SCHEME OF EXAMINATION

B. Tech- 3rd Year | **Semester: 5th**

Branch: Computer Science and Engineering. (Internet of Things and Cyber Security with Blockchain Technology)

S.N.	Subject Name	Subject Code	Periods per week			Scheme of Exam			Total Marks	Credit L+(T+P)/2
						Theory/Practical				
			L	T	P	ESE	CT	TA		
1	Theory of Computation	CS102501	2	1	-	100	20	30	150	3
2	Computer Network	CS102502	3	0	-	100	20	30	150	3
3	Introduction to Blockchain Technology	CS116503	2	1	-	100	20	30	150	3
4	Internet of Things	CS115504	3	0	-	100	20	30	150	3
5	Professional Elective-1	Refer Table -1	3	0	-	100	20	30	150	3
6	Computer Network Lab	CS102591	-	-	2	25	-	25	50	1
7	Blockchain Technology Lab	CS116592	-	--	2	25	-	25	50	1
8	Internet of Things Lab	CS115593	-	-	2	25	-	25	50	1
9	Minor Project-1	CS102597	-	-	2	25	-	25	50	1
10	Internship Assessment	CS102598	-	-	2	-	-	25	25	1
11	Constitution of India	CS100596	-	-	-	-	-	25	25	-
Total			**13**	**2**	**10**	**600**	**100**	**300**	**1000**	**20**

Professional Elective -1		
Sr. No.	**Subject Code**	**Name of Subject**
1.	CS102521	Computer Graphics
2.	CS102522	Cryptography and Network Security
3.	CS115523	IoT Architecture & Security
4.	CS111524	BDA Essentials
5.	CS109525	Artificial Neural Network
6.	CS113526	Statistical Foundation for Data Science
7.	CS102527	Biometrics
8.	CS102528	Object Oriented Modeling and Design

Subject Code CS102501	Theory Of Computation	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
Formal languages and automata theory deals with the concepts of automata, formal languages, Grammar, computability and decidability. The reasons to study Formal Languages and Automata Theory are Automata Theory provides a simple, elegant view of the complex machine that we call a computer .More precisely, the objectives are: • To give an overview of the theoretical foundations of computer science from the perspective of formal languages. • To illustrate finite state machines to solve problems in computing. • To explain the hierarchy of problems arising in the computer sciences. • To familiarize Regular grammars, context frees grammar. • To solve various problems of applying normal form techniques, push down automata and Turing Machines	On successful completion of the course, the student will be able to: **CO1**.Design finite automata to accept a set of strings of a language. **CO2**.Determine whether the given language is regular or not. **CO3**.Design context free grammars to generate strings of context free language. **CO4**.Design push down automata and the equivalent context free grammars and Design Turing machine. **CO5**.Distinguish between computability and non-computability, Decidability and un-decidability.

UNIT – I: The Theory Of Automata **CO1**

Introduction to automata theory, Examples of automata machine, Finite automata as a language acceptor and translator, Deterministic finite automata. Non-deterministic finite automata, finite automata with output (Mealy Machine. Moore machine), Finite automata with Epsilon moves, Minimizing number of states of a DFA, My hill Nerode theorem, Properties and limitation of FSM, Application of finite automata. **[8Hrs.]**

UNIT – II: Regular Expressions **CO2**

Alphabet, String and Languages, Regular expression, Properties of Regular Expression, Finite automata and Regular expressions, Arden's Theorem, Regular Expression to DFA conversion & vice versa. Pumping lemma for regular sets, Application of pumping lemma, Regular sets and Regular grammar, Closure properties of regular sets. Decision algorithm for regular sets and regular grammar. **[7Hrs.]**

UNIT – III: Grammars **CO3**

Definition and types of grammar, Chomsky hierarchy of grammar, Relation between types of grammars, Context free grammar, Left most & right most derivation trees, Ambiguity in grammar, Simplification of context free grammar, Chomsky Normal From, Greibach Normal From, properties of context free language, Pumping lemma for context free language, Decision algorithm for context tree language. **[7Hrs.]**

UNIT – IV: Push Down Automata And Turing Machine **CO4**

Basic definitions, Deterministic push down automata and non-deterministic push down automata, Acceptance of push down automata, Push down automata and context free language, Turing machine model, Representation of Turing Machine, Construction of Turing Machine for simple problem's, Universal Turing machine and other modifications .Church's Hypothesis, , Halting problem of Turing Machine. **[7Hrs.]**

UNIT – V: Computability **CO5**

Introduction and Basic concepts, Recursive function, Partial recursive function, Initial functions, Composition of functions, Ackerman's function, Recursively Enumerable and Recursive languages, Decidable and decidable problem, Post correspondence problem, Space and time complexity **[7Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Theory of Computer Science (Automata Language & Computation)	K.L.P. Mishra and N. Chandrasekran	PHI
2	Introduction to Automata theory. Language and Computation	John E. Hopcropt & Jeffery D. Ullman	Narosa, Publishing House

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Introduction to Languages and the Theory of Computation	John Martin,	Tata McGraw Hill.
2	Introduction to Formal Languages Automata Theory and Computation	Kamala Krithivasan, Rama R	2nd Edition, Pearson Education.

Subject Code CS102502	Computer Network	L = 3	T =	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
To Provide students with an enhanced knowledge in Computer Networking. • Understanding concept of local area networks, their topologies, protocols and applications. • Understanding the different protocols, and network architectures. • To make students understand the basic model of data communication and various concepts of networking.	On completion of this course the student will be able to: **CO1:** Describe the basis and structure of an abstract layered Network protocol model. **CO2:** understand the working of network protocols. **CO3:** Students will have deep understanding of various protocols used at Data Link Layer and will be able to analyze the advantages and disadvantages of various available protocols for flow and error control. **CO4:** Students will be able to analyze various Ethernet standards and will be able to choose an appropriate standard according to requirement of LAN. **CO5:** Students will be able to use various network based applications.

UNIT – I: Introduction: History of Computer Network, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN, PAN,. Applications, networks architecture requirements, ISO-OSI, TCP/IP, XNS, IPX/SPX,
Physical Layer: Transmission media, signal and encoding, asynchronous communications; Narrow band, broad band ISDN and ATM, Packet Switching and Circuit Switching.

UNIT – II: Data link layer : Design issues, framing, error detection and correction techniques with numerical, CRC, Elementary Protocol : stop and wait, Sliding Window, Slip, Data link layer in HDLC, ATM. Multiple Access Protocols, Link Layer Addressing, ARP, DHCP, Ethernet devices – Hubs, Bridges, and Switches.
Medium Access sub layer: ALOHA, MAC addresses, CSMA, CSMA/CD. IEEE 802.X Standard Ethernet, wireless LAN.

UNIT – III: Network Layer : Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks, Router, Routing Table, Internet Protocol (IP) – IPv4 and IPv6 , ICMP, Link State Routing , Distance Vector Routing, Hierarchical Routing , RIP, OSPF, BGP, Broadcast and Multicast Routing , MPLS, Mobile IP, IP sec. IPv4 : Classes, Classless, Subneting, Super netting and its numerical

UNIT – IV: Transport Layer: Transport Layer Services – Multiplexing and Demultiplexing, UDP

–Go Back-N and Selective Repeat**. Connection-Oriented Transport**: TCP, Segment Structure, RTT estimation, Flow Control, Connection Management, Congestion Control, TCP Delay Modeling, SSL and TLS. QoS architecture models: IntServ vs DiffServ

UNIT – V: Presentation Layer protocols: AFP, ICA, LPP, NCP, NDR, Telnet
Session Layer protocols: PAP, PPTP, RPC, SCP
Application Layer: Principles of Network Applications , The Web and HTTP, HTTPS, FTP, Electronic Mail, SMTP, IRC, Video Conferencing, MIME, DNS, Socket Programming with TCP and UDP.
Network Security: Principles of Cryptography, Firewalls, Application Gateway, Attacks and Countermeasures.

Text Books:

S.No.	Title	Author(s)	Publisher
1	Data Communications and Networking	Behrouz A. Forouzan	Third Edition TMH
2	Computer Networking: A Top-Down Approach Featuring the Internet	James F. Kurose and Keith W. Ross	Pearson Education, Third edition, 2006

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Computer Networks	Andrew S Tanenbaum	4th Edition. Pearson Education/PHI
2	An Engineering Approach to Computer Networks	S. Keshav	2nd Edition, Pearson Education

Subject Code CS116503	Introduction to Blockchain Technology	L = 3	T = 0	P = 2	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted = 02			Minimum Assignments = 02	

Course Objectives	Course Outcomes
The objective of this course is ➢ the basics of cartography used in Blockchain ➢ Explain design principles of Blockchain. ➢ Explain consensus algorithm used in distributed systems. ➢ Explain the basic building blocks of Blockchain. ➢ Explains the Blockchain system by sending and reading transactions. ➢ Design, build, and deploy a distributed application. ➢ Different real-life applications of Blockchain.	On successful completion of the course, the student will be able to: CO1. Understand the basic technology used in Blockchain CO2. Understand the working principle of Blockchain systems (mainly Bit coin and Ethereum). CO3. Able to understand and design any application specific consensus algorithm CO4. Design, build and deploy Smart Contracts and distributed applications, CO5. integrating the Blockchain technology into their own applications/ projects.

UNIT-I Introduction to Blockchain: Need for Distributed Record Keeping,Blockchain architecture, blockheader detailed design, Abstract Models for Blockchain, Proof of Work (PoW), liveness and fairness, Proof of Stake (PoS) based Chains, Hybrid models (PoW + PoS); Types of Blockchain..

UNIT-II Blockchain Consensus Algorithm challenges and solutions, Modeling faults and adversaries, Byzantine Models of Fault tolerance; Zero Knowledge proofs and protocols in Blockchain.

UNIT-III Introduction to cryptographic basics for cryptocurrency - a short description of Hashing, digital signature schemes, encryption schemes and elliptic curve cryptography, verifiable random functions.

UNIT-IV Blockchain 2.0: Introduction to Ethereum, Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity, Smart Contracts, Attacks on smart contracts, The Turing Completeness of Smart Contract Languages and verification challenges. Blockchain 3.0: Hyperledger implementation on Ethereum, the plug and play platform and mechanisms in permissioned blockchain.

UNIT-V Application of Blockchain: Bitcoin- Bitcoin consensus, Wallet, Bitcoin Blocks, Merkley Tree, hardness of mining, transaction verifiability, anonymity, forks, double spending, mathematical analysis of properties of Bitcoin. Altcoins. Medical record management systems, DNS records.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Blockchain Technology: Concepts and Applications	Kumar Saurabh and Ashutosh Saxena	Wiley Publications, 2020
2	Blockchain Basics	Daniel Drescher	Apress Publications, 2017
3	'Blockchain: The Blockchain for Beginnings	Josh Thompson	Create Space Independent Publishing Platform, 2017
4.	Bitcoin and cryptocurrency technologies: a comprehensive introduction'	Arvind Narayanan, Joseph Bonneau., Edward Felten, Andrew Miller, and Steven Goldfeder	Princeton University Press, 2016
5.	Blockchain Technology: Concepts and Applications'	Kumar Saurabh, AshutoshSaxena	Wiley, 2020

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Blockchain Ultimate guide to understand Blockchain, bitcoin, cryptocurrencies, smart contract	Mark Gates	Wise Fox Publishing, 2017
2	Blockchain For Dummies	Tiana Laurence	John Wiley & Sons, 2018
3	Beginning blockchain: A beginner guide to building Blockchain solutions	Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda	Apress Publications, 2018
4			

Subject Code CS115504	Internet of Things	L = 3	T = 0	P = 2	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted = 02			Minimum Assignments = 02	

Course Objectives	Course Outcomes
The objective of this course is • To understand Concepts, design and characteristics of IoT. • To understand Architecture of IoT. • To understand basic protocols of IoTs. • To understand challenges and applications of IoTs. • To develop IoT applications using Tools.	On successful completion of the course, the student will be able to: CO6. Students will familiar with the concepts of Internet of Things. CO7. Students will familiar with IoT Architecture CO8. Students will ready to Analyze basic protocols in wireless sensor network CO9. Students will be capable to design IoT applications in different domain and be able to analyze their performance CO10. Capable to implement basic IoT applications on embedded platform

Unit 1: Introduction to Internet of Things: Origin of Terminology IoT, Applications of IoT, Characteristics, Implementation Issues, IoT Architecture, IoT Levels, Connectivity Layers, Interoperability in IoT, associated technologies with IoT (M2M, Telemedicine, Big Data, Cloud, Smart Grid, IoV, MANET, VANET, CPS, SDN, 3G/4G/5G), Challenges in IoT, IoT vs WoT, IoT vs M2M**,** IoT Network Configurations.

Unit 2: Connectivity: IoT Network Configurations , Gateway Prefix Allotment, Gateways , Multi-homing , IPv4, IPv6, IPv4 versus IPv6, RPL **Data Protocol:** MQTT, CoAP, AMQP, DDS, XMPP.
Communication Protocols: IEEE Standards 802.3, 802.11 and 802.15 and their versions, Z Wave, Bluetooth, ZigBee, 6LowPAN, HART and Wireless HART, NFC, RFID, Software-Defined Networking

Unit 3: Sensors: Definition, Property of Sensors, Types of sensors:- Transducers, Temperature Sensors, Humidity **Sensors**. Pressure Sensors. Proximity Sensors. Level Sensors. Accelerometers. Gyroscope. Gas Sensors. etc., Sensors Classes
Actuation: Actuator, Actuator Types :- Hydraulic Pneumatic, Electrical, Thermal/ Magnetic, Mechanical, Soft Actuators, Shape memory polymer (SMP)
Types of Motor Actuators and their **working**- Servo motor, Stepper motor, Hydraulic motor, Solenoid Relay, AC motor

Unit 4: Introduction to Arduino Programming – : Operators in Arduino, Control Statement, Loops, Arrays, String, Math Library, Random Number, Interrupts, Integration and calibration of Sensors and Actuators with Arduino:

Implementation of IoT: Introduction to Arduino and NodeMCU (ESP8266) board, Programming NodeMCU using Arduino, Connectivity of Sensors and Actuators with NodeMCU, Introduction to Python programming, Introduction to Raspberry PI.

Unit 5: Cloud Computing Fundamentals**:** Recent Trends in Computing, Evolution of Cloud Computing, Evolution of Cloud Computing, Business Advantages, Components
Service Models: Software-as-a-Service(SaaS), Platform-as-a-Service (PaaS), Infrastructure-as-a-Service (IaaS), Multi-cloud, Inter-cloud, Cloud Computing Service Management and Security,
Case studies: Open stack, Microsoft Azure, Amazon Elastic Compute Cloud (EC2)

Text Books:

S. No.	Title	Author(s)	Publisher
1	Internet of Things: A Hands-On Approach	Vijay Madisetti, Arshdeep Bahga	Orient Blackswan Private Limited - New Delhi
2	Fundamentals of Wireless Sensor Networks: Theory and Practice	Waltenegus Dargie, Christian Poellabauer	Willey Publication
3	Internet of Things with Arduino Cookbook	Macro Schwar	Packet Publishing Ltd

Subject Code CS102591	Computer Network Lab	L =	T =	P = 2	Credits = 1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
To Provide students the basic knowledge of Computer Networking, tools used, their purpose and their connectivity based on requirements.	On completion of this course the student will be able to setup and configure various networking hardware and software. They will also be able to identify the basic faults and can resolve.

List of experiments to be conducted in Computer Network Lab.

Prerequisite

1. Introduction to cables, connectors and topologies.
2. Demonstration of Switch, Hub, Router and their uses and types.
3. Installation of UTP, Co-axial cable, Cross cable, parallel cable.
4. Case Study of Ethernet (10base5, 10base2, 10 base T)
5. Case Study of various Wireless technologies available.

Experiments

1. Basic network command and Network configuration commands like ping, netstat, hostname, nslookup, route, arp, tracert, ipconfig, ARP etc.
2. To enable secured / unsecured file sharing, device sharing over network.
3. Installation and working of Remote Desktop and other third party related software's.
4. To setup IP and other values avoiding DHCP.
5. Use of Subnet mask to create two or more different logical network in same lab.
6. Installation and working with IIS Server.
7. Basic Configuration of Home Router/Modem
8. Introduction to Server administration.
9. Basic Chat Program in Java using TCP.
   Basic Chat Program in Java using UDP.

Text Books:

S.No.	Title	Author(s)	Publisher
1	Data Communications and Networking	Behrouz A. Forouzan	Third Edition TMH
2	Computer Networking: A Top-Down Approach Featuring the Internet	James F. Kurose and Keith W. Ross	Pearson Education, Third edition, 2006

Subject Code CS116592	Blockchain Technology Lab	L =	T =	P =	Credits =
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	
	Minimum number of class tests to be conducted =			Minimum Assignments =	

Course Objectives	Course Outcomes
To Provide students the basic knowledge of Block chain tools, ethereum, their purpose, use and requirements.	On completion of this course the student will be able to setup and configure ethereum accounts and its related applications.

Blockchain Solidity Lab

1. Introduction to Ethereum , Ethereum Nodes, Ethereum Accounts and Ethereum Addresses,
2. Creating an Ethereum Account Using Meta Mask, Creating an Ethereum Account Using My Ether Wallet (MEW),Ether (ETH)
3. Rinke by Authenticated Faucet, How to Transfer ETH, Gas, Gas Price, Gas Limit and Opcodes, Ethereum Block Explorer, Ethereum Transactions Blocks , Ethereum Transaction's Fields,
4. Ethereum 2.0 (ETH2). PoW vs. PoS , Eth2 Sharding, Links to Original Bitcoin & Ethereum White Papers
5. Remix IDE, Compilation In Depth: ABI and Bytecode, Contract Deployment on JSVM Contract Deployment on Rinkeby Using Remix and MetaMask,
6. The Structure of a Smart Contract, Solidity Basic Syntax Rules, State and Local Variables, Functions, Setters, and Getters,
7. The Constructor, Coding - Variables and Functions, Variable Types: Booleans and Integers, SafeMath, Overflows and Underflows ,
8. Fixed-Size Arrays, Coding - Fixed-Size Arrays, Dynamically-Sized Arrays, Coding - Dynamic Arrays,
9. Bytes and String Types, Structs and Enums, Coding - Structs and Enums, Mappings ,Coding – Mappings,
10. Storage vs. Memory (Solidity Gotchas) ,Built-In Global Variables ,
11. Coding - Global Variables
12. Contract's Address and Balance: Payable, Receive and Fallback Functions
13. Coding - Receiving Ether , Accessing the Contract's Balance ,Protecting the Contract's Balance ,Coding - The Contract's Balance
14. Variables and Functions Visibility: Private, Public, Internal, External
15. Coding - Visibility Specifiers

Text Books:

S. No.	Title	Author(s)	Publisher
1			
2			
3			

Subject Code CS115593	Internet of Things Lab	L =	T =	P =	Credits =
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	
	Minimum number of class tests to be conducted =			Minimum Assignments =	

Course Objectives	Course Outcomes
The objective of this course is • To understand Concepts, design and characteristics of IoT. • To understand Architecture of IoT. • To understand basic protocols of IoTs. • To understand challenges and applications of IoTs. • To develop IoT applications using Tools.	On successful completion of the course, the student will be able to: CO1. Students will familiar with the concepts of Internet of Things. CO2. Students will familiar with IoT Architecture CO3. Students will ready to Analyze basic protocols in wireless sensor network CO4. Students will be capable to design IoT applications in different domain and be able to analyze their performance **CO5.** Capable to implement basic IoT applications on embedded platform

Note: Students need to perform at least 10 experiments. Use of sensors and actuators are not restricted as provided. Student may use any other components also.

1. Introduction to various sensors and actuators.
   a) PIR Motion Sensor.
   b) Rain Drop Sensor.
   c) Moisture Sensor.
   d) Temperature Sensor.
   e) Touch Sensor.
   f) Infrared Sensor.
   g) RFID Sensor.
   h) Ultrasonic Sensor.
   i) Bluetooth Module.
   j) Wi-Fi Module.
   k) LED/OLED
   l) Servo Motor.
2. Acquaintance with NodeMCU and perform essential programming establishment.
3. Connect LED/Buzzer with NodeMCU and compose a program to turn ON LED for 1 sec later at regular intervals.
4. Perform Experiment to use NodeMCU ESP8266 as HTTP Server using WiFi Access Point (AP) mode .
5. Perform Experiment for Controlling LED through an HTTP page Using NodeMCU Station

Mode (STA).

6. Interact with DHT11 sensor with NodeMCU and compose a program to print temperature and humidity readings on screen.
7. Communicate OLED with NodeMCU and compose a program to print temperature and moisture readings on it.
8. Communicate Bluetooth with Arduino/ NodeMCU and compose a program to send sensor information to cell phone utilizing Bluetooth.
9. Connect Bluetooth with Arduino/ NodeMCU and compose a program to turn LED ON/OFF when '1'/'0' is sent from cell phone utilizing Bluetooth.
10. Compose a program on NodeMCU to transfer temperature and stickiness information to thingspeak,Blynk or any other free cloud.
11. Compose a program on NodeMCU to fetch temperature and moistness information from thingspeak cloud and display it using OLED.
12. Creating a webpage and display the values received from sensors through NodeMCU.
13. Study of other IoT Boards and components available. (Student Activity).

Text Books:

S. No.	Title	Author(s)	Publisher
1	Internet of Things: A Hands-On Approach	Vijay Madisetti, Arshdeep Bahga	Orient Blackswan Private Limited - Delhi
2	Fundamentals of Wireless Sensor Networks: Theory and Practice	Waltenegus Dargie, Christian Poellabauer	Willey Publication
3	Internet of Things with Arduino Cookbook	Macro Schwar	Packet Publishing Ltd

Subject Code	Cloud Computing Lab	L =	T =	P =	Credits =
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	
	Minimum number of class tests to be conducted =			Minimum Assignments =	

Course Objectives	Course Outcomes
To Provide students the basic knowledge of Cloud purpose, use and requirements.	On completion of this course the student will be able to setup and configure Cloud accounts and its related applications.

AWS Cloud Lab

1. Introduction, what is Cloud Computing?, Traditional IT Overview, The Different Types of Cloud Computing
2. Creating an AWS Account, AWS Account Activation Troubleshooting, , AWS Cloud Overview, Tour of the Console & Services in AWS, About the UI changes in the course, Shared Responsibility Model & AWS Acceptable Policy.
3. IAM - Identity and Access Management, IAM Introduction: Users, Groups, Policies, IAM Users & Groups Hands On, IAM Policies, IAM Policies Hands On, IAM MFA Overview, IAM MFA Hands On,
4. AWS Access Keys, CLI and SDK, AWS CLI Setup on Windows, AWS CLI Setup on Mac, AWS CLI Setup on Linux, AWS CLI Hands On,
5. AWS CloudShell: Region Availability, AWS CloudShell, IAM Roles for AWS Services, IAM Roles Hands On, IAM Security Tools, IAM Security Tools Hands On,
6. IAM Best Practices, Shared Responsibility Model for IAM
7. EC2 - Elastic Compute Cloud, AWS Budget Setup, EC2 Basics, Create an EC2 Instance with EC2 User Data to have a Website Hands On,
8. EC2 Instance Types Basics, Security Groups & Classic Ports Overview, Security Groups Hands On,
9. SSH Overview, How to SSH using Linux or Mac, How to SSH using Windows, How to SSH using Windows 10, SSH Troubleshooting,
10. EC2 Instance Connect, EC2 Instance Roles Demo, EC2 Instance Purchasing Options, Shared Responsibility Model for EC2, EC2 Summary
11. EC2 Instance Storage, EBS Overview, About EBS Multi-Attach, EBS Hands On,
12. EBS Snapshots Overview, EBS Snapshots Hands On, AMI Overview, AMI Hands On,
13. EC2 Image Builder Overview, EC2 Image Builder Hands On, EC2 Instance Store, EFS Overview, Shared Responsibility Model for EC2 Storage,
14. Amazon FSx Overview.
15. ELB & ASG - Elastic Load Balancing & Auto Scaling Groups, High Availability, Scalability, Elasticity,Elastic Load Balancing (ELB) Overview, About the Gateway Load Balancer,

Application Load Balancer (ALB) Hands On, Auto Scaling Groups (ASG) Overview, Auto Scaling Groups (ASG) Hands On, Auto Scaling Groups (ASG) Strategies,

16. S3, 74.S3 Overview, 75.S3 Hands On, S3 Security: Bucket Policy, S3 Security: Bucket Policy Hands On, S3 Website Overview, S3 Website Hands On, S3 Versioning Overview, S3 Versioning Hands On, S3 Server Access Logging, S3 Server Access Logging Hands On, S3 Replication Overview, S3 Replication Hands On, S3 Storage Classes Overview, S3 Storage Classes Hands On, S3 Glacier Vault Lock & S3 Object Lock, S3 Encryption, Shared Responsibility Model for S3,
17. AWS Snow Family Overview, AWS Snow Family Hands On, Storage Gateway Overview.

Text Books:

S. No.	Title	Author(s)	Publisher
1			
2			
3			

Subject Code CS113526	Statistical Foundation for Data Science	L = 3	T =	P = 0	Credits = 2
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
The objective of the course is aimed learn the probability distributions and density estimations to perform analysis of various kinds of data. Also to explore the statistical analysis techniques using Python and R programming languages.	**On successful completion of the course, the student will be able to:** **CO1:** Implement statistical analysis techniques for solving practical problems. **CO2:** Apply statistical analysis on variety of data. **CO3:** Perform multi-dimensional scaling. **CO4:** Perform appropriate statistical tests using R. **CO5:** Analyze data using python

UNIT 1 Probability Theory: Sample Spaces-Events-Axioms–Counting–Conditional Probability and Bayes' Theorem, The Binomial Theorem – Random variable and distributions: Mean and Variance of a Random variable, Binomial-Poisson-Exponential and Normal distributions. Curve Fitting and Principles of Least Squares Regression and correlation. (7Hrs) **CO1**

UNIT 2 Sampling Distributions & Descriptive Statistics: The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Sampling distributions (Chi Square, t, F,z).Test of Hypothesis-Testing for Attributes. (7Hr) **CO2**

UNIT 3 Mean of Normal Population – One-tailed and two-tailed tests, F-test and Chi-square test Analysis of variance ANOVA – One way and two way classifications. Tabular data Power and the computation of sample size- Advanced data handling-Multiple regression Linear models- Logistic regression-Rates and Poisson regression-Nonlinear curve fitting. (7Hrs)**CO3**

UNIT 4 Linear Algebra: Vector space, subspaces, linear dependence and independence of vectors, matrices, projection matrix, orthogonal matrix, idempotent matrix, partition matrix and their properties, quadratic forms, systems of linear equations and solutions; Gaussian elimination, eigen values and eigen vectors, determinant, rank, nullity, projections, LU decomposition, singular value decomposition. **CO4 7 Hrs**

UNIT 5 Calculus and Optimization: Functions of a single variable, limit, continuity and differentiability, Taylor series, maxima and minima, optimization involving a single variable.

(8Hrs) CO5

Text Books:

S.No.	Title	Author(s)	Publisher
1	Introduction to Probability and Statistics for Engineers and Scientists	Sheldon M. Ross	Academic Press
2	Introductory statistics with R	Dalgaard, Peter	Springer Media Science & Business
3	A Handbook of Statistical Analysis Using R	Brain S.Everitt	Apple Academic Press
4	Mathematical Statistics	J.K.Goyal	Krishna Prakashan

Reference Books:

S. No.	Title	Author(s)	Publisher
1	R Cook book	Paul Teetor	O'Reilly

Subject Code CS102527	Biometrics	L = 3	T =	P = 0	Credits = 2
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
The basic objective in offering this course is to study the state-of-the-art in biometrics technology can explore the way to improve the current technology. The students can learn and implement various biometrics technologies using advanced algorithm.	**On successful completion of the course, the student will be able to:** 1. Understand the basic definition of 'Biometric Recognition' and the distinctive of this form of biometrics. 2. Be able to state precisely what functions these systems perform. 3. Be able to draw a system-level diagram for any biometric system and discuss its components. 4. Be able to solve verification, identification, and synthesis problems for a variety of biometrics such as fingerprint, face, iris, hand gestures and cryptography. 5. Be able to use the biometrics ingredients of existing system to obtain a given security goal. 6. Judge the appropriateness of proposal in research papers for a given applications. 7. Be able to design a biometric solution for a given application.

Unit I: Introduction of Biometrics Biometrics: definition, history, basic working architecture, types; Performance measures of biometrics; applications and benefits of biometrics; design of biometrics; biometric identification versus verification.

Unit II: Face and Iris Biometrics Background of face and iris recognition; Face recognition methods: Eigen face methods, contractive transformation method; Challenges of face biometrics; Design of iris biometrics: image segmentation, image preprocessing, determination of iris region; Advantages and disadvantages of face and iris biometrics.

Unit III: Fingerprint and Sign Language Biometrics Fingerprint matching: image acquisition, image enhancement and segmentation, image binarization, minutiaeextraction and matching; Sign language biometrics: Indian sign language (ISL) biometrics, SIFT algorithm, advantages and disadvantages of ISL and fingerprint biometrics.

Unit IV: Biometric Cryptography and Privacy Enhancement Introduction to biometric cryptography; general purpose cryptosystems; Cryptographic algorithms: DES and RSA; Privacy concerns and issues related to biometrics; biometrics with privacy enhancement; soft biometrics; comparison of various biometrics; Identity

and privacy.

Unit V: Scope of Biometrics and Biometric Standards Multimodal biometrics: basic architecture and fusion scheme, application, example of AADHAAR; scope and future market of biometrics; role of biometrics in enterprise and border security; DNA biometrics; biometric standards; biometric APIs.

Text Books:

S.No.	Title	Author(s)	Publisher
1	Biometrics: concepts and applications	Dr G R Sinha and Sandeep B. Patil	Wiley India Publications
2	Introduction to biometrics	Anil K Jain, Arun Ross and Karthik Nandakumar	Springer
3	Biometrics Identity verification in a networked world	Samir nanawati, Michael Thieme and Raj Nanawati	US edition of Wiley India

Subject Code CS102522	Cryptography & Network Security	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
➢ Explain the objectives of information security, importance and application of each of confidentiality, integrity, authentication and availability. ➢ Understand various cryptographic algorithms. ➢ Understand the basic categories of threats to computers and networks. ➢ Describe public-key cryptosystem and enhancements made to IPv4 by IPSec. ➢ Understand Intrusions and intrusion detection. ➢ Discuss the fundamental ideas of public-key cryptography and Web security and Firewalls. ➢ Generate and distribute a PGP key pair and use the PGP package to send an encrypted email message.	On successful completion of the course, the student will be able to: ➢ Student will be able to understand basic cryptographic algorithms, message. ➢ Student will be able to understand web authentication and security issues. ➢ Ability to identify information system requirements for both of them such as client and server. ➢ Ability to understand the current legal issues towards information security.

UNIT – I Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms.
Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, possible types of attacks.

UNIT – II Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.
Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT – III Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512).
Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures.
Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, Public – Key Infrastructure.

UNIT – IV Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH).
Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN,

IEEE 802.11i Wireless LAN Security.

UNIT – V E-Mail Security: Pretty Good Privacy, S/MIME, MIME
IP Security: IP Security overview, IP Security architecture, Authentication Header, combining security associations, Internet Key Exchange
Web Security: TLS, SSL etc. , Secure Electronic Set (SET), Firewalls & its Types, Introduction to IDPS; Risk Management; Security Planning.

Text Books:

S.No.	Title	Author(s)	Publisher
1	Cryptography and Network Security - Principles and Practice	William Stallings	Pearson Education, 6th Edition
2	Cryptography and Network Security	Atul Kahate	Mc Graw Hill, 3rd Edition

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Cryptography and Network Security	C K Shyamala, N Harini, Dr T R Padmanabhan	Wiley India, 1st Edition.
2	Cryptography and Network Security	Forouzan Mukhopadhyay	Mc Graw Hill, 3rd Edition
3	Information Security Principles, and Practice	Mark Stamp	Wiley India
4	Principles of Computer Security	WM. Arthur Conklin, Greg White	
5	Introduction to Network Security	Neal Krawetz	CENGAGE Learning
6	Network Security and Cryptography	Bernard Menezes	CENGAGE Learning