CURRICULUM

FOR THE ACADEMIC YEAR 2025-2026

(22 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 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 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 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 Scienceand 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.

Department of Computer Science & Engineering SCHEME OF TEACHING FOR VII SEMESTER–22 SERIES

Sl. No	Course	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	IPCC	22CS71	Big Data Analytics	3	0	2	0	03	50	50	100	4
2	IPCC	22CS72	Ethical Hacking	3	0	2	0	03	50	50	100	4
3	PCC	22CS73	Cloud Computing	4	0	0	0	03	50	50	100	4
4	PEC	22CS74x	Professional Elective-III	3	0	0	0	03	50	50	100	3
5	OEC	22CSOE75x	Open Elective-II	3	0	0	0	03	50	50	100	3
6	PROJ	22CSP76	Major Project Phase-II	0	0	12	0	03	50	50	100	6
			Total	**16**	**0**	**16**	**0**	**18**	**300**	**300**	**600**	**24**

Professional Elective-III

Sl. No	Course Code	Course Name
1.	22CS741	Generative AI
2.	22CS742	Deep Learning
3.	22CS743	Blockchain Technology
4.	22CS744	Quantum Computing

Open Elective-II

Sl. No	Course Code	Course Name
1.	22CSOE751	Introduction to Cloud Computing
2.	22CSOE752	Project Management
3.	22CSOE753	Web Technologies

Department of Computer Science & Engineering

SCHEME OF TEACHING FOR VIII SEMESTER–22 SERIES

Sl. No	Course	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	PEC	22CS81x	Professional Elective-IV (Online Courses) –NPTEL	3	0	0	0	03	50	50	100	3
2	OEC	22CSOE82x	Open Elective-III (Online Courses)	3	0	0	0	03	50	50	100	3
3	INT	22CSINT83	Internship (Industry/Research) (14-20 weeks)	0	0	12	0	03	50	50	100	10
			Total	**6**	**0**	**12**	**0**	**09**	**150**	**150**	**300**	**16**

Course Title: BIG DATA ANALYTICS		
Subject Code: **22CS71**	Credits: **4**	CIE:50
Number of Lecture Hours/Week((L:T:P)	**3:0:2Hrs**	SEE:50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: Knowledge of any Programming, DBMS		

Course Objectives:

- Understand fundamentals and applications of Big Data analytics Explore the Hadoop framework and Hadoop Distributed File system and essential Hadoop Tools
- Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
- Employ MapReduce programming model to process the big data
- Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis.

MODULES	**Teaching Hours**
Module-I **Big Data Analytics:** Big Data, Scalability and Parallel Processing, Designing Data Architecture, Data Sources, Quality, Pre-Processing and Storing, Data Storage and Analysis, Big Data Analytics Applications and Case Studies. **Laboratory Experiment** 1. Install, configure and run python, numPy, Pandas, Hadoop and HDFS. 2. Visualize data using basic plotting techniques in Python.	**09 Hrs**
Module-II **Hadoop:** Introduction, Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and Programming Model, Hadoop Yarn, Hadoop Ecosystem Tools. **Hadoop Distributed File System Basics:** HDFS Design Features, Components, HDFS User Commands. **Essential Hadoop Tools:** Using Apache Pig, Hive, Sqoop, Flume, Oozie, HBase. **Laboratory Experiment** 1. Demonstrate the following using HDFS i. Basic HDFS commands ii. Working with Hadoop file system: Reading, Writing and Copying 2. Develop the following applications using MapReduce i. Word count application using Map Reduce on single node cluster ii. Analysis of Weather Dataset on Multi node Cluster using Hadoop iii. Real world case studies on Map Reduce applications 3. Writing User Defined Functions/Eval functions for filtering unwanted data in Pig	**09 Hrs**

Module–III **NoSQL Big Data Management, MongoDB and Cassandra:** Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks, MongoDB, Databases, Cassandra Databases. **Laboratory Experiment** 1. Implement no sql Database Operations: Crud Operations, Arrays Using MONGODB.	**08 Hrs**
Module–IV Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hive, HiveQL, Pig, Spark. **Laboratory Experiment** 1. Working with Hive on the following i. HiveQL ii. Writing User Defined Functions in Hive 2. Implement the following on Spark i. Processing large datasets on Spark framework ii. Word count application	**08 Hrs**
Module–V **Machine Learning Algorithms for Big Data Analytics:** Introduction, Estimating the relationships, Outliers, Variances, Probability Distributions, and Correlations, Regression analysis, Finding Similar Items, Similarity of Sets and Collaborative Filtering, Frequent Itemsets and Association Rule Mining. **Text, Web Content, Link, and Social Network Analytics:** Introduction, Text mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and analyzing a Web Graph, Social Network as Graphs and Social Network Analytics **Laboratory Experiment** 1. Implement structured streaming using spark with retail store dataset 2. Implement streaming using Kafka	**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. Raj Kamal and Preeti Saxena, "Big Data Analytics Introduction to Hadoop, Spark, and Machine Learning", McGraw Hill Education, 2018 ISBN: 9789353164966, 9353164966 2. 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. ISBN13: 978- 9332570351	

Reference Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O"Reilly Media, 2015.ISBN-13: 978- 9352130672
2. Boris Lublinsky, Kevin T Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1st Edition, Wrox Press, 2014ISBN-13: 978-8126551071
3. Eric Sammer, "Hadoop Operations: A Guide for Developers and Administrators", 1st Edition, O'Reilly Media, 2012.ISBN-13: 978-9350239261
4. Arshdeep Bahga, Vijay Madisetti, "Big Data Analytics: A Hands-On Approach", 1st Edition, VPT Publications, 2018. ISBN-13: 978-0996025577

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

Course code	CO #	Course Outcome (CO)
22CS71	CO1	Explain the fundamentals and applications of Big Data analytics.
	CO2	Investigate Hadoop framework, Hadoop Distributed File system and essential Hadoop tools.
	CO3	Demonstrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
	CO4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
	CO5	Apply Machine Learning algorithms for real world big data, web contents and Social Networks to provide analytics with relevant visualization tools.

COURSE TITLE: ETHICAL HACKING		
Subject Code: **22CS72**	Credits:03	CIE:50
Number of Lecture Hours/Week(L:T:P)	**3:0:2 Hrs**	SEE:50
Total Number of Lecture Hours: 42Hrs		SEEHours:03
Prerequisites: Computer Networks		

Course Objectives:

- Acquire knowledge of basics of Cryptography.
- To understand how to conduct ethical hacking and its types
- To learn various tools used for ethical hacking.
- Identify security loopholes in networks and web applications.

MODULES	**Teaching Hours**
Module-I Cryptography fundamentals: Symmetric algorithms, Asymmetric Algorithms, Digital Signature, Sensitive Data Encryption, Hashing Algorithms, Public Key Infrastructure Components, Cryptography Attacks: Birthday Attack, Mathematical Attack, Brute Force Attack, Man-in-the-Middle Attack, SSL/TSL Downgrade Attack, Dictionary Attack, Replay Attack, Password Cracking. Elements of Information Security. Ethical Hacking Concepts: Ethical hacking introduction, Motive, Means, and opportunity behind intrusion and attack, types and profiles of attackers and defenders, Attack target and types, Anatomy of an attack. Role of security and penetration testers, Penetration testing methodologies Legal aspects of Ethical Hacking 1. Create Message Digest using SHA-1, SHA-2 2. Generate Digital Signature of a document 3. Encrypt a message using DES, AES algorithm. 4. Analyze different encoding (Base64, URL, HTML) and encryption (MD5, 5. SHA1, SHA2 etc) mechanisms used in application.	**08 Hrs.**
Module-II Ethical Hacking Footprinting and Reconnaissance: foot printing types and objectives , Footprinting Methodology, Tools for footprinting .**Scanning and Enumeration:** Comparison between scanning and enumeration**,** scanning techniques and types, understanding service enumeration, Nmap Network scanning tool. Introduction to Enumeration, significance of Enumeration, Classification of Enumeration, types of Enumeration, Techniques, goals, Enumerating Windows OS, SNMP Enumeration, SMTP Enumeration. 1. Perform footprinting using Google hacking to extract information from archived website, extract contents from website, trace an email header analysis and fetch DNS information. 2. Use tools for port scanning, network scanning and generate report.	**08 Hrs.**

Module-III **VUNERABILITY ASSESSMMENT AND THREAT MODELLING: Vulnerability assessment concepts:** Explaining vulnerability assessments, Types of vulnerability assessments, **Vulnerability assessment life cycle**, **Vulnerability scanning tools**, Introducing the Nessus vulnerability scanner, Best practices for vulnerability assessments, Vulnerability assessment reports, **The elements of threat modelling:** The finding, The kill chain, The single asset value, The organizational asset value, The estimated risk. **Threat modelling frameworks:** STRIDE, PASTA, VAST, Attack trees, CVSS, **Threat modelling tools, Threat forecasting:** Phase 1 – Research, Phase 2 - Implementation and analysis, Phase 3 - Information sharing and building, **Threat model lab – personal computer security** **Hacking windows OS :** Technical requirements, Exploiting the Windows OS, Exploiting Windows device drivers, **Exploiting Windows networking :** Address Resolution Protocol, Simple network management protocol, Server Message Block, NetBIOS, **Exploiting Windows authentication, User authentication and movement:** Obtaining and extracting passwords, Exploring password-cracking techniques, Authentication spoofing, Pulling Windows account names via null sessions, Tools for pulling account names via null sessions, Privilege elevation, **Exploiting Windows services and applications**: Server-side exploits, Client-side exploits, Exploring the Windows Registry, Windows Registry exploitation, Exploiting the Windows logs**Hacking LINUX OS: Exploiting the Linux operating system, Exploring the Linux file system**: Exploiting the file system, Linux hidden files, Important files, **Exploiting Linux networking, Exploiting Linux authentication**: Cracking passwords, **Linux updates and patching, The Linux logging system, Exploiting the Linux kernel**: Checking your kernel version, Exploiting the kernel **1.** Perform vulnerability assessment using Nessus tool Essentials. **2.** Perform application threat modeling using STRIDE and calculate the risk. **3.** Exploit Linux services to gain the root privileges.	**09 Hrs.**
Module–IV **Ethical Hacking of Web Servers**: Web servers' architecture, configuration, and vulnerabilities : Adding processing logic, Threats, vulnerabilities, and exploits to web services, Web server authentication: Basic authentication, OAuth, Some real-world web servers and ways to combat attacks: IIS hardening tasks, Apache web server hardening tasks, Types of web server/website attacks: Website defacement, DoS/ DDoS attack, HTTP response-splitting attack, Cross-Site Request Forgery, Deep linking, Directory traversal attack, Man-in-the-Middle/sniffing attack, Cookie tampering, Cookie-based session attacks, Session hijacking, DNS **Attacking Session Management:** The Need for state, Weaknesses in token generation, Weaknesses in session token handling, Securing session management **Attacking Data Stores:** Injecting into interpreted contexts, injecting into SQL,	**09 Hrs.**

injecting into NoSQL, **Attacking Back-end components:** Injecting OS Commands, Manipulating File Paths, Injecting into Back-end HTTP Requests. 1. Perform Directory and Path traversal attack. 2. Build a checklist for Session management and use the same to perform manual checks on the application. 3. Experiment to perform Sessions Hijacking using Web-Goat 4. Experiment to perform SQL Injection in application using manual and 5. automated tools. 6. Experiment to perform OS Command Injection in application and extend the attack to gain web shell access.	
Module–V **Crosssite scripting attack:** Varieties of XSS, XSS Attacks in Action, Finding and Exploiting XSS vulnerabilities, Preventing XSS Attacks. **Ethical hacking for malware analysis**: Technical requirements, malware existence and sources, exploring types of malware: Virus, Worms, Trojans, Ransomware, Bots/botnets, Adware, Spyware, Malvertising, Fileless malware, Backdoors, Rootkits, Analysing a sample: Setting up a malware analysis lab, Static analysis, Dynamic analysis, Detecting malware and removing it, Perimeter monitoring, Malware prevention **1.** Experiment to simulate XSS attack of different types **2.** Experiment using Wire shark to identify signs of malware communication and analyze captured network traffic. **3.** Experiment to detect Trojan in a systems	**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. Hands-On Ethical hacking Tactics, Shane Hartman,1st Edition, April 2024,Packt Publishing Ltd. , www.packtpub.com
2. Hands-On Ethical Hacking and Network Defense, Michael T. Simpson, Nicholas D. Antill, Robert S. Wilson, 4th Edition, 2023
3. Web Application Hacker's Handbook, Dafydd Stutarf, Marcus Pinto,Wiley,2nd Edition,2011

REFERENCE BOOKS:

1. Hacking: TheArtofExploitationbyJonErickson,2nd Edition,Feb2008.
2. Penetration Testing: A Hands-On Introduction to Hacking Paper back by Georgia Weidman, June 2014.
3. Stuart McClure, Joel Scambray and Goerge Kurtz, "Hacking Exposed Network Security Secrets & Solutions", 5th Edition, Tata Mc Graw Hill Publishers, 2010.
4. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, "Gray Hat Hacking The Ethical Hackers Handbook", 3rd Edition, McGraw-Hill Osborne Media paperback(January 27, 2011)

5. Ceh V11 Certified Ethical Hacker Study Guide, RicMessier, 1st Edition, Sybex Publication, 2021.

E- Resources:

1. https://www.eccouncil.org/programs/certified-ethical-hacker-ceh-practical/
2. https://www.guru99.com/ethical-hacking-tutorials.html
3. https://www.udemy.com/penetration-testing/
4. https://www.eckovation.com/course/ethical-hacking-and-cyber-security
5. https://onlinecourses.nptel.ac.in/noc16_cs07/preview

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

Course Code	CO#	Course Outcome(CO)
22CS72	CO1	Explain fundamentals of cryptography, basic ethical hacking principles and demonstrate different encryption and decryption techniques.
	CO2	Demonstrate tools for Footprinting and Reconnaissance, scanning and enumeration
	CO3	Discover the network vulnerabilities and perform threat modelling.
	CO4	Apply ethical hacking principles to discover web server vulnerabilities (session hijacking and SQL injection)
	CO5	Acquire skills to identify Crosssite scripting, malware and learn preventive measures.

Course Title: CLOUD COMPUTING		
Subject Code **: 22CS73**	Credit :04	CIE: 50
Number of Lecture Hours/Week	**4:0:0 Hrs**	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
Prerequisites: Operating systems, Computer networks		

Course Objectives:

- 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 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.	**11 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.	**10 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	**11 Hrs**

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.	
Module – IV 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	**10 Hrs**
Module –V 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.	**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. International Edition - Rajkumar Buyya, Christian Vecchiola, and Thamarai selvi, "Mastering Cloud Computing", Morgan Kaufmann, Burlington, Massachusetts, USA, May 2014.

REFERENCES BOOKS:

1. Paul Goransson and Chuck Black, "Software Defined Networks: A Comprehensive Approach", 1stedition, 2014, Morgan Kaufmann Publishers, Inc., SanFrancisco.
2. T. Erl, R. Puttini, and Z. Mahmood, "Cloud Computing: Concepts, Technology & Architecture" ISBN-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)
22CS73	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	Illustrate Data intensive computing and apply Map Reduce
	CO5	Describe the importance of cloud computing driven commercial systems.

Course Title: GENERATIVE AI		
Subject Code : **22CS741**	Credit :04	CIE: 50
Number of Lecture Hours/Week	**3:0:0 Hrs**	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: Basics of Artificial Intelligence		
Course Objectives: • Understand the basics of Generative AI. • Know the basics of Text Generation. • Understand the process of generating videos. • Know about GAN and its variants. • Understand and Apply Gen AI tools.		
MODULES		**Teaching Hours**
Module-I **INTRODUCTION TO GEN AI:** Historical Overview of Generative modelling - Difference between Gen AI and Discriminative Modeling – Importance of generative models in AI and Machine Learning – Types of Generative models – GANs, VAEs, autoregressive models and Vector quantized Diffusion models - Understanding if probabilistic modelling and generative process - Challenges of Generative Modelling – Future of Gen AI – Ethical Aspects of AI – Responsible AI – Use Cases.		**09 Hrs**
Module-II **GENERATIVE MODELS FOR TEXT: Language** Models Basics – Building blocks of Language models - Transformer Architecture – Encoder and Decoder – Attention mechanisms - Generation of Text – Models like BERT and GPT models – Generation of Text - Auto encoding – Regression Models – Exploring ChatGPT – Prompt Engineering – Designing Prompts– Revising Prompts using Reinforcement Learning from Human Feedback (RLHF) - Retrieval Augmented Generation – Multimodal LLM – Issues of LLM like hallucination.		**08 Hrs**
Module–III **GENERATION OF IMAGES: Introduction** to Generative Adversarial Networks – Adversarial Training Process – Nash Equilibrium – Variation Auto encoders – Encoder-Decoder Architectures - Stable Diffusion Models – Introduction to Transformer-based Image Generation – CLIP – Visual Transformers ViT- Dall-E2 and Dall-E3, GPT-4V – Issues of Image Generation models like Mode Collapse and Stability.		**09 Hrs**
Module–IV **GENERATION OF PAINTING, MUSIC, AND PLAY: Variants** of GAN – Types of GAN - Cyclic GAN – Using Cyclic GAN to Generate Paintings – Neural Style Transfer – Style Transfer - Music Generating RNN – MuseGAN – Autonomous agents – Deep Q Algorithm – Actor-critic Network.		**08 Hrs**

Module–V **OPEN-SOURCE MODELS AND PROGRAMMING FRAMEWORKS:** Training and Fine tuning of Generative models – GPT4All - Transfer learning and Pretrained models - Training vision models – Google Copilot - Programming LLM – LangChain – Open-Source Models – Llama - Programming for TimeSformer – Deployment – Hugging Face.	**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:

2. Denis Rothman, "Transformers for Natural Language Processing and Computer Vision", Third Edition ,Packt Books, 2024

REFERENCE BOOKS:

1. David Foster, "Generative Deep Learning", O'Reily Books, 2024.
2. Altaf Rehmani, "Generative AI for Everyone", BlueRose One, 2024.

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

Course Code	CO #	Course Outcome (CO)
22CS741	**CO1**	Describe the concepts of Generative Modelling.
	CO2	Apply Gen AI to Generating Texts.
	CO3	Apply Gen AI for generating video
	CO4	Illustrate concepts of Generative adversarial networks.
	CO5	Apply Open Source Tools for solving problems using Gen AI.

COURSE TITLE: DEEP LEARNING		
Subject Code: **22CS742**	**Credits:3**	CIE:50
Number of Lecture Hours/Week(L:T:P)	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	**42**	SEE Hours:03
Prerequisite: Machine learning		

Course Objectives:

- Understand complexity of Deep Learning algorithms and their limitations.
- Be capable of performing experiments in Deep Learning using real-world data.

MODULES	**Teaching Hours**
Module I **Introduction to Deep Learning:** Introduction to deep learning, Biological & artificial neurons ANN & its layer, Exploring activation functions, Forward propagation in ANN, How does ANN learn, Debugging gradient descent with gradient checking. Getting to Know TensorFlow: Introduction to TensorFlow, Understanding computational graphs and sessions, Variables, constants and placeholders, Introducing TensorBoard , Handwritten digit classification using TensorFlow , Introducing eager execution, Math operations in TensorFlow, TensorFlow 2.0 and Keras, Keras or TensorFlow.	**09 Hrs**
Module II **Sequence Modelling:** Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory**,** Generating Song Lyrics Using RNN, Introducing RNNs Generating song lyrics using RNNs, Different types of RNN architectures.	**08 Hrs**
Module III **Convolutional Networks:** The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types. **Demystifying Convolutional Networks:** Demystifying Convolutional Networks, The math behind CNNs, Implementing a CNN in TensorFlow, CNN architectures, Capsule networks, Building Capsule networks in TensorFlow. Case study	**09 Hrs**
Module IV L**earning Text Representations:** Learning Text Representations, Understanding the word2vec model, Building the word2vec model using gensim, Visualizing word embeddings in Tensor Board, Doc2vec Understanding, skip-thoughts algorithm, Quick- thoughts for sentence embeddings.	**08 Hrs**
Module V **Generating Images Using Generative Adversarial Networks:** Generating Images Using GANs, Differences between discriminative and generative models. DCGAN – Adding convolution to a GAN, Deconvolution generator, convolutional discriminator.	**08 Hrs**

Learning More about GANs: Conditional GAN, Loss Function of CGAN, Generating specific digits using CGAN, Understanding InfoGAN, Exploring Mutual Information, Architecture of InfoGAN, Translating images using CycleGAN, Role of generators, Role of discriminators, Loss Function, Cycle Consistency Loss, Stack GAN, Architecture of StackGANs. Introduction to auto encoder.	

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. Sudharsan Ravichandiran, "Hands on deep learning algorithms with python", Packt Publishing,July 2019,
2. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016

REFERENCE BOOKS:

1. Raúl Rojas Neural Networks: Asystematic Introduction 1996.
2. Chirstopher Bishop Pattern Recognition and machine Learning 2007.
3. Francois Chollet, Deep Learning with Python, Manning Publications, 2018.

Course outcomes:

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

Course Code	CO#	Course Outcome(CO)
22CS742	CO1	Explain the concepts of Deep Learning, Use TensorFlow, its main functions, operations and the execution pipeline.
	CO2	Design Recurrent Neural Networks(RNN), Implement different architectures of RNN in Tensorflow.
	CO3	Demonstrate the working of convolutional neural networks, Implement CNN with Tensorflow.
	CO4	Demonstrate Text Representations and Build the word2vec model using gensim and interpret the results.
	CO5	Build different architectures of Generative Adversarial Networks in Tensorflow.

Course Title: **BLOCKCHAIN TECHNOLOGY**		
Subject Code: **22CS743**	**Credits:03**	CIE:50
Number of Lecture Hours/Week (L:T:P)	**3:0:0 Hrs**	SEE:50
Total Number of Lecture Hours	**42 Hrs**	SEE Hours:03

Prerequisites: Computer Networks, Security Basic Concepts

Course Objectives:

- 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 Hours
Module I **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. **Decentralized System**: Introduction, Distributed Decentralized Databases, Decentralized Enterprise, Decentralization, Disintermediation, Decentralized Enterprise Regulation	**09 Hrs**
Module II **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. **Consensus:** Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods.	**08 Hrs**
Module III **Blockchain Components**: Introduction, Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Cryptography: Introduction, Cryptography and its primitives, Symmetric Cryptography, Asymmetric Cryptography. **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.	**09 Hrs**
Module IV **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.	**08 Hrs**
Module V **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. **Applications of Blockchain:** Introduction, Blockchain in Banking, Blockchain in Education, Blockchain in Health Care, Blockchain in Supply chain, The Blockchain and IoT.	**08 Hrs**

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. Kumar Saurabh, Ashutosh Saxena, "Blockchain Technology Concepts and Applications", First Edition, Wiley India Pvt, 2020.
   Refer the text book 1. for Module I, Module II and Module III.
2. Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, "Blockchain Technology", University Press, 2021.
3. **Refer the text book 2 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," Yellowpaper.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)
22CS743	CO1	Describe fundamentals and Characteristics of Blockchain.
	CO2	Illustrate the use of Hash Functions and Consensus protocols
	CO3	Describe concepts of Blockchain Components and Smart contracts with Examples and Patterns.
	CO4	Explain on sortium Blockchain and Initial Coin Offering
	CO5	Explain Security concepts in Blockchain and its applications.

Course Title: **QUANTUM COMPUTING**		
Subject Code:22CS744	**Credits:03**	CIE:50
Number of Lecture Hours/Week(L:T:P)	**3:0:0 Hrs**	SEE:50
Total Number of Lecture Hours	**42 Hrs**	SEE Hours:03
Prerequisites: Linear Algebra, Python programming		

Course Objectives:

- Understand fundamental concepts of quantum mechanics and quantum computing.
- Learn quantum logic gates, circuits, and algorithms.
- Gain knowledge of quantum programming using tools like Qiskit or Q#.
- Study real-world applications of quantum computing in cryptography, optimization, and AI.

MODULES	Teaching Hours
Module I **Introduction to Quantum Mechanics and Quantum Bits:** Classical vs. Quantum computation, Basic concepts of quantum mechanics: Superposition, Entanglement, Measurement, Quantum bits (qubits) and Bloch sphere representation, Quantum state, Dirac notation, Tensor products and multi-qubit systems.	**09 Hrs**
Module II **Quantum Logic Gates and Circuits:** Quantum gates: Pauli-X, Y, Z, Hadamard (H), Phase (S), T, Identity, Multi-qubit gates: CNOT, Toffoli, SWAP, Gate matrix representations and transformations, Quantum circuits and circuit diagrams, Measurement and state collapse.	**08 Hrs**
Module III **Quantum Algorithms – Part 1:** Deutsch and Deutsch–Jozsa algorithm, Simon's algorithm, Grover's search algorithm: theory, circuit, complexity, Applications in unstructured search problems	**08 Hrs**
Module IV **Quantum Algorithms – Part 2:** Shor's algorithm: integer factorization, modular arithmetic, Quantum Fourier Transform (QFT), Quantum phase estimation, Quantum error correction basics, Introduction to quantum, cryptography (BB84 protocol).	**08 Hrs**
Module V **Quantum Programming and Applications:** Introduction to quantum programming tools (Qiskit or Q#), Writing basic quantum circuits using Qiskit, Simulating algorithms: Grover, Deutsch–Jozsa in Qiskit, Real-world applications: quantum machine learning, optimization, secure communication, Limitations and future of quantum computing.	**09 Hrs**

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. **"Quantum Computation and Quantum Information" by Michael A. Nielsen & Isaac L. Chuang-** (Cambridge University Press), 10th Edition (2010)

Reference Books:

1. **"Quantum Computing: A Gentle Introduction"** – Eleanor Rieffel and Wolfgang Polak (MIT Press), 2011
2. **"Quantum Computer Science: An Introduction"** – N. David Mermin (Cambridge University Press),2007
3. **"Quantum Mechanics: The Theoretical Minimum"** – Leonard Susskind and Art Friedman,2014
4. **"Programming Quantum Computers"** – Eric R. Johnston, Nic Harrigan, Mercedes Gimeno-Segovia (O'Reilly), 2019
5. **IBM Qiskit Textbook** (Free online): https://qiskit.org/textbook, 2019

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

Course Code	CO#	Course Outcome(CO)
22CS744	CO1	Describe the fundamental principles of quantum mechanics and apply them to represent and manipulate qubits.
	CO2	Design and analyze quantum circuits using unitary quantum gates and measurements.
	CO3	Implement basic quantum algorithms such as Deutsch–Jozsa and Grover's search algorithm to demonstrate quantum speed-up over classical methods.
	CO4	Analyze advanced quantum algorithms such as Quantum Fourier Transform, Phase Estimation, and Shor's algorithm for number-theoretic applications.
	CO5	Develop quantum programs using Qiskit and simulate real-world applications in optimization, cryptography, and quantum key distribution.

COURSE TITLE: INTRODUCTION TO CLOUD COMPUTING		
Subject Code: **22CSOE751**	**Credits:03**	CIE:50
Number of Lecture Hours/Week(L:T:P)	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	**42 Hrs**	SEE Hours:03

Prerequisites: Programming Language, Basic computer Lab.

Course Objectives:

- To gain knowledge about virtualization and Virtual Machines
- To familiarize Cloud Computing and its services

MODULES	**Teaching Hours**
Module-I Overview of Cloud Computing: Introduction, Essentials of Cloud Computing, Need of Cloud Computing, history of cloud computing Business and Information Technology Perspective, News on Clouds, Benefits of Cloud Computing, Limitations of Cloud Computing, Develop cloud infrastructure, Vendors of cloud computing, Elastic computing, Social network Enterprise cloud computing, Factors that Affect Cloud Computing, Cloud Data Center Requirements, Influence of Cloud Computing on Business Companies	**09 Hrs**
Module-II **Cloud Computing Architecture:** Grid Framework Overview, Grid Architecture , Cloud Computing Architecture , Key Design Aspects of Cloud Architecture, Cloud Services, and Cloud Applications, Similarities and Differences Between Grid and Cloud Computing, Characteristics of Cloud Computing , Cloud and Dynamic Infrastructure. **Models of Cloud Computing:** Cloud Service Models, Cloud Computing Sub Service Models, Cloud Deployment Models, Alternative Deployment Models, Cloud Stack, Cloud Storage	**08 Hrs**
Module–III **Cloud Data Center:** Cloud Data Center Core Elements, Storage Network Technologies and Virtualization, Object-based Storage Technologies, Unified Storage, Business Continuity, Cloud Backup, Cloud and Disaster Recovery , Replication Technologies , Traditional Data Center Management, Information Life Cycle Management, Cloud Analytics, Computing on Demand **Server Virtualization Technology:** Types of Virtualization , Data Center Virtualization, Server Virtualization, Storage Virtualization, Sensor Virtualization, Storage Area Network, Network Attached Storage	**08 Hrs**
Module–IV **Network Virtualization Technology:** Exploring Network Virtualization, Tools Used in Network Virtualization, Benefits of Network Virtualization, Features of Network Components, Traffic Management and its Techniques, Virtual Machine Migration Services. **Virtualization Technology (At Desktop and Application) :** Understanding	**08 Hrs**

Desktop Virtualization, Drivers Used in Virtualization , Techniques Used for Desktop Virtualization, Application Virtualization , Hardware Virtual Machine (HVM) , Understanding Machine Imaging , Porting Application , Virtual Machine Provisioning , Virtual Machine Migration Services Management. **Cloud Infrastructure Management and Migration:** Administrating Clouds, Cloud Management Products, Unified Management software, Processes in Cloud Service Management, Cloud Providers and Traditional IT Service Providers, Accessing the Cloud, migrating to Clouds, Banking on cloud Economics.	
Module V Security Concerns of Cloud Computing: Cloud Information Security , Cloud Security Design Principles, Cloud Security Services , Secure Cloud Software Testing, Secure Cloud Software Requirements, Secure Development Practices, Vulnerability Assessment Tools for Clouds, Cloud Architectural Consideration , Secure Execution Environment and Communications, Identity Management and Access Control, VM Security Recommendations 21410.13.1 VM Security Techniques 21510.14 Challenges to Cloud Security , Computer Security Incident Response Team, Risk Issues , Physical Security of Systems, Input Validation and Content Injection, Database Integrity Issues, Regulatory Issues, Legal Matters in Cloud Computing , Information Privacy and Laws, Common Threats and Vulnerabilities, Logon Abuse Inappropriate System Uses , Network Intrusion, Session Hijacking Attacks, Fragmentation Attacks , Cloud Access Control Issues. Computing Platforms: Exploring Cloud Management Products, SOA and Cloud Computing , Online Analytical Processing , Business Intelligence, Independent Software Vendor, Cloud Performance Monitoring Tools ,Quality of Service Issues in Clouds, Intercloud, Sky Computing, Xen Cloud Platforms, platform, Force.com and Salesforce.com, Apache Virtual Computing Lab, Enomaly Elastic Computing Platform, Map Reduce, Hadoop, Cloud Mashup , OpenNebula , Nimbus,Google App Engine, Microsoft Hyper-V , Microsoft Azure, AJAX, EMC,NETAPP, Cloud Service Suppliers and Threats, Service Level Agreement, Third-party Technology. Advanced Technologies in Cloud Computing , Cloud Computing Trends, Understanding Cloud Tools , Cloud with DiverseLook, Media Clouds, Security Clouds, App-specific Clouds, Groupware Clouds, Mobile Cloud Computing, Cloud Computing Environment Open-Stack, Selection of Cloud Application, Cloud Descriptor Language, Green Computing, Workload Pattern for Clouds, Third-party Technology, Intercloud, Azure Cloud Services, Bigtable , Cloud Usage for Big Data Analytics and Internet of Things CometCloud ,T-Systems	**09 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. Cloud Computing–Shailendra Singh Oxford University Press.2017.

REFERENCE BOOKS:

1. Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide David S. Linthicum Addison-Wesley Professional.
2. Distributed & Cloud Computing from Parallel Processing to the Internet of Things by KaiHwang. Geoffrey C. Fox. Jack J. Dongarra

WEB REFERENCES:

1. http://nptel.ac.in/courses/106106129/21
2. https://freevideolectures.com/course/3649/cloud-computing
3. https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UlrhJ_JwyA5IlOCdEWlNArFke4jgtlg

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

Course Code	CO#	Course Outcome(CO)
22CSOE751	CO1	Discuss fundamentals of cloud computing
	CO2	Outline the cloud computing and service models
	CO3	Describe core elements of cloud data center and outline server virtualization concepts.
	CO4	Discuss virtualization technology and cloud infrastructure management
	CO5	Describe security concepts in cloud platforms and advanced technologies.

Course Title: PROJECT MANAGEMENT		
Subject Code: 22CSOE752	**Credits:03**	CIE:50
Number of Lecture Hours/Week(L:T:P)	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	**42 Hrs**	SEE Hours:03
Prerequisites:		

Course Objectives:

- To provide a comprehensive understanding of project management principles and practices.
- To develop skills in selecting and prioritizing projects aligned with organizational strategy.
- To enable students to plan and define project scope, objectives, and deliverables effectively.
- To familiarize students with tools such as Work Breakdown Structures (WBS) and project scheduling techniques.
- To impart knowledge on estimating resources, budgeting, and managing project costs.
- To introduce concepts of risk identification, analysis, and mitigation through risk management planning.

MODULES	**Teaching Hours**
Module I **Introduction:** Definition of project, characteristics of projects, understand projects, types of projects, scalability of project tools, project roles **Project Selection and Prioritization –** Strategic planning process, Strategic analysis, strategic objectives, portfolio alignment – identifying potential projects, methods of selecting projects, financial mode / scoring models to select projects, prioritizing projects, securing and negotiating projects.	**09 Hrs**
Module II **Planning Projects:** Defining the project scope, Project scope checklist, Project priorities, Work Breakdown Structure (WBS), Integrating WBS with organization, coding the WBS for the information system **Scheduling Projects:** Purpose of a project schedule, historical development, how project schedules are limited and created, develop project schedules, uncertainty in project schedules, Gantt chart.	**08 Hrs**
Module III **Resourcing Projects:** Abilities needed when resourcing projects, estimate resource needs, creating staffing management plant, project team composition issues, Budgeting Projects: Cost planning, cost estimating, cost budgeting, establishing cost control. **Project Risk Planning:** Risk Management Planning, risk identification, risk analysis, risk response planning, Project Quality Planning and Project Kickoff: Development of quality concepts, project quality management plan, project quality tools, kickoff project, baseline and communicate project management plan, using Microsoft Project for project baselines.	**08 Hrs**

Module IV **Performing Projects:** Project supply chain management: - Plan purchasing and acquisitions, plan contracting, contact types, project partnering and collaborations, project supply chain management.	**08 Hrs**
Module V **Project Progress and Results:** Project Balanced Scorecard Approach, Internal project, customer, financial issues, Finishing the project: Terminate project early, finish projects on time, secure customer feedback and approval, knowledge management, perform administrative and contract closure.	**09 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. Project Management, Timothy J Kloppenborg, Cengage Learning, Edition 2009.

2. Project Management, A systems approach to planning scheduling and controlling by Harold kerzner, CBS publication. Project Management by S Choudhury, Mc Graw Hill Education (India) Pvt. Ltd. New Delhi, 2016

Reference Books:

1. Project Management, Pennington Lawrence, Mc Graw hill

2. Project Management, A Moder Joseph and Phillips New Yark Van Nostrand, Reinhold.

3. Project Management, Bhavesh M. Patal, Vikas publishing House,

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

Course Code	CO#	Course Outcome(CO)
22CSOE752	**CO1**	Illustrate selection, prioritization and initiation of individual projects and strategic role of project management.
	CO2	Describe work breakdown structure by integrating it with organization.
	CO3	Explain the concept of scheduling and uncertainty in projects.
	CO4	Illustrate risk management planning using project quality tools.
	CO5	Explore the activities like purchasing, acquisitions, contracting, partnering and collaborations related to performing projects.

Course Title: **WEB TECHNOLOGIES**		
Subject Code: **22CSOE753**	Credits :3	CIE:50
Number of Lecture Hours/Week	3(Theory)	SEE:50
Total Number of Lecture Hours	42	SEEHours:03

Pre-requisite: Basics of any Programming Language

Course objectives:

- 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 **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; ListProperties; Color; Alignment of Text; The Box Model; Background Images; The and tags; Conflict Resolution.	**08Hrs**
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.	**09Hrs**
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 dropping elements.	**08Hrs**

Module-IV **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 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 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. 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)
22CSOE753	**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: MAJOR PROJECT PHASE-II		
Subject Code:**22CSP76**	Credit:6	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)
22CSP76	**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.

B.E VIII SEMESTER

Course Title : Professional Elective-IV (Online Courses) –NPTEL		
Subject Code : **22CS81X**	Credit :3	CIE: 50
		SEE: 50

LIST OF PROFESSIONAL ELECTIVE – IV (Online Courses) NPTEL

Sl. No	Course Code	Course Name
1	22CS811	Advanced R Programming for Data Analytics in Business
2	22CS812	Data Analytics with Python
3	22CS813	Computer Vision
4	22CS814	Affective Computing
5	22CS815	Advance Computer Architecture
6	22CS816	Business Intelligence and Analytics
7	22CS817	Foundations of Virtual Reality
8	22CS818	Advanced Distributed System
9	22CS819	Responsible & Safe AI Systems
10	22CS820	Practical Cyber Security for Cyber Security Practitioners
11	22CS821	Introduction to Large Language Models (LLMs)
12	22CS822	Cyber Security and Privacy
13	22CS823	Privacy and Security in Online Social Media
14	22CS824	Social Network Analysis

Course Title : Open Elective-III (Online Courses) NPTEL		
Subject Code : 22CSOE82x	**Credit :3**	**CIE: 50**
		SEE: 50

LIST OF OPEN ELECTIVE-III (Online Courses) NPTEL

Sl. No	Course Code	Course Name
1	22CSOE821	Introduction to Wireless and Cellular Communications (Discipline: Electrical and Electronics Engineering)
2	22CSOE822	Pattern Recognition and Application (Discipline: Electrical and Electronics Engineering)
3	22CSOE823	Entrepreneurship (Discipline: Management)
4	22CSOE824	E-Business (Discipline: Management)
5	22CSOE825	Learning Analytics Tools (Discipline: Multidisciplinary)
6	22CSOE826	Understanding Incubation and Entrepreneurship (Discipline: Design Engineering)
7	22CSOE827	Semi-Conductor Devices and Circuits
8	22CSOE828	Environment and Social Development