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

## DEPARTMENT OF
## COMPUTER SCIENCE AND ENGINEERING
## B.E. in COMPUTER SCIENCE & DESIGN

## B.E.VII AND VIII SEMESTER

ESTD : 1958

## 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 hasreceived 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 levelstudents 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 25students) and PG(Computer Network and Engineering with an intake of 18 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 theindustry 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 design, analyze and solve computing problems. |
| PSO2: | Develop solution for scientific and business applications using software engineering practices. |
| PSO3: | Create innovative solutions from idea to product by applying cutting edge technologies using modern tools to find novel solution ethically. |

## SCHEME OF TEACHING FOR VII SEMESTER- 2024-2025

### B.E.(COMPUTER SCIENCE AND DESIGN)

| Sl. No | Course Code | Course Title | Teaching Hours/Week | | | | Examination | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory Lecture(L) | Tutorial (T) | Practical | Self Study (S) | Duration in hours | CIE Marks | SEE Marks | Total Marks | Credits |
| 1 | 21CG71x | Professional Elective –II | 3 | 0 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 2 | 21CG72x | Professional Elective -III | 3 | 0 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 3 | 21CG73OEX | Open Elective –II | 3 | 0 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 4 | 21CG74OEX | Open Elective –III | 3 | 0 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 5 | 21CGP75 | 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** | |
|---|---|
| 21CG711 | Web Application Security |
| 21CG712 | Metaverse |
| 21CG713 | Human Computer Interaction |

| **Professional Elective–III** | |
|---|---|
| 21CG721 | Blockchain Technology |
| 21CG722 | Cloud Computing |
| 21CG723 | Animation and Game Design |

| **Open Elective Course -II** | |
|---|---|
| 21CG73OE1 | Web Technologies |

| **Open Elective Course -III** | |
|---|---|
| 21CG74OE1 | Fundamentals of Cloud Computing |

## SCHEME OF TEACHING FOR VIII SEMESTER–21 SERIES

| Sl. No | Course Code | Course Title | Teaching Hours/Week | | | | Examination | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory Lecture(L) | Tutorial (T) | Practical | Self Study (S) | Duration in hours | CIE Marks | SEE Marks | Total Marks | Credits |
| 1 | 21CGS81 | Technical Seminar | -- | -- | -- | -- | -- | 50 | -- | 50 | 1 |
| 2 | 21CGI82 | Research/ Industry Internship | -- | -- | -- | -- | 3 | 50 | 50 | 100 | 15 |
| | | **Total** | | | | | **3** | **100** | **50** | **150** | **16** |

| **Course Title: WEB APPLICATION SECURITY** | | |
|---|---|---|
| Subject Code:**21CG711** | Credit:**03** | CIE:50 |
| Number of Lecture Hours/Week | 3:0:0 Hrs | SEE:50 |
| Total Number of Lecture Hours | 42 | SEEHours:03 |
| Prerequisites: Computer Network | | |

**Course Objectives:**

- Gain understanding of threat surface.
- To discover security flaws in web applications.

| **MODULES** | **Teaching Hours** |
|---|---|
| **Module I**<br>**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<br>**Web application technologies:** HTTP Protocol, Web Functionality, Encoding Schemes | **08hrs** |
| **Module II**<br>**Mapping Application:** Enumerating Content and functionality, Analyzing application. **Bypassing Client-side controls:** Transmitting Data via Client Capturing User Data: HTML FORMS, Browser Extensions<br>**Attacking Authentication:** Authentication technologies, Design flaws in authentication, Implementation flaws in authentication, Securing authentication. | **09hrs** |
| **Module III**<br>**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**<br>**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**<br>**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 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**.**

**TEXTBOOK:**

1.Web Application Hacker's Handbook, Dafydd Stutarf, Marcus Pinto,Wiley,2ndEdition,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) |
|---|---|---|
| 21CG711 | 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 measures to prevent XSS attacks. |

| **Course Title: METAVERSE** | | |
|---|---|---|
| Subject Code: **21CG712** | **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:** Knowledge of hardware like PC and mobile device, software - coding languages like python etc

**Course Objectives:**

- To understand the History of Metaverse.
- Explore the role of Metaverse to connect the real world and blockchain.
- To understand the advanced development of blockchain in the future.
- To study an open ecosystem of smart properties and assets.
- To explore the integration of futuristic technologies such as blockchain, crypto currency,DAO, AR/VR

| **Modules** | **Teaching Hours** |
|---|---|
| **Module - I**<br>**Introduction To Metaverse:** Introduction to Metaverse and immersive experience- History of Metaverse- Metaverse value chainwith 7 layer | **09 Hrs** |
| **Module – II**<br>**TECHNOLOGIES INVOLVED IN THE METAVERSE :** Metaverse as a product of Extended Reality- Augmented Reality (AR)- Virtual Reality (VR)- Benefits of AR/VR-Difference between AR/ VR - Mixed Reality (MR)-Artificial Intelligence (AI) Introduction in Metaverse-Financial and Economics of Metaverse-Benefits of Metaverse | **09 Hrs** |
| **Module –III**<br>**BLOCKCHAIN ADOPTION IN METAVERSE:** Blockchain Overview-History of Blockchain-Need of Decentralization in MV-Smart Contract Capabilities in Blockchain - Blockchain in Metaverse -Understanding Tokens-Understanding the NFT-NFT Token Standards-NFT | **08 Hrs** |
| **Module -IV**<br>**AR, VR, AND MR IN METAVERSE:** Everything about VR (Virtual Reality)-Everything about AR (Augmented Reality)-Everything about MR (Mixed Reality)-Block chain Identity Management in Metaverse -NFT (non-fungible token) for Metaverse-Introduction to NFTs-History of NFTs-Benefits of NFTs | **08 Hrs** |
| **Module - V**<br>**USE-CASES:** Gaming in Metaverse-Meetings in Metaverse-Virtual Learning in Metaverse-Social Interactions in Metaverse-Virtual Real-estate in Metaverse-e-commerce in Metaverse-Travel in Metaverse- Personalized Avatars-Digital Identity in Metaverse | **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. The Metaverse: And How It Will Revolutionize Everything Kindle Edition by Matthew Ball Publisher : Liveright ,2022.
2. The Metaverse Handbook: Innovating for the Internet's Next Tectonic Shift Kindle Edition by QuHarrison Terry (Author), Scott Keeney (Author), Paris Hilton (Foreword), Publisher: Wiley; 1st edition ,2022.

**Reference Books :**

1. The Wearable Technology Handbook, Haider Raad, scholar publcialtions,2017.
2. Metaverse Made Easy: A Beginner's Guide to the Metaverse, Dr.Liew VoonKiong, Publisher, Liew Voon Kiong, 2022.
3. Metaverse For Beginners and Advanced: A Complete Journey Into the Metaverse Virtual World (Web 3.0), Darell Freeman, Publisher Darell Freeman,2022.
4. Metaverse Glossary - Your Gateway to the Future ,Publishing, 2022 .
5. The Metaverse: Prepare Now for the Next Big Thing Paperback , Terry Winters , Winters media Publication 2021

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

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| 21CG712 | CO1 | Describe metaverse and its history |
| | CO2 | Explore the technologies involved in the metaverse |
| | CO3 | Explain blockchain, its history and need of blockchain in metaverse |
| | CO4 | Integrate AR, VR, MR and blockchain,identity management in metaverse |
| | CO5 | Discuss case studies of metaverse |

| **Course Title: HUMAN COMPUTER INTERACTION** | | |
|---|---|---|
| Subject Code :**21CG713** | Credit : 3 | CIE: 50 |
| Number of Lecture Hours/Week | **3:0:0 Hrs** | SEE: 50 |
| Total Number of Lecture Hours | 42 | SEE Hours: 03 |
| **Pre-requisite:** Programming skill , Data structures**,** Mathematics. | | |
| **Course Objectives:**<br>• To gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface design<br>• Able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks<br>• Recognize the limits of human performance as they apply to computer operation<br>• Understand the social implications of technology and their ethical responsibilities as engineers in the design of technological systems. | | |
| **MODULES** | | **Teaching Hours** |
| **Module –I**<br><br>**Introduction:** Importance of user Interface –definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user –Interface popularity, characteristics-Principles of user interface | | **09 Hrs** |
| **Module-II**<br><br>Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis –presentation information simply and meaningfully– information retrieval on web– statistical graphics– Technological consideration in interface design. | | **08Hrs** |
| **Module-III**<br><br>Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors. | | **08Hrs** |
| **Module- IV**<br>HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert 12 - analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction. | | **08 hrs** |

| **Module- V** | |
|---|---|
| **Cognitive models Goal and task hierarchies Design Focus:** GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right. | **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. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech., 2007.
2. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education, 3rd edition, 2004.

**REFERENCE BOOKS:**

1. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia,2005.
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech, 4th Edition, 2015
3. User Interface Design, Soren Lauesen , Pearson Education, 2nd Edition, 2005.
4. Human –Computer Interaction, D. R. Olsen, Cengage Learning, 2nd Edition, 2010
5. Human –Computer Interaction, Smith - Atakan, Cengage Learning.2009

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

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| 21CG713 | **CO1** | Understand the importance of user interface, GUI characteristics and user interface principles |
| | **CO2** | Analyse the information presentation |
| | **CO3** | Analyze different window schemes with control types, components & colours |
| | **CO4** | Understand universal design with integrating HCI into software processes |
| | **CO5** | Utilize cognitive models, ubiquitous computing & augmented realities |

| **Course Title: BLOCKCHAIN TECHNOLOGY** | | |
|---|---|---|
| Subject Code:**21CG721** | 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:**<br>● Understand the philosophy of Block chain and the cutting edge technology behind its functions<br>● Illustrate how to setup Ethereum tools<br>● Explain the key vocabulary and concepts used in Block chain for Business. | | |
| **MODULES** | | **Teaching Hour** |
| **Module-I**<br>**Basics of Block chain**: Introduction, Concept of Block chain, History, Definition of Block chain, Fundamentals of Block chain, Characteristics of Block chain, Consensus in Trust –Building Exercise, Public, Private and Hybrid Block chain, Distributed Ledger Technologies, DLT Decentralized Applications, Architecture of Block chain, Transactions, Chaining Blocks, Value Proposition of Block chain Technology.<br>**Decentralized System**: Introduction, Distributed Decentralized Databases, Decentralized Enterprise, Decentralization, Disintermediation, Decentralized Enterprise Regulation. | | **8 Hrs** |
| **Module–II**<br>**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.<br><br>**Consensus:** Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods. | | **8 Hrs** |
| **Module-III**<br>**Block chain Components**: Introduction, Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Cryptography: Introduction, Cryptography and its primitives, Symmetric Cryptography, Asymmetric Cryptography.<br>**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. | | **8Hrs** |
| **Module-IV**<br>**Consortium Block chain:** Introduction, Key Characteristics of Consortium Block chain, Why we need Consortium Block chain, Hyperledger Platform, Overview of Ripple, Overview of Corda. **Initial Coin Offering**: Introduction, Block chain Fundraising methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO. | | **8Hrs** |

| Module-V | |
|---|---|
| **Security in Block chain:** Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Block chain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyper ledger Fabric.<br><br>**Applications of Block chain:** Introduction, Block chain in Banking, Block chain in Education, Block chain in Health Care, Block chain in Supply chain, The Block chain and IoT. | **10Hrs** |

**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. 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, "Block chain Technology", University Press, 2021.

**Refer the above mentioned text book for Module III, Module IV and Module V.**

**Reference Books:**

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,"Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

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

| Course Code | CO# | Course Outcome(CO) |
|---|---|---|
| 21CG721 | CO1 | Understand the concept, fundamentals, Characteristics and definition of Block chain. |
| | CO2 | Illustrate the use of Hash Functions and Consensus |
| | CO3 | Experiment with Block chain Components and Smart contracts Examples and Patterns. |
| | CO4 | Make use of Consortium Block chain and Initial Coin Offering |
| | CO5 | Develop Security in Block chain and its applications. |

| **Course Title: CLOUD COMPUTING** | | | |
|---|---|---|---|
| SubjectCode:**21CG722** | Credits :3 | | CIE:50 |
| Number of Lecture Hours/Week | **3Hrs** | | SEE:50 |
| Total Number of Lecture Hours | 42 | | SEEHours:03 |
| **Prerequisites: O**perating systems, Computer networks | | | |
| **Course objectives:**<br>• To understand Virtualization and learn Cloud Services<br>• To implement Task Scheduling algorithms.<br>• Apply Map-Reduce concept. | | | |

| **Modules** | **Teaching Hours** |
|---|---|
| **Module-I**<br>**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. | **9 Hrs** |
| **Module-II**<br>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. | **8 Hrs** |

| | |
|---|---|
| **Module-III**<br>**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<br>**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 Applicationswith the Task Model, developing Parameter Sweep Application, Managing Workflows. | **09 Hrs** |
| **Module-IV**<br>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 Map Reduce Programming, Introducing the Map Reduce Programming Model, Example Application. | **08 Hrs** |
| **Module-V**<br>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. | **08 Hrs** |
| **Question paper pattern:**<br>The question paper will have ten questions.<br>There will be 2 questions from each module, covering all the topics from a module.<br>The students will have to answer 5 full questions, selecting one full question from each module**.** | |
| **Text Book:**<br>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. | |

**REFERENCEBOOKS**

1. Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, 1stedition,2014,MorganKaufmannPublishers,Inc.,SanFrancisco.ISBN-13:978-0124166752,ISBN-10:012416675
2. T. Erl, R. Puttini, and Z. Mahmood, Cloud Computing: Concepts, Technology & ArchitectureISBN-10:0133387526•ISBN-13:9780133387520©2013•PrenticeHall.

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

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| 21CG722 | 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. |

| Course Title: **ANIMATION AND GAME DESIGN** | | |
|---|---|---|
| Subject Code :**21CG723** | Credit : 3 | CIE: 50 |
| Number of Lecture Hours/Week | **3:0:0 Hrs** | SEE: 50 |
| Total Number of Lecture Hours | 42 | SEE Hours: 03 |
| **Pre-requisite:** Mathematics, computer graphics, AR and VR. | | |
| **Course Objectives**<br>• Understand the basics of animation and game theory<br>• Demonstrate the principles of animations and operations<br>• Explain 2D animation techniques<br>• Describing and Solving Game theory problems<br>• Demonstrate applications of the Game Designs | | |
| **MODULES** | | **Teaching Hours** |
| **Module –I**<br>**Basics of Animations-Development:** Idea Creation, Evolving a Story line.<br>**Character Design:** The Evolution of 2D Character Design, The Evolution of 3D Character Design, Animation Style, Concept and Environment Design.<br>**Project Financing:** Animation Markets, Scheduling and Budgeting, Investment, Marketing and Distribution Possibilities. | | **08 Hrs** |
| **Module-II**<br>**Principles of Animation**: Key Poses, Breakdowns, and In between, Timing, Extreme Positions, Arcs and Paths of Action, Holds, Emphasis, Anticipation, Weight and Weighted Movement, Flexibility and Fluid Joint Movement, Overlapping Action, Generic Walks, Walk Cycles, Runs and Run Cycles, Silhouetting, Dialogue and Lip Sync, Laughter, Takes, Eyes and Expressions. | | **08 Hrs** |
| **Module-III**<br>2DAnimation Overview: It's All about Pencils and Paper Script, The Tools of the Trade. 2DAnimation Basics: Keys, In-betweens, and Timing, Dope(Exposure) Sheets and Production Folders, Flipping and Peg Bars, Using Peg Bars | | **08 Hrs** |
| **Module- IV**<br>**Introduction to Game theory:** What is game theory? An outline of the history of game theory, John von Neumann, The theory of rational choice, Coming attractions.<br><br>**Games with Perfect Information**: Nash Equilibrium: Theory , Strategic games, Nash equilibrium, Examples of Nash equilibrium, Experimental evidence on the Prisoner's Dilemma, Focal points, Best response functions, Dominated actions, Equilibrium in a single population: symmetric games and symmetric equilibria | | **08 hrs** |

| | |
|---|---|
| **Module – V**<br>**Nash Equilibrium:** Illustrations, Cournot's model of oligopoly, Bertrand's model of oligopoly, Cournot, Bertrand, and Nash: some historical notes, Electoral competition, The War of Attrition, Auctions, Auctions from Babylonia to eBay, Accident law<br>. | **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. Animation From Pencil to Pixels, Tony White, Classical Techniques for Digital Animators, Focal Press is an imprint of Elsevier, 2006.
2. Martin Osborne: An introduction to game theory, Oxford University Press, Indian Edition,2004.

**Reference Books:**

1. Sketching for Beginners: Step-by-step Guide to Getting Started With Your Drawing, Createspace Independent Publishing Platform,2017
2. Perspective Made Easy (Dover Art Instruction), Dover Publications, 1990.
3. Roger BMyerson: Game theory: Analysis of Conflict, Harvard University Press,1997
4. An Introduction to Game Theory: Strategy, Joel Watson, WW Norton and Company.
5. Algorithmic Game Theory, Noam Nisan, Tim Roughgarden, EvaTardos, VijayV Vazirani, Cambridge University Press, 2007.

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

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| 21CG723 | CO1 | Understand the Basics of Animation techniques. |
| | CO2 | Describe principles animation techniques. |
| | CO3 | Demonstrate the functions of 2DAnimation techniques. |
| | CO4 | Apply game theory in real-time animated projects. |
| | CO5 | Apply the models of the Game theory problems |

| Course Title: **WEB TECHNOLOGIES** | | |
|---|---|---|
| Subject Code**: 21CG73OE1** | 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:**<br>● Provide the principles and practical programming skills of developing Webapplications.<br>● Enables students to develop skills for creating dynamic webpages using JavaScripts, XML, PHP as Server side Scripting. | | |

| **Modules** | **Teaching Hours** |
|---|---|
| **Module-I**<br>**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.<br>**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  tags; Conflict Resolution. | **08Hrs** |
| **Module-II**<br>**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.<br>**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. | **09Hrs** |
| **Module-III**<br>**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. | **08Hrs** |

| | |
|---|---|
| **Module-IV**<br>**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. | **09Hrs** |
| **Module-V**<br>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. | **08Hrs** |

**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. Robert W. Sebsta, *"Programming the World Wide Web*"- 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.

**Reference Books:**

1. M Deitel, P.J. Deitel, A.B Goldberg, ***"Internet & World Wide Web How to H Program****"*- 3rd Edition, Pearson Education/PHI, 2004
2. Chris Bates, *"****Web Programming Building Internet Applications*****"*- 3rd Edition, Wiley India, 2006.
3. Xue Bai Et al, Thomson, *"****The Web Warrior Guide to Web Programming"*****-** 2003.

**Course outcomes:**

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

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| **21CG73OE1** | **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 |

| Course Title: **FUNDAMENTALS OF CLOUD COMPUTING** | | |
|---|---|---|
| Subject Code**: 21CG74OE1** | 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:**

- 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** |
|---|---|
| **Module-I**<br>**Introduction**: Basic concept and terminology, Goals and Benefits, Risks and challenges, Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models.<br>**Cloud Enabling Technology**: Network and internet Architecture, Cloud Data Centres Technology, Modern Virtualization, Multitenant Technology, Service Technology and Service APIs | **08 Hrs** |
| **Module-II**<br>**Understanding Cloud Security and Cybersecurity:** Basic Security Terminology, Basic Threat Terminology, Threat Agents, Common Threats.<br>**Understanding Containerization:** Fundamental Virtualization and Containerization, Understanding Containers | **08 Hrs** |
| **Module-III**<br>**Cloud Infrastructure Mechanisms:** Logical Network Perimeter, Virtual Server, Hypervisor, Cloud Storage Device, Cloud Usage Monitor, Resource Replication ,Ready-Made Environment.<br>**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. | **09 Hrs** |
| **Module-IV**<br>**Cloud Management Mechanism:** Remote Administration System, Resource Management System, SL A Management System, Billing Management System<br>**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. | **09 Hrs** |
| **Module-V**<br>**Cost Metrics and Pricing Models :** Business Cost Metrics, Case Study Example, Cloud Usage Cost Metrics Cost Management Considerations, Case study Example | |

| | |
|---|---|
| **Cloud Delivery Models:** Cloud Provider Perspective, Cloud Consumer Perspective.<br>**Cloud Platforms in Industry:** Amazon Web Services, Google App Engine, Microsoft Azure<br>**Cloud Applications:**Scientific Application, Business and Consumer Applications. | **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.** Cloud computing: concepts, technology & architecture .The Pearson service technology series Thomas Erl, Maugham Mahmood, and Ricardo Puttini 2013

**Reference Books:**

1. John W. itinghouse james F.Ransome, *"Cloud Computing Implementation, Management and Security*" , CRC Press.
2. Borko Furht. Armando Escalante, "Handbook of Cloud Computing", Springer 2010
3. Charles Badcock, "Cloud Revolution" , TMH

**Course outcomes:**

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

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| **21CG74OE1** | **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. |

| **Course Title: PROJECT WORK** | | |
|---|---|---|
| Subject Code:**21CGP75** | Credit:2 | CIE:50 |
| Number of Practical Hours/Week | **2 Hrs** | SEE:50 |
| | | SEE Hours:03 |

**Course Objectives:**

- 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) |
|---|---|---|
| 21CGP75 | 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. |