

B. TECH (CSE (IOT))

sr.no.	Code	Course Title	L	T	P	Credit
1.	155501	IoT Architecture & Design	3	0	0	3
2.	155502	Database Management System	3	0	0	3
3.	155503	Artificial Intelligence	3	0	0	3
4.	155504	Cryptography and Network Security	3	0	0	3
5.	155505	Seminar	1	0	0	1
6.		Program Electives Courses-I	3	0	0	3
7.		Professional Practice, Law & Ethics	3	0	0	0
8.	155511P	Summer Entrepreneurship-II	6 Weeks			6
9.	155512P	NPTEL Course	0	0	4	2
10.	155501P	IoT Architecture & Design Lab	0	0	2	1
11.	155502P	Database Management System Lab	0	0	4	2
TOTAL						27

List of Program Elective Courses-I

sr.no.	Code	Course Title	L	T	P	Credit
1.	155506	IoT Communication Protocols	3	0	0	3
2.	155507	Data Analytics for IoT	3	0	0	3
3.	155508	Emerging Web Technology	3	0	0	3
4.	155509	Mathematical Foundation for IoT	3	0	0	3
5.	155510	Software Engineering	3	0	0	3

Paper Code	IoT Architecture and Design	L	T	P	C
155501		3	0	0	3

Unit-1.0 IoT – An Architectural Overview:**7 hrs.**

Definition, characteristics, evolution, applications, architectures, conceptual framework, enabling technologies, wireless networks, M2M communication, IoT system layers, design principles, communication technologies, IoT protocols, business processes, Everything as a Service (XaaS), role of cloud, security, and privacy aspects.

Unit-2.0 Elements of IoT:**7 hrs.**

Hardware Components: Sensors, digital sensors, actuators, RFID technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Introduction to Arduino (configuration and use), Raspberry Pi (basic functionality of Raspberry Pi B+ board, setup, configuration, and use). Software Components: Programming APIs (Python/Node.js/Arduino) for communication protocols – MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

Unit-3.0 Sensors and Actuators in IoT**7 hrs.**

Introduction to Sensors: Sensor vs. Transducer, nature of sensors, sensor output characteristics, sensing technologies, digital output sensors.

Types of Sensors and Actuators: Humidity sensors, ultrasonic sensors, temperature sensors, industrial sensors – description & characteristics.

Evolution of IoT Sensors: First-generation, advanced generation, integrated IoT sensors, Polytronics systems, sensors' swarm..

Unit-4.0 IoT Architecture**8 hrs.**

Introduction to IoT Architecture: Overview, key components, and importance. IoT Reference Architecture: Functional view, information view, deployment and operational view, other relevant architectural views.

Unit-5.0 IoT APIs**5 hrs.**

Representational State Transfer (REST), Uniform Resource Identifiers (URIs).types of APIs and WebSocket.

Unit-6.0 IoT Challenges, Applications, and Case Studies**8 hrs.**

Challenges in IoT: Design challenges, development challenges, security challenges, and other challenges. IoT Applications & Case Studies: Smart Agriculture: Smart irrigation system, temperature controller. Smart Home & Automation: Home automation, smart metering. Healthcare: E-health.

Text/Reference Books

1. Internet of Things, Architecture and Design Principles Raj Kamal 1st edition, McGraw Hill Education, May 2017
2. Internet of Things: A Hands-On Approach Arshdeep Baga and Vijay Madiseti 1st Edition, Universities press, 2015.
3. IoT (Internet of Things Programming: A simple and fast way of Learning IoT David Etter Kindle edition 2016.
4. Architecting the Internet of Things Bernd Scholz-Reiter and Florian Michahelles, ISBN 978-3- 642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016

5. Programming the Raspberry Pi: Getting Started with Python Simon Monk,
January 2012, McGraw Hill Professional.
6. Getting Started with the Internet of Things Cuno Pfister O'Reilly Media, 2011,
ISBN: 978-1- 4493-9357-1.



Paper Code	Database Management Systems	L	T	P	C
155502		3	0	0	3

Unit 1.0- Database system architecture**8 hrs**

Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Unit 2.0- Relational query languages:**10 hrs**

Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Unit 3.0 – Storage strategies:**4 hrs**

Indices, B-trees, hashing.

Unit 4.0- Transaction processing:**8 hrs**

Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Unit 5.0 – Database Security:**6 hrs**

Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Unit 6.0- Advanced topics:**6 hrs**

Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

Text/ Reference:-

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
2. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
3. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education
4. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison - Wesley.

Paper Code	Artificial Intelligence	L	T	P	C
155503		3	0	0	3

Unit-1.0: Introduction:**7 hrs**

Overview, Turing test, Intelligent agents.

Unit-2.0: Problem Solving:**7 hrs**

Solving Problems by Searching: Uninformed search - Depth First Search, Breadth First Search, DFID, Heuristic search - Generate and Test, Best First Search, Beam Search, Hill Climbing, A*,

Unit-3.0:**7 hrs**

Problem reduction search – AND/OR Graphs, AO*, Constraint satisfaction, Means-ends analysis, Stochastic search methods - Simulated Annealing, Particle Swarm Optimization, Game Playing - Minimax algorithm, Alpha-beta pruning.

Unit-4.0: Knowledge and Reasoning:**7 hrs**

Building a knowledge base - Propositional logic, first order logic, Inference in first order logic, Resolution – refutation proofs, Theorem Proving in First Order Logic; Planning, partial order planning, Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks.

Unit-5.0: Learning:**7 hrs**

Overview of different forms of learning: unsupervised, supervised, semi-supervised, K-means clustering algorithm, Decision Trees, Neural Networks, Deep Learning.

Unit-6.0: Advanced topics:**7 hrs**

Introduction to Computer Vision, Natural Language Processing, Expert Systems, Robotics, Genetic Algorithm,

Text/ Reference:-

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach," Prentice Hall
2. E. Rich, K. Knight and S. B. Nair, "Artificial Intelligence," TMH.
3. C. Bishop, "Pattern Recognition and Machine Learning," Springer
4. D. W. Patterson, "Introduction to artificial intelligence and expert systems," Prentice Hall
5. A. C. Staugaard, Jr., "Robotics and AI: An Introduction to Applied Machine Intelligence," Prentice Hall
6. I. Bratko, "Prolog Programming for Artificial Intelligence," Addison-Wesley
7. S. O. Haykin, "Neural Networks and Learning Machines," Prentice Hall
8. D. Jurafsky and J. H. Martin, "Speech and Language Processing," Prentice Hall.

Paper Code	Cryptography and Network Security	L	T	P	C
155504		3	0	0	3

Unit-1.0 Classical Encryption Techniques and Security Concepts **7 hrs.**
 Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security; Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, stenography, key range and key size, possible types of attacks.

Unit-2. Block Ciphers and Symmetric Key Cryptography: **7 hrs.**
 Symmetric key Ciphers: Block Cipher principles- DES, AES, Blowfish, RC5, International Data Encryption Algorithm (IDEA), Block Cipher Operation Modes, Stream ciphers - RC4.

Unit-3.0 Number Theory and Asymmetric Key Cryptography: **8 hrs.**
 Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms; Asymmetric key Ciphers: Principles of Public Key Cryptosystems, The RSA Algorithm, Diffie Hellman Key Exchange, Elgamal encryption & decryption, Knapsack Algorithm.

Unit-4.0 Cryptographic Hash Functions, Authentication, and Digital Signatures **7 hrs.**
 Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512); Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme; Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

Unit-5.0 Transport Layer Security and Wireless Network Security **6 hrs.**
 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-6.0 E-Mail and IP Security: Concepts and Applications **7 hrs.**
 E-Mail Security: Pretty Good Privacy, S/MIME; IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange; Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

Text/Reference Books

1. Cryptography and Network Security: Principles and Practice William, Stallings, Pearson Education, 8th Edition (2022), ISBN-13: 978-1292437480.
2. Cryptography and Network Security, Atul Kahate, McGraw Hill Education India Pvt Ltd, 3rd Edition (2017), ISBN-13: 978-1259029882.
3. Cryptography and Network Security, Behrouz A. Forouzan, McGraw Hill Education, 3rd Edition (2015), ISBN-13: 978-0070702080.
4. Cryptography and Network Security, C.K. Shyamala, N. Harini, Dr. T.R. Padmanabhan, Wiley India, 1st Edition (2011), ISBN-13: 978-8126521793.
5. Information Security: Principles and Practice Mark Stamp, Wiley, 2nd Edition (2011), ISBN-13: 978-0470626399.
6. Principles of Computer Security: CompTIA Security+ and Beyond Wm. Arthur Conklin, Greg White, McGraw Hill Education, 5th Edition (2018), ISBN-13: 978-1260026375.

Paper Code	Program Elective-I	L	T	P	C
155506	IoT Communication Protocols	3	0	0	3

Unit-1.0 Introduction to IoT Communication Protocols **6 hrs.**

Overview of IoT Communication, Need for Communication Protocols in IoT, Comparison of IoT Communication with Traditional Communication, IoT Communication Stack (OSI & TCP/IP Model in IoT).

Unit-2.0 Data Link Layer Protocols in IoT Communication **8 hrs.**

Role of Data Link Layer in IoT, PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, RFID and NFC, DASH7..

Unit-3.0 Addressing and Network Layer Protocols in IoT: **7 hrs.**

IPv4 vs. IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, and IoT Routing Protocols (RPL, CORPL, CARP).

Unit-4.0 IoT Transport Layer- **8 hrs.**

Connection Models, Protocols, and Secure Communication:

Overview of Transport Layer in IoT, Connection-Oriented vs. Connectionless Protocols; Transport Protocols Used in IoT: TCP, MPTCP, UDP, DCCP, SCTP; Security and Reliability in IoT Transport Layer: TLS, DTLS..

Unit-5.0 Session Layer in IoT Communication **7 hrs.**

Role of the Session Layer in IoT Data Exchange, Key Requirements for IoT Application Protocols (Scalability, Security, Latency), Lightweight Protocols vs Traditional Protocols; Protocols for IoT Communication: HTTP, CoAP, XMPP, AMQP, MQTT, DDS.

Unit-6.0 IoT Security & Emerging Communication Trend **6 hrs.**

Security Challenges in IoT Communication, Emerging IoT Communication Technologies: LoRaWAN, 5G and IoT technologies, Edge Computing & Fog Networking for IoT Communication.

Text/Reference Books

1. Internet of Things: Architecture and Design Principles Raj Kamal McGraw Hill; 2nd Edition, (ISBN: 9789390727384).
2. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, Pearson Education, 1st Edition, (ISBN: 978-1587144561).
3. Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Daniel Minoli, Wiley Publications, 2016, (ISBN: 978-1-118-473474).

Paper Code	Program Elective-I	L	T	P	C
155507	Data Analytics for IoT	3	0	0	3

Unit- 1.0: Introduction to IoT and IoT Analytics **6 hrs**

Introduction to IoT, applications, IoT architectures and components, Fundamental to analytics, IoT analytics challenges.

Unit- 2.0: IoT Devices and Networking Protocols **7 hrs**

Overview of IoT devices and sensors, Basics of networking for IoT, IoT connectivity protocols (e.g., Wi-Fi, Bluetooth, Zigbee, LoRaWAN), IoT data messaging protocols (MQTT, CoAP, AMQP, etc.), Analyzing network data to infer device characteristics.

Unit- 3.0: IoT Analytics for the Cloud **7 hrs**

Introduction to elastic analytics, Decouple key components, Cloud security and analytics, designing data processing for analytics, Applying big data technology to storage.

Unit- 4.0: Exploring IoT Data: **8 hrs**

Exploring and visualizing IoT data, Techniques to assess data quality in IoT, Preprocessing IoT data for analytics, Basic time series analysis in IoT, Statistical analysis for IoT applications.

Unit- 5.0: Machine Learning and IoT Analytics **7 hrs**

Introduction to Machine Learning for IoT, Feature engineering with IoT data, Validation methods in IoT analytics, need of the bias–variance tradeoff, Use cases of machine learning in IoT.

Unit-6.0: Advanced Topics in IoT Analytics **7 hrs**

Deep learning techniques for IoT analytics, Predictive analytics and anomaly detection in IoT, Edge AI and on-device analytics, Ethical considerations and challenges in IoT analytics.

Text/ Reference:-

1. Empowering IoT with Big Data Analytics, Mohamed Adel Serhani, Elsevier, 1st Edition (2024), ISBN: 9780443216404.
2. Internet of Things and Data Analytics Handbook, Hwaiyu Geng, Wiley, 1st Edition (2017), ISBN: 9781119173649.
3. Innovations in Computational Intelligence, Big Data Analytics, and Internet of Things, Houbing Song, Information Age Publishing, 1st Edition (2023), ISBN: 9781648025281.
4. Intelligent Network Design Driven by Big Data Analytics, IoT, AI, and Cloud Computing, D. Jude Hemanth, The Institution of Engineering and Technology, 1st Edition (2023), ISBN: 9781839535338.

Paper Code	Program Elective-I	L	T	P	C
155508	Emerging Web Technology	3	0	0	3

Unit 1.0- Introduction to Web Development and AI: 8 hrs

Overview of Web Programming: Understanding the fundamentals of web development – including client-side and server-side scripting languages – Introduction to Artificial Intelligence (AI): Definition, scope and applications of AI in various fields – Intersection of Web Development and AI: Exploring how AI technologies enhance web applications and user experiences – Tools and Technologies: Introduction to essential tools and technologies for web development and AI integration.

Unit 2.0- Front end Development and AI Integration 8 hrs

What is HTML: History, HTML Documents – Basic structure – Creating an HTML document – Features and Limitations – Mark up Tags – Heading-Paragraphs – Line Breaks – HTML Tags – Formatting tags, Introduction to elements of HTML – Working with Text. Working with Lists, Tables and Frames – Working with Hyperlinks – Images – Image format (quality, size, type, ...) – Importing images (scanners) – Working with Forms and controls. Responsive Web Design: Techniques for creating web applications that adapt to different screen sizes and devices. – Introduction to AI Libraries and APIs: Overview of popular AI libraries and APIs for frontend integration.

Unit 3.0 – Introduction to Cascading Style Sheets 8 hrs

Concept of CSS – Creating Style Sheet, CSS Properties – CSS Styling (Background, Text Format, Controlling Fonts) – Working with block elements and objects – Working with Lists and Tables - CSS Id and Class Box Model (Introduction, Border properties, Padding Properties, Margin properties) – CSS Advanced (Grouping, Dimension, Display, Positioning – Floating, Align, Pseudo class – Navigation Bar – Image Sprites – Attribute selector) – CSS Color – Creating page Layout and Site Designs.

Unit 4.0- Introduction to Web Publishing, Multimedia and Hosting 6 hrs

Creating the Web Site – Saving the site Working on the web site – Creating web site structure – Creating Titles for web pages Themes - Publishing web sites – Inserting audio files – Video files and acceptable formats (MPEG, Quick Time – Video for Windows). Inserting video files – Screen control attributes (WIDTH, HEIGHT, ALIGN) – Start control attributes (START, FILEOPEN, LOOP, LOOPDELAY, and MOUSEOVER) – Basic concepts of Images: Digital Images and Digital Image Representation – Image Formats: TIFF, BMP, JPG/JPEG, GIF, And PIC.PDF, Hosting Basics – Types of Hosting.

Unit 5.0 – Introduction to React and core concept 6 hrs

Overview, JSX, and React components. Props, state, and component lifecycle methods.

Unit 6.0- React Router, State Management, Hooks 6 hrs

Navigation and routing in single-page applications, Context API and Redux for global state. Use State, use Effect, and custom hooks.

Text/ Reference:-

1. "Building Intelligent Web Applications: How to Get Started with Artificial Intelligence-Driven Web Applications" by Mark Watson (Year: 2019)
2. "Web Development with Artificial Intelligence" by Ibrahim Naji (Year: 2020)
3. "Learning React: Functional Web Development with React and Redux" by Alex Banks and Eve Porcello
4. "React Design Patterns and Best Practices" by Carlos Santana Roldán
5. "AI for Web Development: Leverage the Power of Machine Learning and Deep Learning to Build Smart Web Applications" by Sandeep Kumar Patel (Year: 2019)
6. "Full stack React: The Complete Guide to ReactJS and Friends" by Accomazzo, Murray, and Lerner.

Paper Code	Program Elective-I	L	T	P	C
155509	Mathematical Foundation for IoT	3	0	0	3

Unit-1.0 Mathematical Logic and Set Theory**7 hrs.**

Propositional Logic: Statements, Connectives, Well-formed Formulas, Truth Tables, Tautologies Normal Forms; Predicate Logic: Quantifiers, Free and Bound Variables, Inference Theory; Set Theory: Operations on Sets, Principle of Inclusion-Exclusion, Relations (Equivalence, Partial Ordering), Hasse Diagrams.

Unit-2.0 Number Theory and Algebraic Structures:**7 hrs.**

Number Theory: Congruences, Modular Arithmetic, Fermat's Theorem, Euler's Theorem, Chinese Remainder Theorem; Algebraic Structures: Groups, Subgroups, Cosets, Normal Subgroups, Lagrange's Theorem, Rings, Fields, Homomorphism & Isomorphism.

Unit-3.0 Probability and Statistics for IoT:**7 hrs.**

Counting Principles: Permutations and Combinations, Binomial Theorem; Probability: Conditional Probability, Bayes' Theorem; Random Variables: Discrete & Continuous, Expectation, Variance; Distributions: Binomial, Poisson, Normal Distributions, Moment Generating Functions; Inequalities: Markov's and Chebyshev's Inequalities.

Unit-4.0 Graph Theory and Network Structures:**7 hrs.**

Graph Basics: Eulerian & Hamiltonian Graphs, Adjacency & Incidence Matrices; Graph Traversals: BFS, DFS, Shortest Path (Dijkstra's, Floyd-Warshall); Graph Coloring & Covering: Chromatic Number, Planar Graphs, Kuratowski's Theorem; Trees: Spanning Trees, Prim's & Kruskal's Algorithms, Weighted Trees, Max-Flow Min-Cut Theorem.

Unit-5.0 Recurrence Relations and Generating Functions**7 hrs.**

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Solving Homogeneous & Non-Homogeneous Recurrence Relations.

Unit-6.0 Linear Algebra for IoT and Data Analysis**7 hrs.**

Vector Spaces: Basis, Dimension, Linear Transformations; Matrices: Rank, Determinants, Inverse, Eigenvalues & Eigenvectors; Orthogonality: Gram-Schmidt Process, QR Factorization; Applications in IoT: PCA for Data Reduction, SVD for Signal Processing.

Text/Reference Books:

1. Learning Techniques for the Internet of Things, Praveen Kumar Donta, Abhishek Hazra, Lauri Lovén, Springer; 1st Edition, ISBN-13: 978-3031505133
2. Mathematical Foundations of Computing, American Institute of Mathematical Sciences.

Paper Code	Program Elective-I	L	T	P	C
155510	Software Engineering	3	0	0	3

Unit- 1.0: Introduction:**8 hrs**

What is Software Engineering and its history, software crisis, Evolution of a Programming System Product, Characteristics of Software, Brooks' No Silver Bullet, and Software Myths, Software Development Life Cycles: Software Development Process, The Code-and-Fix model, The Waterfall model, The Evolutionary Model, The Incremental Implementation, Prototyping, The Spiral Model, Software Reuse, Critical Comparisons of SDLC models, An Introduction to Non-Traditional Software Development Process: Rational Unified Process, Rapid Application Development, Agile Development Process.

Unit- 2.0 Requirements:**8 hrs**

Importance of Requirement Analysis, User Needs, Software Features and Software Requirements, Classes of User Requirements: Enduring and Volatile, Sub phases of Requirement Analysis, Functional and Nonfunctional requirements, Barriers to Eliciting User requirements, The software requirements document and SRS standards, Requirements engineering, Case Study of SRS for a Real Time System. Tools for Requirements Gathering: Document Flow Chart, Decision Table, Decision Tree, Introduction to nontraditional Requirements.

Unit- 3.0 Software Design:**6 hrs**

Goals of good software design, Design strategies and methodologies, Data oriented software design, Coupling, Cohesion, Modular structure, Packaging, Structured Analysis: DFD, Data Dictionary, Structured Design: Structure chart, Object oriented design, Top-down and bottom-up approach, UML, UML Diagrams, Design patterns.

Unit- 4.0 Software Project Management:**6 hrs**

Overview of Project Manager Responsibilities & project planning, Software Measurement and Metrics: Line of Code (LOC), Function Point (FP) based measures, Various Size Oriented Measures: Halstead's software science, Project Size estimation Metrics Project Estimation, Techniques, COCOMO, Staffing Level Estimation, Scheduling, Organization & Team Structures Staffing, Risk Management.

Unit- 5.0 Software Coding & Testing:**7 hrs**

Development: Selecting a language, Coding guidelines, Writing code, Code documentation. Testing process, Design of test cases, Functional Testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Cyclomatic Complexity Measures: Control flow graphs, Path testing, Data flow and mutation testing, Unit testing, Integration and system testing, Debugging, Alpha & beta testing, testing tools & standards.

Unit- 6.0 Software Maintenance:**7 hrs**

Management of maintenance, Maintenance process, Maintenance models, Regression testing, Reverse engineering, Software reengineering, Configuration management, documentation.

Software Reliability & Quality Management: Introduction to reliability and metrics to reliability measure, Overview of S/W Quality management System ISO 9000, SEI CMM

Text/ Reference:-

1. Software Engineering: A Practitioner's Approach, R. S. Pressman, McGraw Hill
2. Fundamental of Software Engg. By Rajib Mall 4th edition PHI
3. A Concise Introduction to Software Engineering By Pankaj Jalote.
4. Zero Defect Software, G. G. Schulmeyer, McGraw-Hill
5. Object Oriented Modeling and Design, J. Rumbaugh, Prentice Hall
6. Software Engineering, K.K. Aggarwal, Yogesh Singh, New Age International Publishers

Paper Code	IoT Architecture & Design Lab	L	T	P	C
155501P		0	0	2	1

Preform all Experiments

1. Introduction to IoT Platforms: Setting Up Arduino, Raspberry Pi, and NodeMCU
 - a. Familiarization with hardware, software installation, and basic connectivity.
2. Interfacing Ultrasonic Sensor for Distance Measurement Using Arduino, Raspberry Pi, and NodeMCU
 - a. Measure distance and display the data on a serial monitor.
3. IoT-Based LED Control Using Arduino, Raspberry Pi, and NodeMCU
 - a. Implement LED control through GPIO pins and cloud-based control.
4. Temperature Monitoring and Notification System Using LM35 and NodeMCU
 - a. Measure temperature and send alerts via IoT cloud services.
5. Intrusion Detection System Using Ultrasonic Sensor and Arduino
 - a. Detect motion and trigger an alarm for security applications.
6. IoT-Based Smart Lighting System Using LDR and Arduino
 - a. Implement an automatic night lamp based on ambient light conditions.
7. Air Quality Monitoring Using MQ135 Sensor and IoT Cloud Integration
 - a. Measure pollution levels and display data on an LCD or IoT dashboard.
8. Wi-Fi-Based IoT Connectivity: Connecting Arduino to Available Networks
 - a. Establish a Wi-Fi connection and send sensor data to an IoT cloud platform.
9. Bluetooth-Based Home Automation Using Arduino and Relay Module
 - a. Control home appliances using a mobile app and Bluetooth module.
10. Smart Agriculture: Sensor-Based Monitoring Using NodeMCU.
 - a. Implement soil moisture and environmental sensors for precision farming.

Paper Code	Database Management System Lab	L	T	P	C
155502P		0	0	4	2

Preform all Experiments

1. Student should decide on a case study and formulate the problem statement.
2. Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.) Note: Student is required to submit a document by drawing ER Diagram to the Lab teacher.
3. Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys) Note: Student is required to submit a document showing the database tables created from ER Model.
4. Normalization -To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form.
5. Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables.
6. Practicing DML commands- Insert, Select, Update, Delete.
7. Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, CONSTRAINTS etc.
8. Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi).
9. Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.
10. Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger.