUMERIC, plot Size NUMERIC, bedrooms NUMERIC, granite NUMERIC, bathroom NUMERIC, selling Price NUMERIC. Create 16 instances of data set (relation) with appropriate values. Interpret the classifier output and record the results and the classifier parameters set.</p> <p>6. Apply J48 algorithm for experiment no. 5 and compare classification accuracy (performance) by varying the parameter folds of experiment.</p> <p>7. Use the Iris built-in data set (relation) stored as Iris.arff in /data folder of Weka. Use J48 algorithm and classify data set. Set the experiment to 10 folds and create confusion matrix and interpret the results.</p> <p>8. Apply Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, Lazy Learners (or Learning from Your Neighbors), Other Classification Methods on iris data set and interpret results by varying classifier parameters.</p> <p>9. Demonstrate the learning association rules from large datasets. Choose the</p>		

supermarket.arff data set file supplied with weka in /data folder. To do market basket analysis in Weka use Apriori algorithm. Describe the dataset and analyse association rules discovered and record a brief report on it.			
10. Demonstrate the clustering with basic algorithm and hierarchical clustering methods. Use the weather.arff data set. Evaluate by Assessing Clustering Tendency, Determining the Number of Clusters, Measuring Clustering Quality.			
Note : Use Weka Freeware for all the experiments			
Course outcomes:			
On completion of the course, the student will have the ability to:			
Course Code	CO #	Course Outcome (CO)	
16CSL77	CO1	Collect the raw data to make it suitable for various data mining algorithms.	
	CO2	Discover and measure interesting patterns from different kinds of databases.	
	CO3	Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.	
	CO4	Create a regression model for predicting the pattern.	
	CO5	Demonstrate the application areas in data mining.	

Course Title: WEB PROGRAMMING LABORATORY		
Subject Code : 16CSL78	Credits : 1	CIE: 50
Number ofLectureHours/Week	2 Hrs (Practical)	SEE: 50
		SEE Hours: 03
Pre-requisite: Java Object oriented concepts, Java Basics, Multithreading and Exception Handling, Java Annotations and IO, Generics and Collection Classes, HTML, CSS, PHP, Javascript, Mysql to start with web development.		
Course objective: <ul style="list-style-type: none"> • Provide the principles and practical programming skills of developing Internet and Web applications. • Enables students to master the development skill for both client-side and server-side programming, especially for database applications. • Students will have opportunity to put into practice the concepts through programming exercises based on various components of client/server web programming. 		
List of Programs		Teaching Hours
1.Create an XHTML documents to study various HTML tags, style sheets and the tag, Borders, padding, color, and the tag. 2. Develop a Java Script embedded XHTML file for; (any two bits of the given below for exam) i) Generating Sum of n numbers. Use alert window to display the result. ii) Determine the roots of Quadratic Equation. Use document. write to produce Output. iii) Find Standard Deviation when an array of numbers is input. iv) Use prompt to read an array of names. Produce an alphabetical listing of names. 3. Develop an XHTML document and corresponding JavaScript file to create four radio buttons that enables the user to choose information about a specific airplane. The click event is to be used to trigger a call to alert which presents a brief description of the selected airplane. 4. Modify the above example to have five buttons, labeled red, blue, green, yellow and orange. The event handlers for these buttons must produce messages stating the chosen favorite color. The even handler must be implemented as a function whose name must be assigned to the on Click attribute of the radio button elements. The chosen color must be sent to the event handler as a parameter. 5. Develop, test and validate an XHTML document that collects the following information from the user: Last name, First name, middles initial, age(Restricted to be greater than 17), and weight(restricted to the range 0f 80-100). You must have event handlers for the form elements that collect this information that check he input data for correctness. Messages in alert windows must be produced when errors are detected. 6. i) Develop a XHTML document containing four short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can always be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.		

<p>ii) Write an XHTML document containing placed on the display so that they overlap. Define and use DOM addresses and zIndex value to keep track of current top image with the global variable top which is changed every time a new element is moved to the top with the toTop function.</p> <p>7. Write an XHTML document to change the content of elements. The content of an element is accessed through the value property of its associated Java Script object. So, changing the content of an element is not essentially different from changing other properties of the element. Illustrate changing the content of a collection of text fields.</p> <p>8. Design an XML document to store information about a student. The information must include USN, Name, Branch, Year of Joining, email Id and Contact Number. Make up sample database of 5-10 students. Create a CSS style sheet and use it to display the document.</p> <p>9. i) Write a Perl script to show server information like Server Name, Server Software, server protocol, CGI Revision etc.</p> <p>ii) Write a Perl program to accept OS command and to display the output of the command executed.</p> <p>iii) Write a Perl program to count number of Visitors visiting the web page using session variable. Display this count of visitors with proper headings.</p> <p>10. Write a Perl program to insert given data (For example name and age information) into MySQL database and display the contents of the database table.</p> <p>11. i) Write a PHP program to store current data-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening the same page.</p> <p>ii) Write a PHP program to count number of visits that increments and display after each refresh of the page.</p> <p>12. Using PHP and MySQL, develop a program to accept book information viz., Accession Number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.</p> <p>13. Create a webpage with all the knowledge gained from the above exercises. (Example: develop a department webpage.)</p>		
<p>Note: 13th Exercise is for internal evaluation only not for final exam. 2nd & 9th exercise any two bits will be asked in the final examination</p>		
<p>Course outcomes: On completion of the course, the student will have the ability to:</p>		
Course Code	CO #	Course Outcome (CO)
16CSL78	CO1	Demonstrate use of HTML tags in designing webpages.
	CO2	Create dynamic web pages by using CSS, JavaScript and XML with advanced Interactivity.
	CO3	Design and implement functional forms, control browser frames and windows using JavaScript.
	CO4	Design browser side scripting and server side scripting by using PHP and Perl.
	CO5	Develop and Demonstrate an Open Ended Program like a mini project.

Course Title: Project Phase - I		
Subject Code : 16CSL79	Credits : 2	CIE: 50
Number ofLectureHours/Week	2 Hrs (Practical)	SEE: 50
		SEE Hours: 03
Prerequisite: Domain knowledge.		
Course objectives: <ul style="list-style-type: none"> • Provide a learning experience which aims to provide students with the opportunity to synthesize knowledge from various areas of learning, and critically and creatively apply it to real life situations. • Give an exposure to planning, design and implementing a project in hand. • Provide an opportunity to demonstrate their overall skills that are learned through course. 		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
16CSL79	CO1	Apply basic engineering knowledge and identify the problem either individually or as a group
	CO2	Apply Engineering skills to solve problems of Engineering applications
	CO3	Evaluate the knowledge of contemporary issues through literature survey and formulate the problems
	CO4	Design the problem using software methodology.
	CO5	Prepare a well organized report.