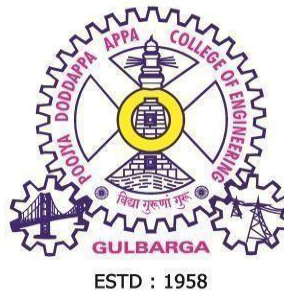


**CURRICULUM
FOR THE ACADEMIC YEAR 2024-2025
(21 Series)**

**DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING**

B.E.VII and VIII SEMESTER



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

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 240 students and offering two Post Graduation programmes: PG (Computer Science and Engineering with an intake of 18 students) and PG(Computer Network and Engineering with an intake of 09 students). The department is offering research program under its recognized research center. Computer Science and Design course was started from 2021 with an intake of 60 students. 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 an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

Mission of the Institution

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

Vision of the Department

- To become a premier department in Computer education, research and to prepare highly competent IT professionals to serve industry and society at local and global levels.

Mission of the Department

- To impart high quality professional education to become a leader in Computer Science and Engineering.
- To achieve excellence in Research for contributing to the development of the society.
- To inculcate professional and ethical behaviour to serve the industry.

Program Educational Objectives (PEO):

PEO1:	To prepare graduates with core competencies in mathematical and engineering fundamentals to solve and analyze computer science and engineering problems
PEO2:	To adapt to evolving technologies and tools for serving the society
PEO3:	To perform as team leader, effective communicator and socially responsible computer professional in multidisciplinary fields following ethical values
PEO4:	To encourage students to pursue higher studies, engage in research and to become entrepreneurs

Program Outcomes:

01. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

02. 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.

03. 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.

04. Conduct investigations 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.

05. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

06. 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.

07. 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.

08. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

09. Individual and team work: 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):

PSO1:	Acquire competency in hardware and software working principles to analyze and solve computing problems.
PSO2:	Design quality software to develop scientific and business applications following Software Engineering practices.
PSO3:	Apply cutting edge technologies using modern tools to find novel solutions ethically to existing problems.

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SCHEME OF TEACHING FOR VII SEMESTER- 2024-2025

B.E.(COMPUTER SCIENCE AND ENGINEERING)

Sl. No	Course Code	Course Title	Teaching Hours/Week				Examination			Credits	
			Theory Lecture(L)	Tutorial (T)	Practical	Self Study (S)	Duration in hours	CIE Marks	SEE Marks		Total Marks
1	21CS71x	Professional Elective –II	3	0	0	0	3	50	50	100	3
2	21CS72x	Professional Elective -III	3	0	0	0	3	50	50	100	3
3	21CS73OE	Open Elective –II	3	0	0	0	3	50	50	100	3
4	21CS74OE	Open Elective –III	3	0	0	0	3	50	50	100	3
5	21CSP75	Project Work	0	0	2	0	3	50	50	100	10
6	21NPAE76	Ability Enhancement Course (Online- 8 weeks)	--	--	--	--	--	--	--	--	2
Total			12	0	2	0	15	250	250	500	24

Professional Elective–II	
21CS711	Web Application Security
21CS712	Wireless Networks & Mobile Computing
21CS713	Data Mining and Warehousing

Professional Elective–III	
21CS721	Blockchain Technology
21CS722	Cloud Computing
21CS723	Virtual and Augmented Reality

Open Elective Course –II	
21CS73OE	Web Technologies

Open Elective Course -III	
21CS74OE	Fundamentals of Cloud Computing

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SCHEME OF TEACHING FOR VIII SEMESTER–21 SERIES

Sl. No	Course Code	Course Title	Teaching Hours/Week				Examination			Credits	
			Theory Lecture(L)	Tutorial (T)	Practical	Self-Study (S)	Duration in hours	CIE Marks	SEE Marks		Total Marks
1	21CSS81	Technical Seminar	--	--	--	--	--	50	--	50	1
2	21CSI82	Research/ Industry Internship	--	--	--	--	3	50	50	100	15
Total							3	100	50	150	16

Curriculum for B.E VII-VIII Semester - 21 Series (CSE) Syllabus 2024-2025

Course Title: WEB APPLICATION SECURITY		
Subject Code: 21CS711	Credit: 03	CIE:50
Number of Lecture Hours/Week	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	42	SEEHrs:03
Prerequisites: Computer Network		
Course Objectives:		
<ul style="list-style-type: none"> • Gain understanding of threat surface. • To discover security flaws in web applications. 		
MODULES		Teaching Hours
Module I		
Web Application Insecurity and Defense Mechanism: The Evolution of Web Applications, Web Application Security, Key Problem Factors, Handling User Access, Handling User Input, Handling Attackers Web application technologies: HTTP Protocol, Web Functionality, Encoding Schemes		08hrs
Module II		
Mapping Application: Enumerating Content and functionality, Analyzing application. Bypassing Client-side controls: Transmitting Data via Client Capturing User Data: HTML FORMS, Browser Extensions Attacking Authentication: Authentication technologies, Design flaws in authentication, Implementation flaws in authentication, Securing authentication.		09hrs
Module III		
Attacking Session Management: The Need for state, Weaknesses in token generation, Weaknesses in session token handling, Securing session management. Attacking Access Controls: Common vulnerabilities, Attacking access controls, Securing access controls.		08hrs
Module IV		
Attacking Data Stores: Injecting into interpreted contexts, Injecting into SQL, Injecting into NoSQL, Attacking Back-end components: Injecting OS Commands, Manipulating File Paths, Injecting into Back-end HTTP Requests.		09hrs
Module V		
Attacking Users: Cross-Site Scripting: Varieties of XSS, XSS Attacks in Action, Finding and Exploiting XSS vulnerabilities, Preventing XSS Attacks.		08hrs
Question paper pattern:		
The question paper will have ten questions.		
There will be Two questions from each module, covering all the topics from a module.		
The students will have to answer Five full questions , selecting one full question from each module.		

TEXTBOOK:		
1. Web Application Hacker's Handbook, Dafydd Stutarf, Marcus Pinto, Wiley, 2nd Edition, 2011		
REFERENCEBOOKS:		
1. Web Applications Security by Andrew Hoffman published O'Reilly Media, March 2020.		
2. Hacking Exposed Web Applications, Third Edition, 3rd Edition, by Joel Scambray, Vincent Liu, Caleb Sima. Released October 2010. Publisher(s): McGraw-Hill.		
3. Hacking: The Art of Exploitation by Jon Erickson, 2nd Edition, Feb 2008		
4. Penetration Testing: A Hands-On Introduction to Hacking Paperback by Georgia Weidman, June 2014.		
Course outcomes:		
On completion of the course, the student will have the ability to:		
Course Code	CO#	Course Outcome(CO)
21CS711	CO1	Describe vulnerabilities associated with web applications.
	CO2	Analyze the application and identify authentication design flaws
	CO3	Evaluate session management and access control vulnerabilities and adopt security methods.
	CO4	Demonstrate SQL and OS injection in an ethical way.
	CO5	Explore different cross site scripting(xss) flaws and to prevent xss attacks

Curriculum for B.E VII-VIII Semester - 21 Series (CSE) Syllabus 2024-2025

Course Title: WIRELESS NETWORKS & MOBILE COMPUTING		
SubjectCode: 21CS712	Credits:3	CIE:50
Number of Lecture Hours/Week	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	42	SEEHrs:03
Prerequisites: Computer Networks		
Course Objectives:		
<ul style="list-style-type: none"> • To learn the basics of Wireless voice and data communications technologies. • To study the working principles of wireless LAN and its standards. • To build knowledge on various Mobile Computing algorithms. • To build skills in working with Wireless application Protocols to develop mobile content applications 		
Modules		Teaching Hours
Module - I		
Wireless Communication Fundamentals: Introduction – Wireless transmission – Frequencies for radio transmission –Signals – Antennas Signal Propagation – Multiplexing – Modulations – Spread spectrum–MAC– SDMA– FDMA– TDMA–CDMA–Cellular Wireless Networks.		09Hrs
Module– II		
Telecommunication Networks : Telecommunication systems–GSM– GPRS– DECT–UMTS–IMT-2000–SatelliteNetworks-Basics– Parameters and Configurations–Capacity Allocation–FAMA and DAMA–Broadcast Systems– DAB-DVB.		09Hrs
Module–III		
Wireless LAN : Wireless LAN –IEEE 802.11-Architecture–services–MAC– Physical layer–IEEE802.11a802.11b standards– HIPERLAN–Blue Tooth.		08Hrs
Module–IV		
Mobile Network Layer : Mobile IP – Dynamic Host Configuration Protocol - Routing – DSDV – DSR –Alternative Metrics		08Hrs
Module – V		
Transport And Application Layers: Traditional TCP–Classical TCP improvements–WAP, WAP 2.0		08Hrs
Question paper pattern:		
The question paper will have ten questions. There will be Two questions from each module, covering all the topics from a module. The students will have to answer Five full questions , selecting one full question from each module.		
Text Books:		
1.Jochen Schiller, “Mobile Communications”, PHI / Pearson Education, Second Edition,2008.		
Reference Books:		
1.Kaveh Pahlavan, Prasanth Krishnamoorthy,“ Principles of Wireless Networks”, PHI/ Pearson Education,2003.		
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, New York,2003.		
3. Hazysztof Wesolowshi, “Mobile Communication Systems”, John Wiley and Sons Ltd, 2012.		

Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
21CS712	CO1	Understand the concept of Wireless Communication Fundamentals.
	CO2	Demonstrate the concepts of wireless technologies.
	CO3	Illustrate Wireless Architecture and services.
	CO4	Demonstrate routing protocols .
	CO5	Describe Transmission control Protocol and Wireless Application Protocol

Curriculum for B.E VII-VIII Semester - 21 Series (CSE) Syllabus 2024-2025

Course Title: DATA WAREHOUSING AND MINING		
SubjectCode: 21CS713	Credits:3	CIE:50
Number of Lecture Hours/Week	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	42	SEE Hours:03
Prerequisite: Basic Knowledge about Database, 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
<p style="text-align: center;">Module I</p> <p>Introduction: Why Data Mining, Kinds of Data Can be Mined, Kinds of Patterns can be Mined, Technologies used for Data Mining, Kinds of Applications Targeted, Major issues in Data Mining. Data Objects and Attribute types, Measuring Data Similarity and Dissimilarity, Data Preprocessing: Data Preprocessing Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization</p>		09 Hrs
<p style="text-align: center;">Module II</p> <p>Data Warehouse and Online Analytical Processing: Data Warehouse, Data Warehouse Modeling for Data cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction.</p>		08 Hrs
<p style="text-align: center;">Module III</p> <p>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, Bayesian Belief Networks, Lazy Learners.</p>		09 Hrs
<p style="text-align: center;">Module IV</p> <p>Cluster Analysis: Basic Concepts and Methods Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Evaluation of Clustering, Clustering High-Dimensional Data, Clustering with Constraints, Outliers and Outlier Analysis.</p>		08 Hrs
<p style="text-align: center;">Module V</p> <p>Data Mining Trends and Research Frontiers: Mining of Complex Data Types, Methodologies of Data Mining, Data Mining Applications, Data Mining and Society, Data Mining Trends.</p>		08 Hrs
Question paper pattern:		
The question paper will have ten questions.		
There will be Two questions from each module, covering all the topics from a module.		
The students will have to answer Five 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, 3 rd Edition, 2012.		

REFERENCES:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, *“Introduction to Data Mining”* Pearson education, Second Edition, 2019.
2003.
2. Arun K Pujari, *“Data Mining Techniques”* –University Press, Private Limited, 2013.
3. 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)
21CS713	CO1	Identify the scope and necessity of Data Mining and Warehousing for the Society.
	CO2	Illustrate the analysis of Data Warehouse and Online Analytical Processing
	CO3	Design and deploy appropriate classification techniques.
	CO4	Ability to develop various algorithms based on Cluster Analysis
	CO5	Discuss the Data Mining trends and applications.

Curriculum for B.E VII-VIII Semester - 21 Series (CSE) Syllabus 2024-2025

Course Title: BLOCKCHAIN TECHNOLOGY		
Subject Code: 21CS721	Credits:3	CIE:50
Number of Lecture Hours/Week	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	42	SEEHours:03
Pre-Requisite: Computer Networks, Security Basic Concepts.		
Course objectives: <ul style="list-style-type: none"> ● Understand the philosophy of Blockchain and the cutting edge technology behind its functions ● Illustrate how to setup Ethereum tools ● Explain the key vocabulary and concepts used in Blockchain for Business. 		
MODULES		Teaching Hour
<p style="text-align: center;">Module-I</p> <p>Basics of Blockchain: Introduction, Concept of Blockchain, History, Definition of Blockchain, Fundamentals of Blockchain, Characteristics of Blockchain, Consensus in Trust –Building Exercise, Public, Private and Hybrid Blockchain, Distributed Ledger Technologies, DLT Decentralized Applications, Architecture of Blockchain, Transactions, Chaining Blocks, Value Proposition of Blockchain Technology.</p> <p>Decentralized System: Introduction, Distributed Decentralized Databases, Decentralized Enterprise, Decentralization, Disintermediation, Decentralized Enterprise Regulation.</p>		8 Hrs
<p style="text-align: center;">Module-II</p> <p>Hash Functions: Introduction, Hashing, Message Authentication Code, Secure Hash Algorithms (SHA-1), Secure Hash Algorithm Version 3, Distributed Hash Tables, Hashing and Data Structures, Hashing in Blockchain Mining.</p> <p>Consensus: Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods.</p>		8 Hrs
<p style="text-align: center;">Module-III</p> <p>Blockchain Components: Introduction, Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Cryptography: Introduction, Cryptography and its primitives, Symmetric Cryptography, Asymmetric Cryptography.</p> <p>Smart Contracts: Introduction, Smart Contracts, Absolute and Immutable, Contractual Confidentiality, Law Implementation and Settlement, Characteristics, Internet of Things, Types of Smart Contracts, Types of Oracles.</p>		8Hrs
<p style="text-align: center;">Module-IV</p> <p>Consortium Blockchain: Introduction, Key Characteristics of Consortium Blockchain, Why we need Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda. Initial Coin Offering: Introduction, Blockchain Fundraising methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO.</p>		8Hrs

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Module-V		10Hrs
<p>Security in Blockchain: Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyper ledger Fabric.</p> <p>Applications of Blockchain: Introduction, Blockchain in Banking, Blockchain in Education, Blockchain in Health Care, Blockchain in Supply chain, The Blockchain and IoT.</p>		
<p>Question paper pattern: The question paper will have ten questions. There will be Two questions from each module, covering all the topics from a module. The students will have to answer Five full questions , selecting one full question from each module.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Kumar Saurabh, Ashutosh Saxena, “Blockchain Technology Concepts and Applications”, First Edition, Wiley India Pvt, 2020. Refer the above mentioned text book for Module I, Module II and Module III. 2. Chandramouli Subramanian, Asha A George, Abhilash K A and MeenaKarthikeyan, “Blockchain Technology”, University Press, 2021. Refer the above mentioned text book for Module III, Module IV and Module V. 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies 2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System 3. DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger,” Yellowpaper.2014. 4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts 		
<p>Course outcomes: On completion of the course, the student will have the ability to:</p>		
Course Code	CO#	Course Outcome (CO)
21CS721	CO1	Understand the concept, fundamentals, Characteristics and definition of Blockchain.
	CO2	Illustrate the use of Hash Functions and Consensus
	CO3	Experiment with Blockchain Components and Smart contracts Examples and Patterns.
	CO4	Make use of Consortium Blockchain and Initial Coin Offering
	CO5	Develop Security in Blockchain and its applications.

Curriculum for B.E VII-VIII Semester - 21 Series (CSE) Syllabus 2024-2025

Course Title: CLOUD COMPUTING		
SubjectCode: 21CS722	Credits :3	CIE:50
Number of Lecture Hours/Week	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	42	SEE Hours:03
Prerequisites: Operating systems, Computer networks		
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		9 Hrs
<p>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 App Engine, 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. Case Study Containers, Dockers.</p>		
Module-II		8 Hrs
<p>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.</p>		

<p style="text-align: center;">Module-III</p> <p>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</p> <p>Decomposition: Matrix Multiplication, Functional Decomposition: Sine, Cosine, and Tangent. High-Throughput Computing: Task Programming, Task Computing, Characterizing 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.</p>	<p>09 Hrs</p>
<p style="text-align: center;">Module-IV</p> <p>Data Intensive Computing: Map-Reduce Programming, Data-Intensive Computing, Characterizing Data-Intensive Computations, Challenges Ahead, Historical Perspective, Technologies for Data-Intensive Computing, Storage Systems, Programming Platforms, Aneka Map Reduce Programming, Introducing the Map Reduce Programming Model, Example Application.</p>	<p>08 Hrs</p>
<p style="text-align: center;">Module-V</p> <p>Cloud Platforms in Industry, Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine, 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.</p>	<p>08 Hrs</p>
<p>Question paper pattern: The question paper will have ten questions. There will be Two questions from each module, covering all the topics from a module. The students will have to answer Five full questions , selecting one full question from each module.</p>	
<p>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 2014.</p>	

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-10:012416675
2. T. Erl, R. Puttini, and Z. Mahmood, Cloud Computing: Concepts, Technology & Architecture ISBN-10:0133387526 • ISBN-13:9780133387520 ©2013 • Prentice Hall.

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

Course Code	CO #	Course Outcome (CO)
21CS722	CO1	Describe Cloud Computing setup and applications using different architecture and understand concept of Virtualization.
	CO2	Demonstrate various cloud reference models and deployment modes
	CO3	Develop and deploy cloud application using popular cloud platforms.
	CO4	Understand Data intensive computing and apply Map Reduce
	CO5	Describe the importance of cloud computing driven commercial systems.

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COURSE TITLE: VIRTUAL AND AUGMENTED REALITY		
Subject Code: 21CS723	Credits:03	CIE:50
Number of Lecture Hours/Week(L:T:P)	3:0:0Hrs	SEE:50
Total Number of Lecture Hours	42	SEEHrs:03
Prerequisites:		
Course Objectives: <ul style="list-style-type: none"> • Describe the working of VR systems and list the applications of VR. • Design and implementation of the hardware that enables VR systems to be built • Understand the system of human vision and its implication on perception and rendering. • Explain the concepts of motion and tracking in VR systems. • Describe the applications of MR, AR and VR 		
MODULES		Teaching Hours
Module-I		08Hrs
Mixed Reality: Introduction, A history of MR technologies, Origin of MR concept Virtual Reality: Definitions, Terms for understanding VR, Virtuality, Virtual object/image, Virtual world/environment, Presence, Telepresence, Types of VR: Immersive VR, Non-Immersive VR.		
Module-II		09Hrs
Current VR Technologies: Hardware, HMDs (Head-Mounted Displays) as an Output, HMDs, Tethered HMDs, Mobile phone integrated HMDs, Stand-alone HMDs, 2 Inputs, Software, Game Engines, 3D modelling tools, Video editing, Benefits. Disadvantages, Examples of VR applications.		
Module-III		09Hrs
Augmented Reality: Definitions, Terminology associated with AR, Types of AR, Marker-based AR, Markerless-based AR, Current AR Technologies, Hardware, Tracking systems for AR, AR Displays, Head attached displays (HADs), Handheld displays, Spatial Displays		
Module-IV		08Hrs
Augmented Reality Software: Interaction in AR interfaces, Tangible AR interfaces, Collaborative AR interfaces, Hybrid AR interfaces, Multimodal AR interfaces AR development tools: Vuforia, Easy AR, Wikitude, Kudan, 5 AR Tool Kit, AR Core, AR Kit, Benefits of AR, Disadvantages, Examples of AR Applications		
Module-V		08Hrs
Augmented Reality in Education: AR applications for primary school , AR applications for science training, AR applications for social science training, AR applications for high school and university, AR applications for in-service & professional training, ID in MR , What is ID Characteristics of the ID process, MR ID models , Should I use MR technologies for my teaching process, How do I design my MRLE, 3D environment design, Hints for deciding on your ID.		
Question paper pattern: The question paper will have ten questions. There will be Two questions from each module, covering all the topics from a module. The students will have to answer Five full questions , selecting one full question from each module.		

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Text Books:

1. Virtual and Augmented Reality: An Educational Handbook by Zeynep Tacgin, Cambridge Scholars Publishing, 2020 .

Reference Books:

1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2018

Course outcomes:

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

Course Code	CO#	Course Outcome(CO)
21CS723	CO1	Describe Mixed and Virtual Reality
	CO2	Analyze and Describe the working of Virtual Reality
	CO3	Explain Augmented Reality
	CO4	Understand the use of Augmented Reality Software and uses
	CO5	Demonstrate the applications Augmented and Virtual Reality

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Course Title: WEB TECHNOLOGIES		
SubjectCode: 21CS73OE	Credits :3	CIE:50
Number of Lecture Hours/Week	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	42	SEEHours:03
Pre-requisite: Basics of any Programming Language		
Course objectives: <ul style="list-style-type: none"> ● Provide the principles and practical programming skills of developing Webapplications. ● Enables students to develop skills for creating dynamic webpages using JavaScripts, XML, PHP as Server side Scripting. 		
Modules		Teaching Hours
Module-I		08Hrs
<p>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.</p> <p>CSS: Introduction ; Levels of Style Sheets; Style Specification formats; Selector Forms; Property value forms; Font properties; ListProperties; Color; Alignment of Text; The Box Model; Background Images; The and <div> tags; Conflict Resolution.</p>		
Module-II		09Hrs
<p>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.</p> <p>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.</p>		
Module-III		08Hrs
<p>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 dropping elements.</p>		

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Module-IV		09Hrs
<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>		
Module-V		08Hrs
<p>PHP: Origins and uses of PHP; Overview of PHP; General Syntactic Characteristics; Primitive; Operations and Expressions; Output; Control Statements; Arrays; Functions; Pattern Matching; Form Handling, Files, Cookies; Session Tracking.</p>		
<p>Question paper pattern: The question paper will have ten questions. There will be Two questions from each module, covering all the topics from a module. The students will have to answer Five 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>"- 6th Edition, Pearson Education, 2011. 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, Wiley India, 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)
21CS73OE	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	Create XML documents with CSS, XSLT and Illustrate use of XML processors, web services.
	CO5	Create PHP documents for server side scripting

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Course Title: FUNDAMENTALS OF CLOUD COMPUTING		
Subject Code: 21CS74OE	Credits :3	CIE:50
Number of Lecture Hours/Week	3:0:0	SEE:50
Total Number of Lecture Hours	42	SEEHours:03
Pre-requisite: Basics of any Programming Language		
Course objectives: <ul style="list-style-type: none"> • Fundamentals of Cloud Computing Mechanisms, Architecture • The Concepts of cloud goals benefits risks and challenges. • Cloud computing concepts of cloud delivery and Deployment models. • Cloud computing Virtualization ,web technology Cloud threat agents and security threats. 		
Modules		Teaching Hours
<p style="text-align: center;">Module-I</p> <p>Introduction: Basic concept and terminology, Goals and Benefits, Risks and challenges, Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models.</p> <p>Cloud Enabling Technology: Network and internet Architecture, Cloud Data Centres Technology, Modern Virtualization, Multitenant Technology, Service Technology and Service APIs</p>		08 Hrs
<p style="text-align: center;">Module-II</p> <p>Understanding Cloud Security and Cybersecurity: Basic Security Terminology, Basic Threat Terminology, Threat Agents, Common Threats.</p> <p>Understanding Containerization: Fundamental Virtualization and Containerization, Understanding Containers</p>		08 Hrs
<p style="text-align: center;">Module-III</p> <p>Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Hypervisor, Cloud Storage Device, Cloud Usage Monitor, Resource Replication ,Ready-Made Environment.</p> <p>Cloud Security and Cyber Security Mechanisms: Container, Encryption, Hashing, Digital Signature, Cloud-Based Security Groups, Public Key Infrastructure(PKI)System, Single Sign-On(SSO)System, Hardened Virtual Server Image, Firewall,, Virtual Private Network(VPN),Biometric Scanner Multi-Factor Authentication(MFA) System Intrusion Detection System(IDS), User Behavior Analytics(UBA) System, Third-Party Software Update Utility, Network intrusion Monitor, Authentication Log Monitor, VPN Monitor.</p>		09 Hrs
<p style="text-align: center;">Module-IV</p> <p>Cloud Management Mechanism: Remote Administration System, Resource Management System, SL A Management System, Billing Management System</p> <p>Cloud Computing Architecture: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture, Multicloud Architecture, Case Study Example, Hypervisor Clustering Architecture, Virtual Server Clustering Architecture, Load-Balanced Virtual Server Instances Architecture.</p>		09 Hrs
<p style="text-align: center;">Module-V</p> <p>Cost Metrics and Pricing Models : Business Cost Metrics, Case Study Example, Cloud Usage Cost Metrics Cost Management Considerations, Case study Example</p>		

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<p>Cloud Delivery Models: Cloud Provider Perspective, Cloud Consumer Perspective.</p> <p>Cloud Platforms in Industry: Amazon Web Services, Google App Engine, Microsoft Azure</p> <p>Cloud Applications: Scientific Application, Business and Consumer Applications.</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: 1. Cloud computing: concepts, technology & architecture .The Pearson service technology series Thomas Erl, Maugham Mahmood, and Ricardo Puttini 2013</p>		
<p>Reference Books: 1. John W. itinghouse james F.Ransome, “<i>Cloud Computing Implementation, Management and Security</i>” , CRC Press. 2. Borko Furht. Armando Escalante, “<i>Handbook of Cloud Computing</i>”, Springer 2010 3. Charles Badcock, “<i>Cloud Revolution</i>” , TMH</p>		
<p>Course outcomes: On completion of the course, the student will have the ability to:</p>		
Course Code	CO #	Course Outcome (CO)
21CS740E	CO1	Articulate the main concepts of Cloud Computing Mechanisms, Architecture and working with clouds.
	CO2	Describe the security issues and study common threats, Virtualization and Containerization.
	CO3	Identify the cloud delivery and infrastructure mechanisms.
	CO4	Describe cloud computing architecture.
	CO5	Discuss pricing models and study platforms and applications.

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Course Title: PROJECT WORK		
Subject Code: 21CSP75	Credit:2	CIE:50
Number of Practical Hours/Week	2 Hrs	SEE:50
		SEE Hours:03
Course Objectives:		
<ul style="list-style-type: none"> ● Gain and revise the knowledge of contemporary issues through literature surveys. ● Formulate, design and implement the solutions to real world problems. ● Apply programming skills to bring out solutions to global, economic, environmental and societal problems. ● Apply modern technologies and engineering tools. ● Effectively communicate verbally and literally. ● 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)
21CSP75	CO1	Apply basic engineering knowledge and identify the problem either individually or as a group.
	CO2	Evaluate the knowledge of contemporary issues through literature survey and formulate the problems.
	CO3	Design the problem using software engineering practices.
	CO4	Apply Engineering skills to solve problems of Engineering applications
	CO5	Prepare a well organized report.

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Course Title : TECHNICAL SEMINAR		
Subject Code : 21CSS81	Credit :1	CIE: 50
Course Objectives:		
<ul style="list-style-type: none"> ● Identify state of art topic in current trends. ● Perform self-study. ● Comprehend the domain knowledge and organize well documented report and make overall presentation. 		
Course outcomes:		
On completion of the course, the student will have the ability to:		
Course Code	CO #	Course Outcome (CO)
21CSS81	CO1	Identify current and significant topics focusing current IT trends
	CO2	Conduct literature survey to identify ,analyse on the selected seminar topic
	CO3	Present the selected topic with effective communication and presentation skills.
	CO4	Summarize the work and present future scope
	CO5	Compile and make technical report.

Course Title : RESEARCH/ INDUSTRY INTERNSHIP		
Subject Code : 21CSI82	Credit :15	
CIE: 50	SEE: 50	
<p>Course Objectives:</p> <ul style="list-style-type: none"> • Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job to create competent professionals. • Expose to the current technological developments relevant to the subject area of training. • Use the experience gained from the industrial internship in discussions held in the classrooms. • Create conditions conducive to quest for knowledge and its applicability on the job. • Learn to apply Technical knowledge in real industrial situations. • Gain experience in writing reports in Technical works/projects. • Expose students to the engineer’s responsibilities and ethics. • Promote academic, career and/or personal development. 		
<p>Guidelines:</p> <p>The Industry/Research Internship should be completed in VII / VIII Semester; Duration of the Industry/Research Internship shall be 15 weeks. Each student should submit the internship report at the end of semester with internship certificate. Viva-voce examination shall be conducted by a panel of examiners.</p> <p>An Industry/ Research Internship should be conducted under the supervision of Faculty Mentor</p>		