**ACADEMIC REGULATIONS,**

**COURSE STRUCTURE**

**AND**

**DETAILED SYLLABUS**

**for**

**B.Tech–CSE (Internet of Things) II, III & IV Year**

**A22 Regulation**

(Applicable for the Batches admitted from 2022-2023)

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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING-IOT**

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY

(An Autonomous Institution approved by UGC and affiliated to JNTUH)

Yamnampet, Ghatkesar, Hyderabad - 501 301

**November -2023**

**B. Tech** **CSE (IOT) Course Structure**

**B. Tech. CSE–IOT I Year- I Semester**

**B. Tech. CSE –IOT I YEAR I SEM**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Course Category** | **Dept Course** | **Code** | **Course** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 | BS | S&H | 9HC04 | Engineering Chemistry | 2 | 1 | 0 | 3 | 40 | 60 |
| 2 | PC | IT | 9FC01 | Problem Solving using C | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | BS | S&H | 9HC11 | Matrix Algebra and Calculus | 2 | 1 | 0 | 3 | 40 | 60 |
| 4 | HS | S&H | 9HC01 | Essential English Language Skills | 2 | 0 | 0 | 2 | 40 | 60 |
| 5 | HS | S&H | 9HC61 | Oral Communication Lab – I | 0 | 0 | 2 | 1 | 40 | 60 |
| 6 | BS | S&H | 9HC64 | Engineering Chemistry Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 7 | PC | IT | 9FC61 | Problem Solving using C Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | ES | S&H | 9BC61 | Workshop/Manufacturing Processes Lab | 0 | 1 | 3 | 2.5 | 40 | 60 |
| 9 | HS | S&H | 9HC18 | Induction Program | [2weeks in the beginning of the semester] | | | | **Satisfactory/Not Satisfactory**  - | |
|  |  |  |  | Total : | 9 | 3 | 11 | 17.5 | 320 | 480 |

**B. Tech. CSE –IOT I YEAR II SEM**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Course Category** | **Dept Course** | **Code** | | **Course** | | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 | BS | S&H | | 9HC07 | | Engineering Physics | 2 | 1 | 0 | 3 | 40 | 60 |
| 2 | PC | CSE | | 9EC01 | | Data Structures | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | BS | S&H | | 9HC12 | | Advanced Calculus | 2 | 1 | 0 | 3 | 40 | 60 |
| 4 | ES | S&H | | 9BC01 | | Engineering Graphics | 1 | 0 | 4 | 3 | 40 | 60 |
| 5 | ES | EEE & ECE | | 9AC48 | | Basic electrical and electronics Engineering | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | HS | S&H | | 9HC62 | | Oral communication Lab – II | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 7 | BS | S&H | | 9HC66 | | Engineering Physics Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | PC | CSE | | 9EC61 | | Data Structures using C Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
|  |  |  | |  | | Total : | 11 | 2 | 13 | 19.5 | 320 | 480 |

**B.Tech.CSE (IOT) II Year- I Semester**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Course Category** | **Dept Course** | **CODE** | **Course** | **L** | **T** | **P/D** | **C** | **Max Marks** | | |
| **CIE** | **SEE** | |
| 1 | BS | CSE-CS | 9J301 | Statistical Methods and Number Theory | 3 | 0 | 0 | 3 | 40 | | 60 |
| 2 | PC | CSE | 9EC02 | Object Oriented Programming through Java | 2 | 1 | 0 | 3 | 40 | | 60 |
| 3 | BS | IT | 9F303 | Discrete Mathematics | 2 | 1 | 0 | 3 | 40 | | 60 |
| 4 | ES | ECE | 9CC51 | Digital Electronics | 3 | 0 | 0 | 3 | 40 | | 60 |
| 5 | PC | IOT | 9I302 | Introduction to IOT | 2 | 1 | 0 | 3 | 40 | | 60 |
| 6 | HS | S&H | 9HC16 | Quantitative Aptitude and Logical reasoning | 3 | 0 | 0 | 3 | 40 | | 60 |
| 7 | PC | CSE | 9EC62 | Object oriented Programming through Java Lab | 0 | 0 | 4 | 2 | 40 | | 60 |
| 8 | PC | IOT | 9I360 | Digital Electronics and IOT Lab | 0 | 0 | 3 | 1.5 | 40 | | 60 |
| 9 | ES | EEE& ECE | 9AC96 | Basic Electrical and Electronics  Lab | 0 | 0 | 3 | 1.5 | 40 | | 60 |
|  |  |  |  | **Total :** | **15** | **3** | **10** | **23** | **360** | | **540** |

**B.Tech. CSE (IOT) II Year II Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Course Category** | **CODE** | **Dept Course** | **Course** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 | HS | 9HC03 | S&H | Universal Human values | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | ES | 9CC56 | ECE | Computer Organization and Architecture | 2 | 0 | 0 | 2 | 40 | 60 |
| 3 | PC | 9FC04 | IT | Database Management Systems | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | PC | 9FC02 | IT | Python Programming | 2 | 1 | 0 | 3 | 40 | 60 |
| 5 | HS | 9ZC01 | MBA | Business Economics and Financial Analysis | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | HS | 9HC63 | S&H | Soft Skills Lab | 0 | 1 | 2 | 2 | 40 | 60 |
| 7 | MC | 9HC05 | S&H | Environmental Science | 3 | 0 | 0 | - | Pass/Fail | |
| 8 | PC | 9FC76 | IT | Database Systems Lab | 0 | 0 | 2 | 1 | 40 | 60 |
| 9 | PC | 9FC62 | IT | Python Programming Lab | 0 | 0 | 4 | 2 | 40 | 60 |
| 10 | ES | 9CC83 | ECE | Computer Organization Lab | 0 | 0 | 2 | 1 | 40 | 60 |
| 11 | PS | 9I485 | IOT | Technical Seminar | 0 | 1 | 0 | 1 | 100 | - |
|  |  |  |  | **Total :** | **16** | **3** | **10** | **21** | **460** | **540** |

**B.Tech. CSE (IOT) III Year- I Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Course Category** | **CODE** | **Dept. Course** | **Course** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 | PE |  |  | Professional Elective – I | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | ES | 9FC06 | IT | Web Technologies | 2 | 1 | 0 | 3 | 40 | 60 |
| 3 | PC | 9EC04 | CSE | Computer Networks | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | PC | 9EC06 | CSE | Operating Systems | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | PC | 9FC07 | IT | Automata theory and Compiler Design | 2 | 1 | 0 | 3 | 40 | 60 |
| 6 | ES | 9EC03 | CSE | Software Engineering | 2 | 0 | 0 | 2 | 40 | 60 |
| 7 | PC | 9IC65 | CSE-IOT | CN and OS Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | PC | 9FC66 | IT | Web Technologies Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | PS | **9I595** | CSE-IOT | Summer Industry Internship-I | - | - | - | 1 | 40 | 60 |
|  |  |  |  | **Total :** | **15** | **2** | **6** | **21** | 360 | 540 |

**Note: Summer Internship – I is to be carried out during the summer vacation between IV andV semesters**

**B.Tech CSE (IOT) III Year II Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Course**  **Category** | **CODE** | **Dept Course** | **Course** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
|  |  |  |  |  |  |  |  |  | **CIE** | **CIE** |
| 1 | OE |  |  | Open Elective – I | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | PE |  |  | Professional Elective – II | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | PE |  |  | Professional Elective – III | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | PC | 9IC01 | CSE-IOT | Introduction to Linux Programming | 2 | 0 | 0 | 2 | 40 | 60 |
| 5 | ES | 9I601 | CSE-IOT | Introduction to Embedded and Real Time Systems | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | PC | 9LC01 | AIML | Introduction to Artificial Intelligence | 2 | 0 | 0 | 2 | 40 | 60 |
| 7 | PC | 9IC04 | CSE-IOT | Intellectual Property Rights | 3 | 0 | 0 | 0 | Pass/Fail | |
| 8 | PC | 9I665 | CSE-IOT | Embedded Systems using RTOS and DAA Lab | 0 | 0 | 4 | 2 | 40 | 60 |
| 9 | PC | 9I666 | CSE-IOT | Programming using Linux Lab | 0 | 0 | 4 | 2 | 40 | 60 |
| 10 | ES | 9I680 | CSE-IOT | Comprehensive Viva Voce | - | - | - | 1 | 40 | 60 |
|  |  |  |  | **Total :** | **19** | **0** | **8** | **21** | **360** | **540** |

**B.Tech. CSE (IOT) IV Year I Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Course Category** | **CODE** | **Dept Course** | **Course** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
|  |  |  |  |  |  |  |  |  | **CIE** | **SEE** |
| 1 | OE |  | CSE | Open Elective – II | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | PE |  | CSE | Professional Elective-IV | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | PE |  | CSE | Professional Elective-V | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | PC | 9EC20 | CSE | Cloud Computing | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | PC | 9LC03 | CSE | Machine Learning | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | PC | 9IC10 | CSE-IOT | IOT Security | 3 | 0 | 0 | 3 | 40 | 60 |
| 7 | PC | 9I765 | CSE-IOT | Cloud computing and IOT Lab | 0 | 0 | 2 | 1 | 40 | 60 |
| 8 | PC | 9I766 | CSE-IOT | Machine Learning and Cyber Forensic Lab | 0 | 0 | 4 | 2 | 40 | 60 |
| 9 | PS | **9I785** | CSE-IOT | Summer Industry Internship – II | - | **-** | - | 1 | 40 | 60 |
|  |  |  |  | **Total:** | **18** | **0** | **6** | **22** | **360** | **540** |

**Note: Summer Internship – II is to be carried out during the summer vacation between VI and VII Semester**

**B.Tech. CSE (IOT) IV Year II Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Course**  **Cate gory** | **CODE** | **Dept Course** | **Course** | **L** | **T** | **P/ D** | **C** | **Max Marks** | |
|  |  |  |  |  |  |  |  |  | **SEE** | **SEE** |
| 1 | OE |  |  | Open Elective- III | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | PC | 9I801 | CSE-IOT | Real-Time Analytics | 2 | 0 | 0 | 2 | 40 | 60 |
| 3 | PS | 9I896 | CSE-IOT | Project | - | - | 20 | 10 | 40 | 60 |
|  |  |  |  | **Total:** | **5** | **0** | **20** | **15** | **120** | **180** |

Note: All End Examinations (Theory and Practical) are of Three hours duration.

**T – Tutorial L - Theory P/D – Practical/Drawing**

**C - Credits Int. - Internal Exam Ext. - External Exam** **Course code Definitions**

BS- Basic Science Courses

ES- Engineering Science Courses

HS- Humanities and Social Sciences including Management course

PC-CSE Professional core courses

PE -CSE Professional Elective courses, OE-CSE Open Elective courses

**Professional Elective –I**

|  |  |
| --- | --- |
| 9I507 | IoT System Architectures |
| 9I508 | Sensor Technology and Instrumentation |
| 9EC09 | Cryptography and Network Security |
| 9FC15 | Big Data Analytics |
| 9JC16 | Cyber Security |

**Professional Elective –II**

|  |  |
| --- | --- |
| 9FC05 | Data Warehouse and Data Mining |
| 9I610 | Industrial IoT |
| 9JC04 | Ethical Hacking |
| 9EC04 | Design and Analysis of Algorithms |
| 9JC05 | Block Chain Technology |

**Professional Elective –III**

|  |  |
| --- | --- |
| 9I709 | Mobile Application Development for IoT |
| 9FC13 | Software Project Management |
| 9I712 | Cloud Computing and Virtualization |
| 9I713 | IoT Automation |
| 9FC16 | Agile Software Development |

**Professional Elective-IV**

|  |  |
| --- | --- |
| 9EC10 | Introduction to Data Science |
| 9I716 | Cyber Forensics |
| 9I717 | Ad hoc Wireless Sensor Networks |
| 9I718 | Edge Computing |
| 9FC82 | Data Analytics |

# **Professional Elective –V**

|  |  |
| --- | --- |
| 9I813 | Cognitive Computing |
| 9EC21 | Augmented Reality & Virtual Reality |
| 9I814 | 5G and IoT Technologies |
| 9I815 | Smart Sensor Technologies |
| 9LC21 | Quantum Computing |

##### CSE –IOT Open Electives – A22 Regulations

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Open Elective (OE)** | | | | | |
| **Code** | **OE – I (3-1)** | **Code** | **OE – II (3-2)** | **Code** | **OE – III (4-2)** |
| 9ZC22 | Basics of Entrepreneurship | 9ZC23 | Advanced Entrepreneur ship | 9ZC24 | Product and Services |
| 9ZC25 | Basics of Indian Economy | 9ZC26 | Basics of Polity and Ecology | 9ZC27 | Indian History, Culture and Geography |
| 9ZC05 | Banking Operations, Insurance and Risk Management | 9ZC19 | Entrepreneur ship Project Management and Structured Finance | 9ZC15 | Financial Institutions, Markets and Services |
| 9BC51 | Introduction to Additive Manufacturing Process | 9BC53 | Principles of Operations Research | 9AC45 | Fundamentals of Renewable Energy Sources |
| 9AC44 | Fundamentals of Measurement s and Instrumentation | 9ZC10 | Entrepreneurs hip & Business Design |

**Syllabus for B. Tech. III Year I semester**

**Computer Science and Engineering-IOT**

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P** | **C** |
| **2** | **1** | **0** | **3** |

**WEB TECHNOLOGIES**

**Code:**

**Prerequisite:** Computer Networks, Object-Oriented Programming concepts

**Objectives:**

1. To impart the basics knowledge of HTML5, CSS3 and Tailwind CSS
2. To develop proficiency in JavaScript programming.
3. To comprehend the fundamentals of MERN stack development
4. To design and implement RESTful APIs:
5. To build interactive and user-friendly web applications with ReactJS.

**Course Outcomes:**

Upon completing the course, a student will be able to

**CO 1:** Build a custom website with HTML5, CSS3, and Tailwind.

**CO 2:** Demonstrate features of JavaScript and advanced JavaScript

**CO 3:** Learn about MERN stack and Node JS

**CO 4:** Understand Web Servers and Rest API

**CO 5:** Implement Express applications using MongoDB **CO 6:** Design a Single Page Application using React JS.

**Unit I**

**HTML 5:** Semantic Elements, Web storage API, HTTP status codes.

**CSS 3:** Syntax structure, types, box model, Grid, Flexbox. Responsive Web Design using Media Queries, use of viewport, Transition, Animation.

**CSS Framework:** Tailwind css

**Unit II**

**JavaScript:** Introduction to JavaScript, data types, functions, Arrays, Objects, Regular expressions

**Advanced JavaScript concepts:** let, const, arrow functions, destructuring, spread, rest, Prototypal Inheritance, Closure, understanding callbacks, Promise, Async/await.

**UNIT III**

**Introduction to MERN:** What is MERN? MERN components, Server-Less Hello World, Server setup.

**Node JS:** Introduction to Node.js, REPL, Node Modules: events, OS, HTTP, file i/o, environment variables, dotenv

**Unit IV**

**Web Servers:** client-server architecture**,** request-response objects,creating a basic HTTP server

**Rest API:** Introduction to REST APIs, HTTP verbs

**Unit V**

**Express Framework**: Introduction to Express, Installation of Express, Create first Express application, application, request, and response objects, configuring an Express application, Rendering views, sessions, forms, file upload. Connecting to an SQL database

**MongoDB:** Introduction to MongoDB, connecting to a MongoDB instance with Node, Reading from MongoDB, Writing to MongoDB.

**Unit VI**

**Introduction to ReactJS**: History of Front – end libraries, Motivation for using React, Key differentiators (Virtual DOM, one – way binding), React Components, JSX, props hooks, state, events, effects, fetching data from API using fetch, form validations, React Router, building and deploying react application.

**TEXTBOOKS:**

1. Beginning HTML, XHTML, CSS, and JavaScript, Jon Duckett, Wrox Publications, 2010

2. Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node , Vasan Subramanian, 2nd Edition, A Press.

**REFERENCES:**

1. E – resource: https://nodejs.org/en/docs/

2. E – resource : https://reactjs.org/

3.E – resource : https://tailwindcss.com/

4.E – resource : https://expressjs.com/

5.E – resource : https://web.dev/learn/css

6.E – resource : https://web.dev/learn/html

1.Core SERVLETS AND JAVASERVER PAGES VOLUME 1: CORE TECHNOLOGIES, Marty Hall and Larry Brown Pearson

2.Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson.

3.Murach’s Beginning JAVA JDK 5, Murach, SPD

4.An Introduction to Web Design and Programming –Wang-Thomson

5.Web Warrior Guide to Web Programming-Bai/Ekedaw-Thomas

**Syllabus for B. Tech. III Year I semester**

**Computer Science and Engineering-IOT**

**Computer Networks**

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P** | **C** |
| **3** | **0** | **0** | **3** |

**Code:9EC04**

**Prerequisite : Data Communication**

## Course Objectives:

Understand primitives of computer networks Learn flow control, error control and access control mechanisms. Learn routing and congestion control algorithms, internet protocols.

Understand Transport layer entities such as DNS and HTTP.

**Course Outcomes:** At the end of this course the student will be able to

* 1. Identify the different types of network topologies and protocols useful for real time applications and transmission medias.
  2. Discuss design issues of data link layer and solve problems on Checksum and flow control.
  3. Describe Channel allocation issues, MAC protocols such as ALOHA, CSMA and CSMA/CD and MAC addresses with IEEE 802.X and wireless LAN.
  4. Discuss network layer design issues, routing algorithms and Internetworking concepts.
  5. Discuss network layer sub netting concepts, its protocols of control and congestion and QOS.
  6. Describe concepts and services and protocols of transport, Application layers along with the network security issues.

**UNIT I Introduction:** Uses of Computer Networks, Types of networks: WAN, LAN, MAN, Network Topologies, Reference models: OSI, TCP/IP.

**Physical Layer:** Transmission media: magnetic media, twisted pair, coaxial cable, fiber optics, wireless transmission.

**UNIT II: Data link layer**: Design issues in data link layer: framing, flow control, error control, Error Detection and Correction: Parity, CRC checksum, Hamming code, Flow Control: Sliding Window Protocols, Applications: Data link layer protocols HDLC, PPP.

**UNIT III: Medium Access sub layer:** Channel allocation problem, MAC Protocols: ALOHA, CSMA, CSMA/CD, MAC addresses, IEEE 802.X, Standard Ethernet, Wireless LANS. Bridges, Types of Bridges.

**UNIT IV: Network Layer:** Design issues in Network Layer, Virtual circuit and Datagram subnets-Routing algorithm: Shortest path routing, Flooding, distance vector routing, Link state routing, Hierarchical routing, Broad casting, Multi casting, Routing for mobile hosts.

Internetworking: Concatenated Virtual Circuits, Connectionless internetworking, Tunneling, Internetwork routing, Fragmentation

**UNIT V:** Network layer in internet: IPv4, IP addresses, Sub netting, Super netting, NAT.Internet control protocols: ICMP, ARP, RARP, DHCP**.**

Congestion Control: Principles of Congestion, Congestion Prevention Policies.

Congestion Control in datagram Subnet: Choke packet, load shedding, jitter control.

Quality of Service: Leaky Bucket algorithm and token bucket algorithm.

**UNIT VI: Transport Layer:** Transport Services, Connection establishment, Connection release and TCP and UDP protocols.

**Application Layer**: Domain name system, FTP, HTTP, SMTP, WWW.

## TEXT BOOKS:

1. Computer Networks — Andrew S Tanenbaum, 6th Edition. Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan.fifth Edition TMH.

3. Data Communication and Networks-Bhushan Trivedi-OXFORD Publications.

**REFERENCES:**

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **H** | **H** |  |  |  |  |  |  |  |  |  |  |

**Syllabus for B. Tech. III Year I semester**

**Computer Science and Engineering-IOT**

**Operating Systems**

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P** | **C** |
| **3** | **0** | **0** | **3** |

**Code:9EC06**

**Prerequisite : Computer Organisation**

## *Course Objectives: Learn basics of operating Systems. Understand the process management and synchronization that take place in the operating system. Learn the principles of memory, I/O and file management in a secured environment.*

**Course Outcomes:**

## *At the end of this course the student will be able to*

|  |
| --- |
| 1. Describe the basic functionalities and structure of the Operating System |
| 1. Explain the concepts and implementations of: Processes, Process Scheduling. Describe, contrast and compare various types of Operating systems like Windows and Linux. |
| 1. Comprehend the concepts of Synchronization and Deadlocks in the Operating System |
| 1. Discuss the concepts of Memory Management(Physical and Virtual memory) |
| 1. Explain the concepts of File System with regard to directory and disk management algorithms. |
| 1. Students understand the concepts of I/O systems, protection and security in a case study given |

**Unit I:**Introduction to Operating System, Computer System Architecture: Single Processor System, Multiprocessor System, Clustered System, Multiprogramming System, Multitasking (Time sharing) system, Operating System Services, System Calls, Types of System Calls, System Programs, Operating System Structure: single structure, layered approach, micro kernels, modules.

Application: system calls in the file systems

**Unit II:** Process Management: Process concept, process scheduling, operation on processes; CPU scheduling, scheduling criteria, scheduling algorithms -First Come First Serve (FCFS), Shortest-Job-First (SJF), Priority Scheduling, Round Robin(RR), Multilevel Queue Scheduling. Engg.Applications – Process scheduling in Windows, Linux.

**Unit III:**Process- Synchronization & Deadlocks: Critical Section Problems, semaphores; Monitors; Deadlock Characterization, methods for handling deadlocks-deadlock prevention, Avoidance & Detection; Deadlock recovery. Applications: Handling deadlocks in computer system

**Unit IV**: Memory Management :Logical & Physical Address Space, swapping, Contiguous memory allocation, Paging and Segmentation techniques, Segmentation with paging; Virtual memory: Demand Paging, Page-Replacement Algorithms, Thrashing. Engg. Applications – Memory management in Windows, Linux.

**Unit V:**File System: Different types of files and their access methods, directory structures, various allocation methods, disk scheduling and management and its associated algorithms.

Applications: File allocation, FAT

**Unit VI:** I/O Systems: I/O Hardware, Application I/O Interface, Kernel, Transforming I/O requests, Performance Issues. Protection and Security: Goals of protection, Principles of protection, Access matrix, Access control list, Capability List. Security Attacks, Program threats. Applications: Handling I/O requests

**Text Books:**

1. Operating System Concepts by Silberchatz Galvin, 10th edition.
2. Modern Operating Systems by A. Tanenbaum, 1992, Prentice-Hall.
3. Operating Systems Internals and Design Principles by William Stallings,4th edition, 2001, Prentice-Hall

**References:**

1. Operating System By Peterson , 1985, AW.
2. Operating System By Milankovic, 1990, TMH.
3. Operating System Incorporating With Unix& Windows By Colin Ritche, 1974, TMH.
4. Operating Systems by Mandrik & Donovan, TMH
5. Operating Systems By Deitel, 1990, AWL.

Operating Systems – Advanced Concepts By Mukesh Singhal , N.G. Shivaratri, 2003, T.M.H

**Syllabus for B. Tech. III Year I semester**

**Computer Science and Engineering (IOT)**

**Automata Theory and Compiler Design**

**Code : 8FC07**

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P** | **C** |
| **2** | **1** | **0** | **3** |

**Prerequisite : Nil**

## Course Objectives:

## Learn principles of Finite state machine, finite automation models, and transition diagrams.

## Understand regular languages and expressions for writing grammars.

## Understand context free grammars useful in designing compilers.

## Study the design and working of a complier .

## Study the role of grammars in compiler design.

## Learn a various parsing techniques for design of compilers.

## Course Outcomes:

## At the end of this course the student will be able to

|  |
| --- |
| 1.  Design the finite automata different Languages |
| 2.   Construct finite Automata for a given regular expressions, and derive strings with suitable examples. Conceptualize context free grammars and normal forms. |
| 3. Design the push down automata and Turing Machine for complex languages. |
| 4. Understand LEX tool and relate parsing techniques, |
| 5. Demonstrate and solve problems on SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar and use YACC tool. |
| 6. Understand Semantic Analysis concepts to design compiler: and describe Intermediate code generation such as 3-address code form. |

**UNIT-I:** Strings, Alphabet, Language, Operations, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non deterministic finite automaton,   
 Equivalence between NFA to DFA conversion.

**UNIT-II: Regular Languages**, Regular sets, regular expressions, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Closure properties of regular sets (proofs not required).

**Context Free Grammars:** Context free grammar, derivation trees, Right most and leftmost derivation of strings. Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greiback normal form,

**UNIT-III:** Push down automata: definition, model, acceptance of CFL, Introduction to DCFL and DPDA.  
**Turing Machine:** Turing Machine, definition, model, design of TM, recursively enumerable languages. Chomsky hierarchy of languages

**UNIT IV:** Overview of compiler – Environment, pass, phase, phases of compiler, LEX tool,

Top Down Parsing: Top down parsing technique, Recursive decent parsing with back tracking, Ambiguous grammar, Elimination of left recursion, Left factoring, Predictive parsing, LL (1).

**UNIT V** Bottom up parsing: shift reduce parser SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar, YACC tool.

**UNIT VI:** Semantic Analysis: Syntax directed translation, S- Attributed, L Attributed definition, Type checker, Intermediate code generation: 3-address code form, DAG. Code optimization: Optimization, loop optimization, peep-hole optimization, Symbol table format

**TEXTBOOKS:**

1. Introduction to Automata Theory Languages and Computation. Hopcroft H.E. and Ullman J. D. Pearson Education
2. Introduction to Theory of Computation? Sipser 2nd edition Thomson
3. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education

**REFERENCES:**

1. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
2. Introduction to languages and the Theory of Computation ,John C Martin, TMH
3. Elements of Theory of Computation?, Lewis H.P. &amp; Papadimition C.H. Pearson /PHI.
4. Theory of Computer Science Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI Course Requirements.
5. Modern Compiler Construction in C , Andrew W.Appel Cambridge University Press.
6. Compiler Construction, LOUDEN, Thomson

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**Syllabus for B. Tech III Year I semester**

**Computer Science and Engineering-IOT**

**SOFTWARE ENGINEERING**

**Code: 9EC03**

***Course Objectives:*** In this course the student will learn about

* The concepts of Software Engineering, various process and system models.
* Software requirements in an engineering perspective.
* Various system models and design engineering.
* The concepts of objected oriented design and approaches to software testing strategies.
* Metrics for products, risk management.
* Quality management.

***Course Outcomes:*** After completing this course, student should be able to

1. Apply process models in real world software products.
2. Classify software requirement specification document.
3. Design system models and user interface.
4. Evaluate test strategies for various softwares.
5. Describe product metrics,risks.
6. Understand the quality management.

**UNIT – I: Introduction to Software Engineering:** Evolving role of software, Changing Nature of Software, Software myths.

**A Generic view of process:** Software engineering – A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.

**Process Models:**  The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

**Applications:** Word processing, Spread sheets, Computer Graphics, multimedia, Database management, Entertainment, Personal & business, Financial applications, Insulin pump, Aerospace Engineering

**UNIT – II: Software Requirements: F**unctional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

**Requirements engineering process:** Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

**Applications:** Developing Software Requirement Specification document for an application

**UNIT - III: System models:** Context Models, Behavioral models, Data models, Object models, structured methods.

**Design Engineering:**  Design process and Design quality, Design concepts, and the design model.

**Creating an architectural design:** Software architecture, Data design, Architectural styles and patterns, Architectural Design.

**Applications:** Implementing Microwave Oven, Context model for ATM machine, Insulin Pump

**UNIT – IV: Object-Oriented Design:** Objects and object classes, An Object-Oriented design process, Design evolution, **UML-**Introduction to Unified Modeling Language, UML diagrams.

**Performing User Interface design:** Golden rules, User Interface analysis and design, interface analysis, interface design steps, Design evaluation.

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

**Applications**: Object Model for an application such as Library, Implementing testing strategy on cash counter in malls and in softwares.

**UNIT – V: Product Metrics:** Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

**Metrics for Process and Products:** Software Measurement, Metrics for software quality.

**Risk Management:** Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

**Applications**: Calculating SLOC and metrics for a software.

**UNIT – VI: Quality Management:** Quality concepts, Software quality assurance, Software Reviews, Formal

technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

**Applications**: Applied in rating a software or an organization

**TEXT BOOKS:**

1. Software Engineering, Practitioner’s Approach – Roger S. Pressman, 7th Edition, McGraw Hill International Edition.
2. Software Engineering – Sommerville, 7th Edition, Pearson education.

**REFERENCES:**

1. Software Engineering – K K Agarwal and Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach – James F Peters, Witold Pedrycz, John Wiley.
3. Systems Analysis and Design – Shely Cashman Rosenlatt, Thomson Publications.
4. Software Engineering principles and practice – Waman S Jawadekar, McGraw Hill Companies

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**Syllabus for B.Tech III year I Semester**

**B.Tech (CSE) - IOT**

**Computer Networks and Operating Systems Lab**

## Code:9I564

**Computer Networks Lab**

**Code:**

## Course Objectives: To provide an understanding of the design concepts of framing Error Detection & correction, Routing, Congestion concepts and Network tools.

**Course Outcomes:**

## At the end of this course the student will be able to

1. Implement and analyze framing methods of data link layer.
2. Implement and analyze framing methods of data link layer.
3. Illustrate and implement error detection & correction techniques.
4. Implement different Routing Algorithm.
5. Understand basic Network Commands.
6. Use of Wireshark and NS-2 tools

**Computer Networks Lab Exercises:**

1. Implement the data link layer framing methods such as

a) Character / Byte stuffing

b) Bit stuffing.

2. Implement on a data set of characters the three CRC polynomials

a) CRC 12 b) CRC 16 c) CRC CCITT.

3. Implement Hamming code for error detection and error correction

4. Implement Dijkstra's algorithm to compute the shortest path through a graph.

5. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table for each node using distance vector routing algorithm.

6. Implement Congestion control using Leaky-Bucket Algorithm

7. Execute the basic Networking Commands

1. Arp

Hostname

1. ipconfig
2. ipconfig/all
3. Ipconfig/renew
4. Ipconfig/release

Vii. Ipconfig/flushdns

viii. Pathping

ix. Ping

x. Route

xi. tracert

**Beyond Syllabus:** 1. Installation of NS-2 2. Demonstration of NS-2

**Operating Systems Lab**

**Course Objectives:**  To provide an understanding of the design aspects of operating system concepts through simulation

**Course Outcome:** At the end of this course the student will be able to

1. Simulate and implement operating system concepts such as scheduling, deadlock management, page replacement techniques, file management and memory management

**Exercises**

1. Simulate the following CPU scheduling algorithms

a) Round Robin b) SJF c) FCFS d) Priority

2. Simulate all file allocation strategies

a) Sequential b) Indexed c) Linked

3. Simulate MVT and MFT

4. Simulate Bankers Algorithm for Dead Lock Avoidance

5. Simulate Bankers Algorithm for Dead Lock Prevention

6. Simulate all page replacement algorithms

a) FIFO b) LRU c) LFU

7. Simulate Paging Technique of memory management.

**Syllabus for B. Tech. III Year I semester**

**Computer Science and Engineering-IOT**

**WEB TECHNOLOGIES LAB**

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**Code:**

**Course objectives:**

* 1. Apply HTML5 and CSS3 skills to create functional and visually appealing web pages.
  2. Develop interactive web applications using JavaScript and DOM manipulation.
  3. Build and deploy full-stack web applications using the MERN stack.
  4. Design and implement RESTful APIs using Node.js and Express.js.
  5. Create interactive and user-friendly web interfaces with ReactJS.

**Course Outcomes:**

Upon successful completion of this course, students will be able to:

1. Develop and implement interactive web applications using HTML5, CSS3, and JavaScript.
2. Demonstrate proficiency in using CSS frameworks like Tailwind CSS to enhance web development efficiency.
3. Apply advanced JavaScript concepts to enhance web application development.
4. Build full-stack web applications using the MERN stack (MongoDB, Express.js, React.js, and Node.js).
5. Design and implement RESTful APIs using Node.js and Express.js.

Develop interactive and user-friendly web interfaces with ReactJS.

Note: **Students can select any 3 Problem Statements from each**

**Cycle 1:**

**Problem Statement 1: Responsive Personal Portfolio Website (2 hours)**

Create a responsive personal portfolio website using HTML5 and CSS3. The website should include sections for your profile, skills, experience, projects, and contact information. Use Tailwind CSS to style the website and ensure it is responsive across different screen sizes.

**Problem Statement 2: E-commerce Product Page (3 hours)**

Design and develop an e-commerce product page using HTML5, CSS3, and Tailwind CSS. The page should display product information, including images, descriptions, prices, and options for adding to cart. Use Tailwind CSS to create a visually appealing and consistent layout.

**Problem Statement 3: Interactive Blog Post with Comments (3 hours)**

Create an interactive blog post with comments using HTML5, CSS3, and JavaScript. The blog post should include a title, author, content, and a comment section. Use JavaScript to enable users to submit comments and display them on the page.

**Problem Statement 4: Adaptive Landing Page for Different Devices (2 hours)**

Develop an adaptive landing page that adjusts its layout and content based on the user's device. Use HTML5, CSS3, and JavaScript to detect the device type and display the appropriate content. Employ media queries and responsive design techniques to ensure the page looks great on all devices.

**Cycle 2:**

**Problem Statement 1: Dynamically Generated Content with JavaScript (2 hours)**

Create a web page that dynamically generates content using JavaScript. The page should include a button that, when clicked, generates a new random number and displays it on the page. Use JavaScript to manipulate the Document Object Model (DOM) to add and remove elements.

## Problem Statement 2: Interactive Shopping Cart with JavaScript (3 hours)

Develop an interactive shopping cart using JavaScript. The cart should allow users to add and remove items, update quantities, and calculate the total price. Utilize JavaScript arrays and objects to store product information and manage cart operations.

## Problem Statement 3: Regular Expression-Based Text Manipulation (3 hours)

Build a web application that performs text manipulation using regular expressions. The application should allow users to enter a text string and provide options for search, replace, and formatting. Implement regular expression patterns to identify and modify specific text elements.

## Problem Statement 4: Asynchronous Data Fetching and Display with JavaScript Promises and Async/await (2 hours)

Create a web page that fetches data from an API asynchronously using JavaScript promises and Async/await. The page should display a loading indicator while the data is being fetched and then render the data in a list or table. Demonstrate the use of promises to handle asynchronous operations and improve code readability.

**Cycle 3:**

**Problem Statement 1: Building a Simple REST API with MERN Stack (2 hours)**

Create a simple REST API using the MERN stack (MongoDB, Express.js, React.js, and Node.js). The API should allow users to perform basic CRUD (Create, Read, Update, Delete) operations on a data collection, such as a list of tasks or products. Design the API endpoints, implement the server-side logic using Node.js and Express.js, and connect the API to a MongoDB database.

## Problem Statement 2: Developing a Server-Side Application with Node.js and Express.js (3 hours)

Build a server-side application using Node.js and Express.js. The application should provide an endpoint to accept user input, perform some processing, and return a response.

Implement error handling and logging mechanisms to ensure the application runs reliably. Explore using Node.js modules for common tasks, such as file I/O and data validation.

## Problem Statement 3: Working with Environment Variables and Dotenv in Node.js Applications (2 hours)

Create a Node.js application that utilizes environment variables and dotenv to manage sensitive configuration data. Implement dotenv to load environment variables from a .env file and use them throughout the application. Demonstrate how to access and update environment variables securely.

## Problem Statement 4: Implementing Event-Driven Programming with Node.js (3 hours)

Develop an event-driven Node.js application that utilizes the Node.js EventEmitter API. Create custom events to represent different occurrences, such as user actions or sensor readings. Register event listeners to handle these events and perform appropriate actions. Explore using modules like async/await to manage asynchronous event handling.

## Problem Statement 3: Creating a User Interface with React Router for Navigation (2 hours)

Develop a user interface with React Router for navigation between different components and routes. The application should have multiple pages, such as a home page, a contact page, and an about page. Implement React Router components to handle routing and provide smooth transitions between pages. Utilize nested routes to organize complex navigation structures.

## Problem Statement 4: Building and Deploying a ReactJS Application to a Hosting Platform (3 hours)

Build a complete ReactJS application and deploy it to a hosting platform like Netlify or Vercel. The application should have a functional UI, interact with APIs, and handle user input. Implement build tools like Webpack or Parcel to bundle and optimize the application. Configure the deployment environment and deploy the application to the chosen hosting platform.

**Cycle 4:**

**Problem Statement 1: Building a Simple Web Server with HTTP Request Handling (2 hours)**

Create a basic HTTP server using Node.js and Express.js. The server should handle GET and POST requests, respond with appropriate HTTP status codes, and parse request payloads. Implement route handling to direct requests to specific functions for processing.

**Problem Statement 2: Designing and Implementing a REST API for Resource Management (2 hours)**

Design a REST API for managing a collection of resources, such as books or products. Define the API endpoints for each resource operation (Create, Read, Update, Delete) and map them to HTTP verbs (POST, GET, PUT, DELETE). Implement the API using Node.js and Express.js, including error handling and validation checks.

**Cycle 5:**

**Problem Statement 1: Developing a Full-Stack Web Application with Express and MongoDB (2 hours)**

Create a full-stack web application using Express.js and MongoDB. The application should allow users to create, read, update, and delete (CRUD) data stored in a MongoDB database. Implement the Express framework to handle routing, request processing, and templating.

Utilize MongoDB to store and retrieve data using the Node.js MongoDB driver.

## Problem Statement 2: Building a REST API with Express and MongoDB for User Management (3 hours)

Design and implement a REST API using Express.js and MongoDB for user management. The API should allow users to register, login, update their profiles, and manage their data. Implement authentication and authorization mechanisms to secure user access. Utilize MongoDB to store user information and session data.

## Problem Statement 3: Creating a File Upload Application with Express and MongoDB (2 hours)

Develop a file upload application using Express.js and MongoDB. The application should allow users to upload files, store them in MongoDB, and retrieve them later. Implement file handling techniques to ensure secure and efficient file uploads and storage. Utilize MongoDB to store file metadata and references.

## Problem Statement 4: Implementing Image Processing and Display with Express and MongoDB (3 hours)

Build an image processing and display application using Express.js and MongoDB. The application should allow users to upload images, apply image processing filters, and display the processed images. Utilize image processing libraries to manipulate images and store processed images in MongoDB. Implement image rendering techniques to display images on the web page.

**Cycle 6:**

## Problem Statement 1: Building a Dynamic ReactJS Application with State Management (2 hours)

Create a dynamic ReactJS application that manages state using hooks. The application should display a list of items and allow users to add, remove, and update items. Implement state management techniques to keep the UI in sync with data changes. Utilize hooks like useState and useEffect to handle state updates and side effects.

## Problem Statement 2: Developing a Data-Driven ReactJS Application with API Fetching (3 hours)

Build a data-driven ReactJS application that fetches data from an API and renders it on the UI. The application should display a list of data items retrieved from the API and allow users to filter and search for items. Implement data fetching techniques using the fetch API or libraries like Axios. Utilize state management to store and update data from the API.

## REFERENCES:

1. E – resource: <https://nodejs.org/en/docs/>
2. E – resource : https://reactjs.org/
3. E – resource : <https://tailwindcss.com/>
4. E – resource : <https://expressjs.com/>
5. E – resource : <https://web.dev/learn/css>
6. E – resource : <https://web.dev/learn/html>

**Syllabus for B.Tech III Year I semester**

**Computer Science and Engineering-IOT**

**SUMMER INDUSTRY INTERNSHIP-I**

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**Code: 9I595**

**Prerequisite:** All Courses till this semester

**Course Objectives:**

To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

**Course Outcomes:**

At the end of this course the student will be able to

1. Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
2. Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
3. Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
4. Improve their communicative skills and team skills.

A summer industry internship project shall be carried out by a group of students consisting of 2 to 3 in number during summer third year first semester at industries. This work shall be carried out under the guidance of the faculty assigned as internal guide as well as external guide at industry where students are carrying out summer industry internship projects. Project shall consist of design, fabrication, software development or building of prototype or application app. This can be of interdisciplinary nature also.

There will be 100 marks in total with 40 marks of internal evaluation and 60 marks of external

The **internal evaluation** shall consist of:

Day to day work (internal guide 10M external guide : 5M) : 15 marks

Report : 10 marks

Demonstration / presentation (internal presentation

is evaluated by HOD, senior faculty and internal guide) : 15 marks

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40 marks

End examination : 60 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the internal guide.

**Syllabus for B.Tech III Year I semester**

**Computer Science and Engineering-IOT**

**Professional Elective -I**

|  |  |
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| 9I507 | IoT System Architectures |
| 9I508 | Sensor Technology and Instrumentation |
| 9EC08 | Cryptography and Network Security |
| 9EC18 | Big Data Analytics |
| CS | Cyber Security |

**Syllabus for B. Tech. III Year I semester**

**Computer Science and Engineering-IOT**

**IOT SYSTEM ARCHITECTURES**

**(Professional Elective-I)**

**CODE: 9I507 L T P/D C**

**Course Out comes (CO): 3 0 0 3**

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| CO1 | Comprehend Architectural Overview of IoT |
| CO2 | Justify IoT Reference Architecture and Real World Design Constraints |
| CO3 | Application of various IoT Protocols (Datalink, Network, Transport, Session, Service) |
| CO4 | Relate and examine various Real-World Design Constraints. |

**UNIT –I**

**IoT-An Architectural Overview:** Building an architecture, Main design principles and needed capabilities.

An IoT architecture outline, standards considerations.M2M and IoT Technology Fundamentals-Devices and gateways, Local and wide are a networking.

**UNIT –II**

**Data management:**

Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management.

**Reference Architecture:** IoT Architecture-State of the Art–Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

**UNIT –III**

**Data representation**:

Data representation and visualization, Interaction and remote control.

**IOT Datalink Layer &Network Layer Protocols: PHY**/MAC Layer (3GPP MTC, IEEE802.11, IEEE802.15), WirelessHART, ZWave, BluetoothLowEnergy, ZigbeeSmartEnergy, DASH7-

**UNIT –IV**

NetworkLayer-IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL, CORPL,

CARP.

**Transport:** Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS)

**UNIT –V**

**Session Layer Protocols**: Session Layer-HTTP,CoAP, XMPP, AMQP, MQTT.

**Service Layer Protocols & Security:**Service Layer-oneM2M, ETSIM2M, OMA, and BBF.

**Unit – VI**

**Security**: Security in IoT Protocols–MAC802.15.4, 6LoWPAN, RPL, Application Layer

**Textbooks**

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand ,Stamatis Karnouskos, David Boyle, **“**From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**”,** 1st Edition, AcademicPress,2014.
2. PeterWaher**,“**LearningInternetofThings”,PACKTpublishing,BIRMINGHAM–MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”,ISBN 978-3-642-19156-5 e-ISBN978-3-642-19157-2,Springer
4. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2MCommunications”,ISBN:978-1-118-47347-4, WillyPublicationsVijayMadisettiandArshdeepBahga,**“**InternetofThings(AHands-on-Approach)**”,**1stEdition,VPT,2014.

**Syllabus for B. Tech. III Year I semester**

**Computer Science and Engineering-IOT**

**Sensor Technology and Instrumentation**

**(Professional Elective-I)**

# **Code: 9I508 L T P/DC 3 0 0 3**

# **Course Outcomes:**

**CO1: Classify Sensors and relate its usage**

**CO2: Measure Sensor usage and apply**

**CO3: Compare Instrumentation of various devices and apply**

**CO4: Apply Data Acquisition Methods**

**CO5: Use Smart Sensors**

**Co6: Develop applications using smart sensors**

**Unit - I:**

Sensors & Transducer: Definition, Classification & selection of sensors, Measurement of displacement using Potentiometer, LVDT & Optical Encoder.

**Unit-II:**

Measurement of temperature using Thermistor: Measurement of force using strain gauge, Measurement of pressure using LVDT based diaphragm & pie electric sensor. Thermos couple & RTD, Concept of thermal imaging, Measurement of position using Hall Effect sensors.

**Proximity sensors:** Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor.

**Unit**-**III:**

Virtual Instrumentation: Flow Sensors: Ultrasonic &Laser,

Level Sensors : Ultrasonic & Capacitive Graphical programming techniques, Datatypes, Advantage of Virtual Instrumentation techniques, Concept of WHILE& FOR loops, Arrays, Clusters & graphs,

**Unit-IV:**

Data Acquisition Methods: Structures: Case, Sequence &Formula nodes, Need of software based instruments for industrial automation. Basic block diagram, Analog and Digital IO, Counters, Timers, Types of ADC: successive approximation and sigma-delta.

**Unit V:**

Intelligent Sensors: Types of DAC: Weighted Resistor and R2R Ladder type, Use of Data Sockets for Networked Communication. General Structure of smart sensors & its components.

**UNIT-VI:**

Characteristic of smart sensors: Self calibration, Self-testing & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.

**Text Books**:

1. DVSMurthy, Transducers and Instrumentation, PHI2ndEdition2013
2. DPatranabis, Sensors and Transducers, PHI2ndEdition2013.
3. S.Gupta,J.P.Gupta/PCinterfacingforDataAcquisition&ProcessControl,2ndED/InstrumentSocietyofAmerica,1994.
4. Gary Johnson/LabVIEWGraphicalProgramingIIEdition/McGrawHill1997.

**ReferenceBooks:**

1. Arun K.Ghosh, Introduction to -Measurements and instrumentation, PHI, 4thEdition2012.
2. A.D.Helfrick and W.D.cooper, Modern Electronic

Instrumentation&MeasurementTechniques, PHI–2001.

1. HermannK.P.Neubert,“InstrumentTransducers”2ndEdition2012,OxfordUniversityPress.

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**Syllabus for B. Tech. III Year I semester**

**Computer Science and Engineering-IOT**

**Cryptography and Network Security**

**(Professional Elective-I)**

**Code:9EC08**

**Course Objectives:**

1. To learn the fundamental concepts of security attacks, security services.
2. To apply conventional cryptographic techniques in order to do encryption.
3. To apply Public key cryptography techniques in order to do encryption.
4. To learn IP security Architecture and its role in security framework.
5. To apply SSL and TLS for Web Security. To design and develop Intrusion Detection Systems and Firewall.

**Course Outcomes:**

At the end of this course, the student will be able to

1. Understand the fundamental concepts of Security Attacks and security standards with the model for network Security.
2. Review and analyze conventional cryptographic techniques and authentication
3. Review and analyze public cryptographic techniques and outline the concepts of Kerberos and email privacy
4. Recognize architecture,key management and header formats of Ipsec
5. Outline the various web security threats and protocols
6. Understand Intrusion Detection System and Design principles of Firewalls

**UNIT – I:** Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs.

**UNIT – II:** Conventional Encryption Principles, Conventional encryption algorithms: DES, TDES, AES, RC4 Algorithm, cipher block modes of operation, location of encryption devices, key distribution, Approaches of Message Authentication, Secure Hash Functions: SHA1 and HMAC.

**UNIT – III:** Public key cryptography principles, public key cryptography algorithms: RSA, DIFFIE HELL MAN, digital signatures, digital Certificates, Certificate Authority and key management

Kerberos, X.509 Directory Authentication Service. Email privacy: Pretty Good Privacy (PGP) and S/MIME.

**UNIT – IV:** IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

**UNIT – V:** Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Intruders, Viruses and related threats

**UNIT – VI:** Firewall Design principles, Trusted Systems. Intrusion Detection Systems.

**TEXT BOOKS:**

* 1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education, 6th Edition.
  2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permeh, wiley Dreamtech

**REFERENCE BOOKS:**

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)

2. Network Security - Private Communication in a Public World by Charlie

Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.

3. Cryptography and network Security, Third edition, Stallings, PHI/Pearson

4. Principles of Information Security, Whitman, Thomson.

5. Network Security: The complete reference, Robert Bragg, Mark Rhodes,

TMH

6. Introduction to Cryptography, Buchmann, Springer.

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**Syllabus for B. Tech. III Year I semester**

**Computer Science and Engineering-IOT**

# **BIG DATA ANALYTICS**

# **(PROFESSIONALELECTIVE–I)**

# **CourseCode:9EC18**

**CourseOutcomes :**

* Describe Data design itsapplications
* Apply AnalyticsforBusiness
* Use tools and technology for business applications
* Apply programminglanguageswhichisusedinday todayanalytics cycle
* Apply machine learning methods
* Apply Data visualization techniques for application development

**UNIT - I**

**Data Management :** Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/signal/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Preprocessing. Export all the data onto Cloud ex. AWS/Rackspace etc.

**UNIT-II**

Maintain Healthy, Safe & Secure Working Environment Introduction, workplace safety, Report Accidents & Emergencies, Protect health & safety as your work, course conclusion, assessment.

**UNIT-III**

Big Data Tool: Introduction to Big Data tools like Hadoop, Spark, Impala etc., Data ETL process, Identify gaps in the data and follow-up for decision making.

Provide Data/Information in Standard Formats

Introduction, Knowledge Management, Standardized reporting & compliances, Decision Models, course conclusion. Assessment.

**UNIT - IV**

Big Data Analytics: Run descriptives to understand the nature of the available data, collate all the data sources to suffice business requirement, Run descriptive statistics for all the variables and observer the data ranges, Outlier detection and elimination.

**UNIT - V**

Machine Learning Algorithm: Hypothesis testing and determining the multiple analytical methodologies, Train Model on 2/3 sample data using various Statistical/Machine learning algorithms, Test model on 1/3 sample for prediction etc.

**UNIT - VI**

Data Visualization: Prepare the data for Visualization, Use tools like Tableau, Qlick View and D3, Draw insights out of Visualization tool. Product Implementation.

**TEXT BOOK:**

1. Student’s Handbook for Associate Analytics.

**REFERENCE BOOKS:**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira (the authors have kindly made an online version available): <http://www.dataminingbook.info/uploads/book.pdf>
3. Mining of Massive Datasets Jure Leskovec Stanford Univ. Anand Rajaraman MilliwayLabs
4. JeffreyD.Ullman,StanfordUniv.(http://www.vistrails.org/index.php/Course:\_Big\_Data\_Analysis)

**Syllabus for B. Tech. III Year I semester**

**Computer Science and Engineering-IOT**

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**Cyber Security (PE-I)**

**Code: 9JC21**

**Course Objectives:**

1. Understand the broad set of technical, social & political aspects of Computer Security

2. Describe the operational and organizational security Aspects

3 Have understood the fundamentals of cryptography

4. Explain Authentication Methods

5. Understand the purpose of Intrusion detection system

**Course Outcomes**: At the end of this course, the student will be able to

1. Outline modern security trends and techniques used to defend against each threat.

2. Compare modern cryptography protocols used in Authentication and Remote Access.

3. Categorize the procedures used in the intrusion detection and prevention systems.

4. Identify security tasks that need to be used in e-banking by experts

**Unit – I**

Introduction To Security Trends: The Computer Security Problem - Targets and Attacks - Approaches to Computer Security - Ethics - Basic Security Terminology - Security Models

**Unit – II**

Operational and Organizational Security: Policies, Procedures, Standards, and Guidelines - Security Awareness and Training - Interoperability Agreements - The Security Perimeter - Physical Security - Environmental Issues - Wireless - Electromagnetic Eavesdropping - People—A Security Problem - People as a Security Tool

**Unit – III**

Cryptography: Cryptography in Practice - Historical Perspectives - Algorithms - Hashing Functions - Symmetric Encryption - Asymmetric Encryption - Quantum Cryptography- Cryptography Algorithm Use

**Unit – IV**

Authentication and Remote Access: User, Group, and Role Management - Password Policies - Single Sign-On - Security Controls and Permissions - Preventing Data Loss or Theft - The Remote Access Process - Remote Access Methods

**Unit – V**

Intrusion Detection Systems: History of Intrusion Detection Systems - IDS Overview - Network-Based IDSs - Host-Based IDSs Intrusion Prevention Systems - Honeypots and Honeynets - Tools

**Unit- VI**

e-Banking Security: Online Banking Security, Mobile Banking Security, Security of Debit and Credit Card, UPI Security, e-wallet security guidelines, Security guidelines of PoS.

**TEXT BOOKS**

1. W.A.Coklin, G.White, Principles of Computer Security: Fourth Edition, McGrawHill, 2016

2. William Stallings, Cryptography and Network Security Principles and Practices, Seventh Edition, Pearson

**REFERENCE BOOKS**

1.Achyut S. Godbole, Web Technologies: TCP/IP, Web/Java Programming, and Cloud Computing,

Tata McGraw-Hill Education, 2013

**E-BOOKS:**

1.https://www.newhorizons.com/promotions/cybersecurity-eboo

**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

**Introduction to Linux Programming**

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**Code : 9IC07**

**Prerequisite :** Operating Systems

**Course Objectives:**

1. Induce working principles of Linux operating system, usage of File handling utilities, Security by file permissions, process utilities, Disk utilities, networking utilities.
2. Impart the shell responsibilities and meta-characters of it, control structures, shell interrupt processing, functions, debugging shell scripts.
3. Impart basics of file concepts kernel support for file, file structure and low-level I/O functions, system calls (file API’s). Induce knowledge regarding Directory management and its API.
4. Demonstrate basics of process creation, execution and synchronization mechanisms. Give knowledge regarding a signal, need for having them, usage of various signals.
5. Narrate the need for Inter Process Communication. Explore the possible mechanisms to implement System V APIs. To demonstrate the usage of Message queues.
6. Incorporate implementation for semaphore API and shared memory API. To explain the need for using a basic Client-Server model.

**Course Outcomes:**

At the end of this course, the student will be able to

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| 1. List and demonstrate the basic Linux utilities |  |
| 1. Recite and solve problems using Shell Scripting |  |
| 1. Understand and elaborate File System structure and kernel support for files in Linux. |  |
| 1. Summarize the fundamentals of process control primitives and signal handling. |  |
| 1. Classify the techniques of Inter process communication and apply them to real world problems. |  |
| 1. Demonstrate the significance of Semaphores for Kernel support and simulate program using the same. |  |

**UNIT-I :**  Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities. (Applications: Determining what types of files are present in a system, debugging issues with file accessibility, finding a process troubling for a task and discarding from its existing, Write and extract necessary information from huge test files.)

**UNIT – II:** Working with the Bourne again shell(bash): Introduction, shell responsibilities, pipes and input Redirection, output redirection, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

(Applications: Writing shell scripts for automating most of the regular jobs, taking backup on regular basis and restoring the same)

**UNIT-III:** Files: File Concept, File System Structure, I nodes, File Attributes, File types, Library functions, the standard I/O and formatted I/O in C, stream errors, kernel support for files, System calls, file descriptors, low level file access – File structure related system calls (File APIs), file and record locking, file and directory management – Directory file APIs, Symbolic links & hard links. (Applications: write some system programs to interact with file system, developing small system software’s to work with files and devices, developing program’s on directory management system)

**UNIT-IV**: Process – Process concept, Kernel support for process, process attributes, process control - process creation, waiting for a process, process termination, zombie process, orphan process, Process APIs. Signals– Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.

(Applications: Applications to find number of typical processes are under different context and controlling them in synchronous manner. Develop user defined modules for handling a signal and controlling several issues with signals.)

**UNIT-V**: Inter-process Communication: Introduction to IPC, Pipes, FIFOs, Introduction to three types of IPC-message queues, semaphores and shared memory. Message Queues Kernel support for messages, UNIX system V APIs for messages, client/server example.

(Applications: Developing applications complying with IPC mechanisms, developing an application that exchanges a set of messages among different processes. Write a client server application to go with any concurrent approach)

**UNIT- VI:** Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores. Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, semaphore and shared memory example.

(Applications: Develop critical section handling mechanisms to deal with any real problems. Building applications to share a piece of memory resource among processes concurrently)

**TEXT BOOKS:**

* + 1. Unix System Programming using C++, T.Chan, PHI.
  1. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH, 2006.
  2. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition,rp-2008

**REFERENCES:**

1. Linux System Programming, Robert Love, O’Reilly, SPD.
2. Advanced Programming in the Unix environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. Unix Network Programming, W.R. Stevens, PHI.
4. Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson Education

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**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

**Introduction to Embedded and Real Time Systems**

**Code:**

***Course Objective*** *- In this course the student will learn about*

1. *Embedded System design process using ARM Processor*
2. *ARM interfacing with various bus protocols*
3. *Concepts and constraints related to real-time systems*

***Course Outcomes*** *- After completing this course, student should be able to*

1. *Identify and summarize the characteristics and challenges of designing an embedded system*
2. *Utilize and apply ARM architecture for Embedded System Design*
3. *ARM Architecture and Programming (Assembly and C)*
4. *Design simple input output hardware interfaces using ARM*
5. *Explain the concepts and design requirements related to a real time systems*
6. *Getting embedded software into target system – Debugging*

**UNIT – I**

Embedded Systems and its Applications: Embedded System Design Process, Design challenge, Applications of Embedded Systems (Chapter 1 Vahid) ARM Architectures: ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families (Chapter 1 & 2 Andrew N. Sloss)

**UNIT – II**

ARM Instruction Set: Data Processing Instructions, Addressing Modes, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions. (Chapter 3 Andrew N. Sloss)

**UNIT-III**

Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions (Chapter 4 Andrew N. Sloss)

**UNIT – IV**

ARM Programming: Simple C programs using function calls, pointers, structures, integer and floating point Arithmetic, Assembly code using instruction scheduling, Register Allocation, Conditional Execution and Loops.(chapter 5 Andrew N. Sloss)

**UNIT – V**

Interfacing with ARM: LCD Interfacing, Stepper Motor Interfacing, DC motor Interfacing Using PWM, I2C and SPI protocol.

Networked Embedded Systems: Bus Protocols, I2C bus, CAN bus, SPI protocol, Ethernet Enabled Systems, Design Example- Elevator Controller. (chapter 8 Wolf)

**UNIT – VI**

Introduction to Real-Time Systems: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment Basic Design Using a Real-Time Operating System: Principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Saving Memory and Power, An example RTOS uC-OS / Vx-Works / RT Linux;

**TEXT BOOKS:**

1. Computers and Components: principles of embedded computing system design, Wayne Wolf, Elseveir.

2. Embedded System Design – A Unifies Hardware/Software introduction - Frank Vahid, Tony D. Givargis, John Wiley, 2002.

3. ARM Systems Developer’s Guides- Designing & Optimizing System Software – Andrew N. Sloss, Dominic Symes, Chris Wright, Elsevier

4. An Embedded Software Primer, David E. Simon, Pearson Education.

5. ARM reference manual.

**REFERENCES:**

1. Embedded Systems, Raj Kamal, TMH.

2. LPC2148 ARM7 Microcontroller Manual.

3. ARM Microcontroller Interfacing Hardware and Software, Warwick A Smith, Elkator

4. ARM Microcontroller Part1: 35 Projects for Beginners, Bert Van Dam, Elkator

**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

**Introduction to Artificial Intelligence**

**CODE: L T P/D C**

**Pre requisites: 2 0 0 2**

1. A course on “Computer Programming and Data Structures”

2. A course on “Advanced Data Structures”

3. A course on “Design and Analysis of Algorithms”

4. A course on “Mathematical Foundations of Computer Science”

5. Some background in linear algebra, data structures and algorithms, and probability will all be

helpful

**Course Objectives:**

1. To learn the distinction between optimal reasoning Vs. human like reasoning
2. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
3. To learn different knowledge representation techniques.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Course Outcomes:**

1. Ability to formulate an efficient problem space for a problem expressed in natural language.
2. Select a search algorithm for a problem and estimate its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique for a given

problem.

1. Possess the ability to apply AI techniques to solve problems of game playing, and machine

learning.

**UNIT - I**

Problem Solving by Search-I: Introduction to AI, Intelligent Agents

Problem Solving by Search –II: Problem-Solving Agents, Searching for Solutions, Uninformed Search

Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A\*search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment .

**UNIT - II**

Problem Solving by Search-II and Propositional Logic

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems. Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic,

Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

**UNIT – III**

Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

Logic and Knowledge Representation

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

**UNIT – IV**

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

**UNIT – V**

Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

Uncertain knowledge and Learning

Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes’ Rule and Its Use.

**UNIT – VI**

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of

Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in

Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning;

Dempster-Shafer theory. Learning: Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

TEXT BOOK:

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig,

Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn, E. Rich and K.Knight (TMH)

2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.

3. Artificial Intelligence, Shivani Goel, Pearson Education.

4. Artificial Intelligence and Expert systems – Patterson, Pearson Education

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**Syllabus for B. Tech III Year II semester**

**Computer Science and Engineering-IOT**

**INTELLECTUAL PROPERTY RIGHTS**

**(Common to all allied branches)**

**Code: 9IC04**

**Prerequisite : Nil**

**Course Objective:**

This course is intended to impart awareness on intellectual property rights and various regulatory issues related to IPR

**Course Outcomes:**

At the end of this course the student will be able to

1. Demonstrate a breadth of knowledge in Intellectual property

2. Overview of Patents, Searching, filling and drafting of Patents

3. Overview of copyright & GI .

4. Overview of Trade Mark & Trade Secret,

5. Overview of Integrated Circuit and Industrial Design.

6. Knowledge about different national and international: Conventions and Treaties Governing the

IPRs

**UNIT I: Introduction to IPR:** Discovery, Invention, Creativity, Innovation, History & Significance of IPR, Overview of IPR -Patent, Copyright, Trade Mark, Trade Secret , GI, Industrial Design & Integrated Circuit, Non-patentable criteria.

**UNIT II: Patents**: Patents- Patentability Criteria, Types of Patents-Process, Product & Utility Models, Software Patenting and protection, Patent infringement- Case studies- Apple Vs Samsung, Enfish LLC Vs Microsoft, Overview of Patent search-Types of Searching, Public & Private Searching Databases, Basics of Patent Filing & Drafting, Indian Patents Law.

**UNIT III: Copyrights and Geographical Indications:** Types of Copyrights, Procedure for filing, copyright infringement, Copyright Law, Geographical Indications –Tirupati Laddu , Darjeeling Tea, Basmati rice.

**UNIT IV: Trademark and Trade secrets:** Trade Marks –Commercial importance, protection, registration, Case Studies- Sabena and Subena, Castrol Vs Pentagon, Trade Secrets- Case Studies-Kentucky Fried Chicken (KFC), Coca-Cola.

**UNIT V: Protection of Industrial Designs & Integrated Circuits:** Industrial Designs – Scope, protection, filing, infringement; Integrated Circuits & Layout design, Semiconductors, Unfair competition, Designs Act.

**UNIT VI: International Conventions & Treaties:** Overview of WTO, GATT, TRIPS, WIPO, Berne Convention, Rome convention, Paris Convention, Patent Cooperation Treaty (PCT), Madrid Protocol, Budapest Treaty, Hague agreement

**TEXT BOOKS:**

1. Deborah E. Bouchoux, Intellectual Property for Paralegals – The law of Trademarks, Copyrights, Patents & Trade secrets, 3rd Edition, Cengage learning, 2012
2. N.S. Gopalakrishnan& T.G. Agitha, Principles of Intellectual Property, Eastern Book Company, Lucknow, 2009.

**REFERENCE BOOKS:**

1. M. M. S. Karki , Intellectual Property Rights: Basic Concepts, Atlantic Publishers, 2009
2. Neeraj Pandey &KhushdeepDharni, Intellectual Property Rights, Phi Learning Pvt. Ltd
3. AjitParulekar and Sarita D’ Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd, 2006.
4. B. L. Wadehra. Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000.
5. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.

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**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

**Embedded Systems using RTOS and DAA Lab**

**Code:**

***Lab Objective*** *- In this lab the student will learn about*

1. *ARM Architecture and Programming (Assembly and C)*
2. *ARM interfacing with various bus protocols*
3. *Concepts and constraints related to real-time systems*
4. *Developing innovative projects*

***Lab Outcome:***

* *After completion of this course, the student should be able to design simple input output hardware interfaces using ARMLPC2148*

**Embedded Systems using RTOS Lab Excercises:**

**CYCLE – I: Experiments based on ARM LPC2148 Microcontrollers**

1. Serial Data Transmission using ARM microcontroller in different modes.
2. LCD interface to ARM.
3. ADC, DAC interface based experiment utilizing internal ADC & DAC for ARM Microcontroller.
4. DC Motor Speed Control using PWM using ARM 7.

**CYCLE – II: Experiments using I2C, SPI serial communication using ARM Microcontroller**

1. Program to demonstrate I2C interface serial EEPROM.
2. Program to demonstrate SPI interface for SD-MMC card interface.
3. Porting of RTOS on ARM Microcontroller.
4. Experiments based on RTOS: sending a message to PC through serial port by 3 different tasks on priority bases.
5. Case study on Embedded Linux/Vx-Works/ μCOS- II
6. Case study on Cross Compiler/Assembler tools.

**Design and Analysis of Algorithms Lab Exercises**:

**Prerequisite:** Data Structures (C/C++) Lab

**Course Objectives:**

1. To write programs in java to solve problems using divide and conquer strategy.
2. To write programs in java to solve problems using backtracking strategy.
3. To write programs in java to solve problems using greedy and dynamic programming techniques.

**Course Outcomes**:

At the end of this course, the student will be able to

1. Implement Merge sort algorithm for sorting a list of integers in ascending order, Dijkstra’s algorithm for the single source shortest path problem.

# Implement Prim’s algorithm to generate minimum cost spanning tree.

# Solve the job sequencing with deadlines problem using greedy algorithm.

# Design the solution for the 0/1 knapsack problem using implement Dynamic Programming and implement.

# Using Dynamic programming approach solve the Optimal Binary search Tree problem.

1. Design and implement n-queens problem using backtracking approach.

**List of Programs for Lab**

1. Write a C program to implement Merge sort algorithm for sorting a list of integers in

Ascending order.

# Write a C program to implement Dijkstra’s algorithm for the single source shortest

# path problem.

# Write a C program that implements Prim’s algorithm to generate minimum cost spanning tree.

# Write a C program to implement greedy algorithm for job sequencing with deadlines.

# Write a C program to implement Dynamic Programming algorithm for the0/1 Knapsack problem.

# Write a C program to implement Dynamic programming algorithm for the Optimal

# Binary search Tree problem.

1. Write a C program to implement backtracking algorithm for n-queens problems.
2. Write a C program to implement Quick Sort algorithm for sorting a list of integers in

ascending order.

1. Write a C program to implement the DFS algorithm for a Graph.
2. Write a C program to implement the BFS algorithm for a graph.
3. Write a C program that implements kruskal’s algorithm to generate minimum cost spanning tree.
4. Write a C program to implement Floyd’s algorithm for all pairs shortest path problem.
5. Write a C program to implement the backtracking algorithm for the Hamiltonian

circuit’s problem.

1. Write a C program to implement backtracking algorithm for the sum of subsets problem.

**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

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**Programming Using Linux - Lab**

**Code:9IC61**

**Prerequisite: NIL**

**Course Objectives:**

1. To make use of File handling utilities, Security by file permissions, process utilities, Disk utilities, networking utilities.
2. To understand meta-characters of BASH, acquire the knowledge regarding control structures, shell interrupt processing, functions, debugging shell scripts.
3. To impart usage of kernel support for files using C, understand file structure and low-level I/O functions, system calls (file API’s). Induce knowledge regarding Directory management and its API.
4. To analyze syntaxes for process creation, execution and synchronization mechanisms. Give knowledge regarding a signal, need for having them, usage of various signals.
5. To understand the possible mechanisms to implement System V APIs and analyze the usage of Message queues APIs.
6. To incorporate implementation for semaphore API and shared memory API. To explain the need for using a basic Client-Server model.

**Course Outcomes:**

1. To understand how to work with Linux commands for handling files, processes, text utilities, backup and network utilities.
2. To explore basics of building shell scripts gain knowledge to compose various Shell Scripts.
3. To learn and demonstrate the I/O functions, low-level system calls System Calls available for file and directory handling.
4. To gain knowledge in implementing processes aspects, mastering the process APIs.
5. To understand how to implement pipes, FIFO, how to use for communication purpose in IPC.
6. To understand the significance of Semaphores for Kernel support and simulate program using the same.

**List of Experiments**

* + - 1. Basic Linux Commands File handling utilities, Security by file permissions, Process utilities, Disk utilities, grep.
      2. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
      3. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
      4. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
      5. C programming examples using Linux Operating systems.

a) wc b) cat c) cp

6. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.

7. Write the following Shell scripts:

a) To accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.

b) To list all of the directory files in a directory.

c ) To find factorial of a given integer.

8. a) Write an awk script to count the number of lines in a file that do not contain vowels.

b) Write an awk script to find the number of characters, words and lines in a file.

9. Implement in C the following UNIX commands using System calls a) rename b) link

10. Write a C program to emulate the UNIX ls – l command.

11. Write a C program on zombie process

12. Write a C program that illustrates the following. a) Creating a message queue. b) Writing to a message queue. c) Reading from a message queue.

13. Write a C program that illustrates file locking using semaphores.

14. Write a C program to implement record locking.

15. Write a C program to implement data communication between two processes using PIPE

**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

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**COMPREHENSIVE VIVA VOCE**

**Code:** 9I680

**Prerequisite:** All core Courses till this semester

## Course Objectives:

## Prepare students in basics and advanced relevant courses to revise and face technical interviews for enhancing employability.

**Course Outcomes:**

At the end of this course the student will be

1. Assessed the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year.

Comprehensive Viva Voce will be conducted in third year second semester for 100 marks. Out of 100 marks 40 marks are evaluated internally and 60 marks for external evaluation.

**Internal:**

Comprehensive Viva Voce is conducted twice in a semester and evaluated for 30 marks each and average will be considered for internal.

Internal Examination : 40 Marks

End examination : 60 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, and subject experts.

**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

**Professional Elective –II**

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| IT | Data Warehouse and Data Mining |
| 9I610 | Industrial IoT |
| CS | Ethical Hacking |
| CSE | Design and Analysis of Algorithms |
| CS | Block Chain Technology |

**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

**DATA WAREHOUSE AND DATA MINIG**

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**(Professional Elective- II)**

**Code:**

**Prerequisite : Nil**

**Course Objectives:**

1. To develop the abilities of critical analysis to data mining systems and applications.
2. To implement practical and theoretical understanding of the technologies for data mining
3. To understand the strengths and limitations of various data mining models

**Course Outcomes:**

1. Students should be able to understand why the data warehouse in addition to database systems.
2. Ability to perform the pre-processing of data and apply mining techniques on it.
3. Ability to identify the association rules, classification and clusters in large data sets.
4. Ability to solve real world problems in business and scientific information using data mining.
5. Apply cluster analysis and use complex data type for application development .

**UNIT - I**

**Introduction:** Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining.

**Data Pre-processing:** Needs Pre-processing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

**UNIT - II**

Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining.

**Data Mining Primitives, Languages, and System Architectures :** Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on a Data Mining Query Language Architectures of Data Mining Systems.

**UNIT - III**

**Concepts Description: Characterization and Comparison:**Data Generalization and Summarization- Based Characterization, Analytical Characterization: Analysis of Attribute Relevance,

**Mining Class Comparisons:** Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases.

**UNIT - IV**

**Mining Association Rules in Large Databases :** Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

**UNIT - V**

**Classification and Prediction:** Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, and Classifier Accuracy.

**UNIT - VI**

**Cluster Analysis Introduction :** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

**Mining Complex Types of Data :** Multi Dimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web.

**TEXT BOOKS:**

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER Harcourt India.

**REFERENCES:**

1. Data Mining Introductory and advanced topics –Margaret H Dunham, Pearson Education
2. Data Mining Techniques – Arun K Pujari, University Press.
3. Data Warehousing in the Real World – Sam Anahory & Dennis Murray. Pearson Edn Asia.
4. Data Warehousing Fundamentals – Paulraj Ponnaiah Wiley Student Edition.
5. The Data Warehouse Life cycle Tool kit – Ralph Kimball Wiley Student Edition.

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**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

**INDUSTRIAL IOT**

**(Professional Elective- II)**

**CODE:9I610**

**Prerequisite:**   Basic knowledge of computer and internet

**CourseObjective:**

1. ToprovidestudentswithgooddepthofknowledgeofDesigningIndustrialIOTSystemsforvariousapplication.
2. KnowledgeforthedesignandanalysisofIndustry4.0SystemsforElectronicsEngineeringstudents.

# **Course Outcome:**

* 1. Explain theory and practice related to Industrial IoT Systems.
  2. Ability to identify,formulate and solve engineering problems by using Industrial IoT.
  3. AbilitytoimplementrealfieldproblembygainedknowledgeofIndustrialapplicationswithIoT capability.
  4. Monitor Industrial tasks and systems in IoT environment.
  5. Experiment AR and VR for application development.
  6. Develop application for societal needs.

**UNIT-I: Introduction to Industrial IoT(IIoT)Systems:**

TheVariousIndustrialRevolutions,RoleofInternetofThings(IoT)&IndustrialInternetofThings(IIoT)inIndustry,Industry4.0revolutions,SupportSystemfor Industry4.0, Smart Factories.

**UNIT-II: Implementation systems for IIoT:**

SensorsandActuatorsforIndustrialProcesses,Sensornetworks,ProcessautomationandDataAcquisitionson IoT Platform, Microcontrollers and Embedded PC roles in IIoT, Wireless Sensor nodes with Bluetooth, WiFi, and LoRa Protocols and IoT Hub systems.

**UNIT-III: IIoT Data Monitoring &Control:**

IoT Gate way, IoT Edge Systems and It’s Programming, Cloud computing, Real Time Dashboard for Data Monitoring, Data Analytics and Predictive Maintenance with IIoT technology.

**UNIT-IV**: **Cyber Physical Systems:**

Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artifical Intelligence, Big Data and Advanced Analysis

**UNIT-V: Industrial IoT-Applications:**

Healthcare,PowerPlants,InventoryManagement&QualityControl,PlantSafetyandSecurity(IncludingARandVRsafetyapplications),FacilityManagement.

**UNIT-VI: Case Studies of IIoT Systems:**

IIoT application development with Embedded PC based development boards, Development of mini Project on new version of Operating systems and Edge development board. That project should also address to the current societal needs.

# **List of Books**:

1. Industry4.0:The Industrial Internet of Things [Alasdair Gilchrist](https://www.goodreads.com/author/show/7102856.Alasdair_Gilchrist) Publications: Apress
2. TheConceptIndustry4.0AnEmpiricalAnalysisofTechnologiesandApplicationsinProduction Logistics Authors: Bartodziej, Christoph Jan Springer: Publication in the field of economic science.
3. EmbeddedSystem:Architecture,ProgrammingandDesignbyRajkamal,TMH3.
4. Dr.OvidiuVermesan,Dr.PeterFriess,“*InternetofThings:ConvergingTechnologiesforSmartEnvironments and Integrated Ecosystems*”,River Publishers

**Syllabus for B.Tech. III year II Semester**

**Computer Science and Engineering-IOT**

**ETHICAL HACKING**

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**(Professional Elective- II)**

##### CODE:

##### COURSE OBJECTIVES:

1. To understand and analyse Information security threats and counter measures
2. To perform security auditing & testing
3. To understand issues relating to ethical hacking
4. To study & employ network defense measures.
5. Use tools for web security

**COURSE OUTCOMES:**

1. Apply message Authentication Codes and digital Signature Techniques
2. Apply Key Management and distribution in cryptography
3. Justify IP security and system security
4. Classify computer and security threats and develop a security model to prevent,

detect and recover from attacks.

##### UNITI - ETHICAL HACKING OVERVIEW & VULNERABILITIES

Understanding the importance of security-Concept of ethical hacking andessentialTerminologiesThreat-Attack-Vulnerabilities-TargetofEvaluation-Exploit.Phasesinvolvedinhacking.

##### UNITII - FOOTPRINTING&PORTSCANNING

Foot printing - Introduction to foot printing- Understanding the information gathering methodology of the hackers-Tools used for the reconnaissance phase. Port Scanning - Introduction- using port scanning tools- Ping sweeps-Scripting Enumeration

##### UNITIIISYSTEMHACKING

Introduction- Enumerating windows OS & Linux OS.

Aspect of remote password guessing-Role of eaves dropping-Various methods of password cracking- Keystroke Loggers-Understanding Sniffers-Comprehending Active and Passive Sniffing- ARP Spoofing and Redirection-DNS and IP Sniffing-HTTPS Sniffing.

##### UNITIVHACKINGWEBSERVICES&SESSIONHIJACKING

Webapplicationvulnerabilities-Applicationcodingerrors-SQLinjectionintoBack-endDatabases-Cross-sitescripting-cross-Siterequestforging-Authenticationbypass-Webservicesandrelatedflaws-

##### UNIT V HACKING WIRELESS NETWORKS

##### ProtectivehttpheadersUnderstandingSessionHijacking-PhasesinvolvedinSessionHijacking-TypesofSessionHijacking-SessionHijackingTools.

##### UNIT-VI

Introduction to 802.11-Role of WEP- Cracking WEP Keys- Sniffing Traffic-Wireless DOS attacks-WLAN Scanners-WLAN Sniffers-Hacking Tools-Securing Wireless Networks.

**REFERENCES:**

1. KimberlyGraves,"CertifiedEthicalHacker",WileyIndiaPvtLtd,2010.
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense",CourseTechnology,2010
3. Patrick Engebretson, “The Basics of Hacking and Penetration Testing ”Ethical Hacking and Penetration Testing Made Easy, Syngress Media,SecondRevisedEdition,2013.
4. RajatKhare,"NetworkSecurityandEthicalHacking",LuniverPress,2006.
5. Ramachandran V, “Wireless Penetration Testing Beginner’s Guide “ 3rded..PacktPublishing,2011.
6. ThomasMathew,"EthicalHacking",OSBpublishers,2003

**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

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**Design and Analysis of Algorithms**

**(Professional Elective- II)**

**Code : 8FC05**

**Prerequisite :** Data Structures and C++

**Course Objectives:**

1. To provide a solid foundation in algorithm design and analysis**,** specifically, the student learning outcomes include: Basic knowledge of graph and matching algorithms.

2. Ability to understand and design algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking and branch and bound.

**Course Outcomes:**

After completion of the course, the student will be able to

1. Analyze worst-case running times of algorithms using asymptotic analysis.
2. Synthesize divide and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
4. Comprehend the concept of dynamic programming algorithms, their applications and analyze them.
5. Analyze the Backtracking and Branch and Bound algorithms and also identify the scenarios for its applicability.
6. Comprehend the concept of P and NP Problems and its usage in the applications.

**UNIT I**

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis, Amortized analysis.

Applications: Designing optimal solution with respect to time for a problem.

**UNIT II**

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen’s matrix multiplication.

Applications:PNR number Search, sorting the google search results.

**UNIT III**

Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

Applications: Allocation of funds/resources based on the priority in the computer systems.

**UNIT IV**

Dynamic Programming: General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliabilitydesign.  
Applications: Routing Algorithms in the computer networking

**UNIT V**

Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.  
Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.

Applications: Undo in MS-Word, Games

**UNIT VI**

Introduction to NP-Hard and NP-Complete problems: Basic concepts of non deterministic algorithms, Definitions of NP-Hard and NP-Complete classes, Modular Arithmetic.

Applications: Performance evaluation in the dynamic systems.

**TEXT BOOKS:**

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia publicationspvt.Ltd.

2. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia, Johnwiley and sons.

**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

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**BLOCKCHAIN TECHNOLOGY**

**CODE: (Professional Elective- II)**

Prerequisites:

* Knowledge in security and applied cryptography.
* Knowledge in distributed databases.

Course Objectives:

* To Introduce block chain technology and Cryptocurrency.

Course Outcomes:

* Identify advances related to one of the most popular technological areas today.
* Apply Extensibility of Blockchain concepts.
* Analyze and use Blockchain Science.
* Develop Business model using Blockchain Technology.
* Apply currency multiplicity in business based on need.

**UNIT - I**

Introduction: Block chain or distributed trust, Protocol, Currency

**UNIT – II**

Crypto currency, How a Crypto currency works, Crowd funding.

**UNIT - III**

Extensibility of Blockchain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Blockchain Environment.

**UNIT - IV**

Blockchain Science: Gridcoin, Folding coin, Blockchain Genomics, Bitcoin MOOCs.

**UNIT - V**

Currency, Token, Tokenizing, Campuscoin, Coindrop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency.

**UNIT - VI**

Technical challenges, Business model challenges, Scandals and Public perception, Government

Regulations.

**TEXT BOOKS:**

Melanie Swan, Blockchain Blueprint for Economy, O'reilly.

**REFERENCE BOOKS:**

1. Building Blockchain Apps, Michael Juntao Yuan, Pearson Education

2. Daniel Drescher, Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition

3. Bradley Lakeman, Blockchain Revolution: Understanding the Crypto Economy of the Future. A Non-Technical Guide to the Basics of Cryptocurrency Trading and Investing, ISBN: 1393889158.

**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

**Professional Elective –III**

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| 9I709 | Mobile Application Development for IoT |
| CSE/IT | Software Project Management |
| 9I712 | Cloud Computing and Virtualization |
| 9I713 | IoT Automation |
| CSE | Agile software Development |

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**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

# **MOBILEAPPLICATIONDEVELOPMENT FORIOT**

**(Professional Elective - III)**

**CODE: 9I709**

**Course Objectives:**

Students will learn mobile application development for Internet of Things (IoT)devices.

# **Course Outcomes:**

1. Comprehend IOT Product development life cycle.
2. Use and apply sensors on cloud platform.
3. Develops IoT applications using standardized hardware.
4. Devise IOT products
5. Develop IoT based Wireless Interfaces and IoT Production System.
6. Monitor IOT product development system.

**UNIT – I**

IoT Product Conceptualization: IoT Product Development Lifecycle, IoT Product ConceptualizationsIoTProgrammingFundamentals:GettingStarted,IoTProgrammingsetupforLEDflashing,Programtodisplaymessageonscreen,ProgramtoreadLDRlevelanddisplayonscreen,AndroidAPKtoperformreadwriteoperation.

# **UNIT-II**

ParticleandroidAPKtocontrolLEDintensity,LEDswitchingwithHTMLinterface,Cloudbasedmotiondetection,Displaying temperature sensor data on terminal, Publishing sensor values on the cloud, Performing computation on sensor values.

# **UNIT-III**

**IoT Programming Applications:** Gas level detection using MQ2 sensor, Blink Android Application forcontrollingLEDfrommobile,IntegrationofTemperatureandGasSensorwithBlynkMobileApplication,Printingreal-timeDateandTimevaluesonserialterminal,Displaytemperaturevalueonserialterminal,Displaytemperaturevalueson 16\*2 LCD display

Interfacing:InterfacingofNokia5110display,displayimageonNokia5110,ParticleElectrondisplayingbattery charging level status, GPS tracking device interface to get coordinates.

**UNIT – IV**

**IoTProductHardwareDevelopment:**Productrealization,ConnectiondiagramofIoTproduct,Engineering board development, Product board customization and optimization, Flowchart of IoT warehouse monitoring system,Wirelesscommunication between the multiple kits, Particle cloud IDE.

# **UNIT–V**

**IoTAdvanceWirelessInterfaces:**Bluetoothcommunicationbetweenmasterandslavemodule,Datavisualization on ThingSpeak cloud using webhook services, Storing data into google excel sheet andsendingthe sheetsto emails.

# **UNIT–VI**

**IoT Production System:** IoT Warehouse Monitoring System, IoT Product Packaging, Future of IoT Product Development.

**TEXT BOOK:**

1.IoTProductDevelopmentwithProgramming:Stepwise programming approach with Particle Development board Kindle Edition by Mahesh Jadhav and Tejas Sarang Patil.

**REFERENCE BOOKS:**

1. Kale,Vivek.ParallelComputingArchitecturesandAPIs:IoTBigDataStreamProcessing1stedition,CRC Press,2019.
2. IoTProductDevelopmentwithProgramming:StepwiseprogrammingapproachwithParticleDevelopmentboard Kindle Edition by Mahesh Jadhav and Tejas Sarang Patil.

**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

**SOFTWARE PROJECT MANAGEMENT**

**(Professional Elective - III)**

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**CODE:**

**Course Objectives**

* To acquire managerial skills for software project development
* To understand software economics

**Course Outcomes:**

* Apply knowledge of software economics, phases in the life cycle of software development, project organization, project control and process instrumentation
* Analyze the major and minor milestones, artifacts and metrics from management and technical perspective
* Design and develop software product using conventional and modern principles of software project management
* Apply Metrics for a Project for evaluation and estimation

**UNIT - I**

Software Project Management Renaissance

Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.

**UNIT-II**

Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

**UNIT - III**

**Workflows and Checkpoints of process**

Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments.

**Process Planning**

Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

**UNIT - IV**

**Project Organizations**

Line-of- business organizations, project organizations, evolution of organizations, process automation.

**UNIT - V**

**Project Control and process instrumentation**

The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

**UNIT - VI**

CCPDS-R Case Study and Future Software Project Management Practices

Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

**TEXT BOOKS**:

1. Managing the Software Process, Watts S. Humphrey, Pearson Education

2. Software Project Management, Walker Royce, Pearson Education

**REFERENCE BOOKS**:

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000

2. Process Improvement essentials, James R. Persse, O’Reilly, 2006

3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006

4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O’Reilly, 2006.

5. Head First PMP, Jennifer Greene & Andrew Stellman, O’Reilly, 2007

6. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon, 2nd edition, Wiley India, 2004.

7. Agile Project Management, Jim Highsmith, Pearson education, 2004.

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**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

# **CLOUD COMPUTING AND VIRTUALIZATION**

# **(Professional Elective-III)**

**CODE:9I712**

**Course Objectives:**

1. Guiding design principles for Cloud Computing
2. Understand the concepts of virtualization for cloud computing.

# **Course Outcomes:**

1. Examine and Apply distributed system models.
2. Evaluate concepts of cloud computing.
3. Explore several services provided by cloud.
4. Compare different types of virtualizations.
5. Implement Migration and Virtualization.

# **UNIT-I**

Systems Modelling, Clustering and Virtualization :Distributed System Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Data centers.

# **UNIT - II**

Foundations: Introduction to Cloud Computing, Migrating into a Cloud, Enriching the ‘Integration as aService’ Paradigm for the Cloud Era, The Enterprise Cloud Computing Paradigm.

# **UNIT - III**

Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS): Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures.

# **UNIT - IV**

Enhancing Cloud Computing Environments using a cluster as a Service, Secure Distributed Data Storage in Cloud Computing. Aneka, Comet Cloud, T-Systems’, Workflow Engine for Clouds.

# **UNIT - V**

Virtualization - Hardware virtualization, Full virtualization, Para virtualization, Hypervisor, hardware assisted virtualization, emulator.

# **UNIT - VI**

Migration, operating system virtualization, application virtualization, memory virtualization, storage virtualization, network virtualization, network function virtualization.

# **TEXTBOOKS:**

1. Cloud Computing and Virtualization, Dac- Nhuong Le, Raghvendra Kumar, Gia Nhu Nguyen, Jyotir Moy Chatterjee,Wiley.
2. T. Erl, R. Puttini, Z. Mahmood, Cloud Computing: Concepts, Technology & Architecture,PrenticeHall,2013.

# **REFERENCEBOOKS:**

# Balwinder Singh Sodh, IITRopar,Topics in virtualization and cloud computing.

1. T. Mather, S. Kumaraswamy, S. Latif, Cloud Security and Privacy: An Enterprise Perspectiveon Risksand Compliance,O'ReillySeries,2009.
2. Controlling data in the cloud: out sourcing computation without sourcing control.InProceedingsofthe2009ACMworkshoponCloudcomputingsecurity(CCSW '09).ACM,NewYork,NY,USA,85-90,2009.

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**Computer Science and Engineering-IOT**

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# **IOT AUTOMATION**

# **(Professional Elective–III)**

**CODE:9I713**

**CourseObjectives:**

1. While the promise of the Industrial Internet of Things(IIoT) brings many new businessprospects,italsopresentssignificantchallengesrangingfromtechnologyarchitecturalchoicestosecurityconcerns.
2. Students acquire the upcoming Industrial IoT: Roadmap to the Connected World Course offers important insights on overcoming the challenges and thrive in this exciting space.

# **Course Outcomes:**

1. DiscoverkeyIIoTconceptsincludingidentification,sensors,localization,wirelessprotocols,datastorage and security
2. Explore IoT technologies, architectures, standards, and regulation
3. Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices
4. Examine technological developments that will likely shape the industrial and scape in the future
5. Develop and implement own IoT technologies , solutions, and applications
6. Develop and implement their own IoT technologies, solutions, and applications.

# **UNIT - I**

**Introduction & Architecture:** What is IIoT and the connected world? the difference between IoT andIIoT,ArchitectureofIIoT,IOTnode,ChallengesofIIOT.FundamentalsofControlSystem,introductions,components,closed loop & open loop system.

# **UNIT - II**

**IIOTComponents:**IntroductiontoSensors(DescriptionandWorkingprinciple):Whatissensor?Typesof sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors(DHT-11).Digital switch, Electro Mechanical switches.

# **UNIT - III**

**Communication Technologies of IIoT:** Communication Protocols: IEEE 802.15.4, ZigBee,

Z Wave, Bluetooth, BLE, NFC, RFID Industry standards communication technology (LoRAWAN, OPC UA,MQTT),connectingintoexistingModbusandProfibustechnology,wirelessnetwork communication.

# **UNIT - IV**

**Visualization and Data Types of IIoT:** Front-end EDGE devices, Enterprise data for IIoT, Emerging descriptive data standards for IIoT, Cloud database, Cloud computing, Fog or Edge computing.

Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pidevelopmentenvironment,OptionsforInternetconnectivitywithArduino,ConfiguringyourArduino/Raspberry pi board for the IoT.

# **UNIT - V**

**Retrieving Data:** Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction(M2M).

# **UNIT-VI**

**Control & Supervisory Level of Automation:** Programmable logic controller(PLC),Real-time control system, Supervisory Control & Data Acquisition (SCADA). HMI in an automation process, ERP&MES.

# **TEXT BOOKS:**

1. TheInternetofThingsintheIndustrialSector,Mahmood,Zaigham(Ed.)(SpringerPublication)
2. IndustrialInternetofThings:CybermanufacturingSystem,SabinaJeschke,ChristianBrecher,HoubingSong,Danda B.Rawat(SpringerPublication)

# IndustrialIoTChallenges,DesignPrinciples,Applications,andSecuritybyIsmailButun**(editor)**

# **REFERENCE BOOK:**

1. Jerker Delsing, IoT Automation: Arrow head Framework, CRCPress.

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**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

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**Agile Software Development**

**(Professional Elective –III)**

**Code :**

**Prerequisite:** Software Engineering and OOAD

**Course Objectives:**

To understand how an iterative, incremental development process leads to faster delivery of more useful software

**Course Outcomes:**

At the end of this course, the student will be able to

1. To understand the essence of agile development methods
2. To apply the principles and practices of extreme programming in real world problems.
3. To incorporate proper coding standards and guidelines in an agile process.
4. To optimize an agile process by exploring the possible risks and threats in the software process
5. To improve the process by eliminating waste
6. To design an agile process for a business application and deal with appropriate tradeoff.

**UNIT I:** Why Agile? Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, How to Be Agile? Agile Methods, Don’t Make Your Own Method, The Road to Mastery, Find a Mentor

**UNIT II:** Understanding XP: The XP Lifecycle, The XP Team, XP Concepts, Adopting XP: Is XP Right for Us? Assess Your Agility

**UNIT III:** Practicing XP: Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, Collaborating: Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting, Releasing:“Done Done”, No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation.

**UNIT IV:** Planning: Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. Developing: Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design, Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing

**UNIT V:** Mastering Agility Values and Principles: Commonalities, About Values, Principles, and Practices, Further Reading, Improve the Process: Understand Your Project, Tune and Adapt, Break the Rules, Rely on People: Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, Eliminate Waste: Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput

**UNIT VI:** Deliver Value: Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, Seek Technical Excellence: Software Doesn’t Exist, Design Is for Understanding, Design Tradeoffs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery

**TEXT BOOKS**:

1. James Shore and Shane Warden, “The Art of Agile Development”, O’REILLY, 2007

**REFERENCES:**

* + 1. Robert C. Martin, “Agile Software Development, Principles, Patterns, and Practices” , PHI, 2002.
    2. Angel Medinilla, “Agile Management: Leadership in an Agile Environment”, Springer, 2012.
    3. Bhuvan Unhelkar, “The Art of Agile Practice: A Composite Approach for Projects and Organizations”, CRC Press.
    4. Jim Highsmith, “Agile Project Management”, Pearson education, 2004
    5. Elisabeth Hendrickson, “Agile Testing” Quality Tree Software Inc 2008

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*H: High, M: Medium, L: Low Correlation*

**Syllabus for B. Tech. IV Year I semester**

**Computer Science and Engineering-IOT**

**CLOUD COMPUTING**

**Code: 9EC20**

**Prerequisite: NIL**

**COURSE OBJECTIVES:**

Understand the basic characteristics of cloud computing and technologies that support to implement cloud computing. Analyze the basic cloud computing models that are used to implement cloud technology and available cloud resources in the market. Analyzing the security issues in cloud computing environment and understanding different case studies in cloud computing and IOT platform.

**COURSE OUTCOMES :**

At the end of this course, the students will be able to

1. Summarize the characteristics of cloud and differentiate the cloud service and deployment models.
2. Demonstrate the different kinds of cloud services.
3. Analyze different architectures for cloud applications, Create and run Amazon ec2 instance through python programs
4. Assess the performance of cloud services and summarize the innovative applications of IOT on cloud.
5. Design architecture of an Apps such as map reduce, image processing app etc on cloud.
6. Understand various security aspects in cloud.

**UNIT-1** Introduction to Cloud Computing : Introduction ,characteristics ,Cloud Models and examples ,Applications of Cloud Services .Cloud Concepts and Technologies .

**UNIT-2** Cloud Services and Platforms : Compute Services, Storage Services, Database Services, Application Services, Content Delivery Services, Analytics Services, Deployment and Management Services, Identity and Access Management Services, Open Source Private cloud Software.

**UNIT-3** Cloud Application Design: Design Considerations for Cloud Application, Reference Architectures for Cloud Applications .Cloud Application Design Methodologies , Data Storage Approaches. Python For Cloud: Python for Amazon Web Services, Map Reduce

**UNIT – 4 book 2.** Cloud and the Internet of Things:  Performance of Distributed Systems and the Cloud- Enabling Technologies for the Internet of Things- Innovative Applications of the Internet of Things- Online Social and Professional Networking

**UNIT-5** Cloud Application Development in Python: Design Approaches, Image Processing App, Document Storage App, Map Reduce App, Social Media Analytics App.

**UNIT-6** Cloud Security: Introduction, Cloud Security Architecture (CSA), Authentication, Authorization, Identity Access Management (IAM), Data Security, Key Management, Auditing.

Cloud for Industry, Healthcare and Education.

**TEXT BOOKS:**

1. Cloud Computing –A Hands on Approach , Arshdeep,Vijay Medisetti,University Press.

2. Distributed and Cloud Computing,1st Edition,From Parallel Processing to the Internet of Things,Authors:Kai Hwang Jack Dongarra Geoffrey Fox(Unit4)

3. Cloud Computing: Raj Kumar Buyya,James Broberg,Andrzej GOscinski,Wiley.

**REFERENCES:**

1. Cloud Computing: Dr.Kumar Saurab Wiley India 2011 .

2. Code in the cloud computing: K Chandra sekharan CRC Press.

3. Cloud Compuitng: John W. Rittinghouse ,James Ransome, CRC press.

4. Virtualization Security: Dave Shackleford2013,SYBEX a Willy Brand.

5. Cloud Computing and Software Service: Ahson, iiyas.2011.

6. Cloud Computing Bible: Sosinsky 2012 Wiley India

**Syllabus for B. Tech. IV Year I semester**

**Computer Science and Engineering-IOT**

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# **CLOUD COMPUTING AND IOT LAB**

**CODE:**

**Prerequisite of course:** Fundamentals of computer network, wireless sensor network, communication & internet technology, web technology, information security.

# **Course Objective:**

1. TolearnabouthowtointegratethesecurityaspectintotheirIoTdesigntakingintoconsiderationall the threats that can possibly happen.
2. To develop web applications in cloud.
3. To learn the design and development process involved in creating a cloud-based application.

**Course Outcomes:**

1. UnderstandthevisionofIoTfromaglobalcontextforsecureandsmartcity.

Use of Devices, Gateways and Data Management in IoT. Its security building state of the art architecture in IoT, with Security deployment.

1. Configure various virtualization tools such as Virtual Box, VMware workstation.
2. Design and deploy a web application in a PaaS environment.

# **LISTOFEXPERIMENTS :( CLOUD COMPUTING LAB)**

1. InstallVirtualbox/VmwareWorkstationwithdifferentflavorsoflinuxorwindowsOSontopofwindows7or8.
2. Install a Ccompiler in the virtual machine created using virtual box and execute Simple Programs
3. Install GoogleAppEngine.Create a hello world app and other simple web applications using python/java.
4. Find a procedure to transfer the files from one virtual machine to another virtual machine.
5. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)
6. Install Hadoop single node cluster and run simple applications like word count.

# **E-RESOURCES:**

1. <https://www.iitk.ac.in/nt/faq/vbox.htm>
2. <https://www.cloudsimtutorials.online/cloudsim/>
3. <https://www.edureka.co/blog/install-hadoop-single-node-hadoop-cluster>

# **LIST OF EXPERIMENTS :( IOT LAB)**

1. [IoT Based Intelligent Traffic Management System](https://www.pantechsolutions.net/iot-projects/iot-based-intelligent-traffic-management-system) using ESP 32
2. [IoT based forest fire Alarm System](https://www.pantechsolutions.net/forest-fire-detection-and-prediction-using-nodemcu-with-iot) using ESP 32
3. Smart Irrigation using ESP 32
4. MQTT Home automation using using ESP 32
5. [IoT based Water Management System using ESP 32](https://www.pantechsolutions.net/iot-based-water-management-system-using-raspberry-pi)
6. [MQTT based Smart Waste Collection Management using ESP 32](https://www.pantechsolutions.net/mqtt-based-smart-waste-collection-management-using-raspberry-pi)

# **REFERENCEBOOKS:**

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition,VPT,2014.
2. FrancisdaCosta,“RethinkingtheInternetofThings:AScalableApproachtoConnectingEverything”,1stEdition,ApressPublications,2013.
3. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 978-1-4493-9357-1.

# **SUPPLEMENTARYRESOURCES:**

1. <https://github.com/connectIOT/iottoolkit>
2. <https://www.arduino.cc/>
3. <http://www.zettajs.org/>
4. Contiki(Open source IoT operating system)
5. Arduino(open source IoT project)
6. IoTToolkit(smartobject API gateway service reference implementation)
7. Zetta(BasedonNode.js,ZettacancreateIoTserversthatlinktovariousdevicesandsensors)

.**Syllabus for B. Tech. IV Year I semester**

**Computer Science and Engineering-IOT**

**MACHINE LEARNING**

**Code: L T P/D C 3 0 0 3**

**Prerequisite: Introduction to Data Science**

**Course Objectives:**

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To have a thorough understanding of the Supervised and Unsupervised learning techniques
3. To study the various probability based learning techniques
4. To understand graphical models of machine learning algorithms

**Course Outcomes:**

At the end of this course, the student is able to

1. Understand the fundamental concepts of ML and Designing a Learning System.
2. Understand the basic concepts of MLP,RBF and SVM and their applications.
3. Understand the Probability models namely supervised, unsupervised, basic statistics analyze their analysis of algorithms along with their applications.
4. Understand various Dimensionality Reduction Techniques and Apply various Evolutionary Algorithms with models
5. Understand the Graphical models and their applications
6. Understanding Analytical Learning and Analyze KBANN Algorithm.

**UNIT I: INTRODUCTION:**

Learning (Book-1) – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Linear Discriminants: Definitions of Perceptron, Linear Separability Linear Regression.

Design a Learning System (Book-2) – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm.

**UNIT II: LINEAR MODELS:**

Multi-layer Perceptron(Book-1) – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Interpolations and Basis Functions – Support Vector Machines

**UNIT III: TREE AND PROBABILISTIC MODELS:**

Learning with Trees (Book-1) – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms .

**UNIT IV: DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS:**

Dimensionality Reduction(Book-1) – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example.

**UNIT V: GRAPHICAL MODELS:**

Markov Chain Monte Carlo Methods (Book-1) – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods.

**UNIT – VI ANALYTICAL LEARNING**

Learning with perfect domain theory (Book-2) – Explanation based Learning – Inductive analytical approach to learning – KBANN algorithm.

**TEXT BOOKS:**

1. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

2. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education, 2013.

**REFERENCES:**

1. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.

2. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014

3. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.

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**Syllabus for B. Tech. IV Year I semester**

**Computer Science and Engineering-IOT**

**Machine Learning and Cyber Forensics LAB**

**Code: 8I763**

**Laboratory Outcomes**

The practical/exercises in this section are psychomotor domain Learning Outcomes (i.e. subcomponents of the COs), to be developed and assessed to lead to the attainment of the competency.

CO-1: Understand modern notions in predictive data analysis

CO-2: Select data, model selection, model complexity and identify the trends

CO-3: Understand a range of machine learning algorithms along with their strengths and weaknesses

CO-4: Build predictive models from data and analyze their performance

**LIST OF EXPERIMENTS**

1**.** Write a python program to compute

 Central Tendency Measures: Mean, Median, Mode

 Measure of Dispersion: Variance, Standard Deviation

2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy

3. Study of Python Libraries for ML application such as Pandas and Matplotlib

4. Write a Python program to implement Simple Linear Regression

5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn

6. Implementation of Decision tree using sklearn and its parameter tuning

7. Implementation of KNN using sklearn

8. Implementation of Logistic Regression using sklearn

9. Implementation of K-Means Clustering

10. Performance analysis of Classification Algorithms on a specific dataset

**Prerequisite: Information Security**

**LIST OF EXPERIMENTS**

1 .Open Source Forensic Tools -Disk Forensics and Data Recovery

2. Study of Computer Forensics and different tools used for forensic investigation   
3.How to Recover Deleted Files using Forensics Tools   
4. Study the steps for hiding and extract any text file behind an image file/ Audio file using Command Prompt.

5. Key loggers

6. Network monitors

7. Steganography  
8.How to Extract Exchangeable image file format (EXIF) Data from Image Files using

Exifreader Software   
9.How to make the forensic image of the hard drive using EnCase Forensics.   
10. How to Restoring the Evidence Image using EnCase Forensics   
11. How to Collect Email Evidence in Victim PC   
12. How to Extracting Browser Artifacts  
13. How to View Last Activity of Your PC  
14.Investigate on ecommerce on websites

15. Comparison of two Files for forensics investigation by Compare IT software   
**Syllabus for B. Tech. III Year I semester**

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**Computer Science and Engineering-IOT**

**(Common to Allied Branches)**

**IOT Security**

**Code :9IC10**

**Prerequisite : Introduction to IOT**

Course Outcomes:

CO1 : Describe IOT features and discuss IOT related protocols

CO2 : Classify IOT attacks and recommend counter measures

CO3 : Implement IOT Lifecycle for a project

CO4 : Examine various cryptographic protocols

CO5 : Access Privacy challenges and mitigate

CO6 : Examine compliance standards for IOT infrastructures

**UNIT – I:** [**Defining the IoT**](#_bookmark3): [Cyber securityversusIoTsecurity](#_bookmark5),[cross-industrycollaborationisvital,](#_bookmark7)[IoTuses today,](#_bookmark9)[[IoT in the enterprise](#_bookmark11)](#_bookmark12)[,IoT device lifecycle, IoT future and the need to secure,](#_bookmark11)

[**[IoTcommunications:](#_bookmark11)**](#_bookmark18)[[Messaging protocols,](#_bookmark11)](#_bookmark19) [[Transport protocols,](#_bookmark11)](#_bookmark23) [[Network protocols, Data link and physical protocols.](#_bookmark11)](#_bookmark24)

**UNIT II :**[**[Vulnerabilities, Attacks, and Countermeasures](#_bookmark26)** [:](#_bookmark26)](#_bookmark29)[[Threats,vulnerability,and risks(TVR),](#_bookmark26)](#_bookmark30) [attacks and counter measures.](#_bookmark26)

[**[Common IOT attack](#_bookmark26)**[:Types,](#_bookmark26)](#_bookmark35) [[Attack trees,](#_bookmark26)](#_bookmark36) [[Building an attack tree,](#_bookmark26)](#_bookmark37) [[Fault(failure) trees and CPS,](#_bookmark26)](#_bookmark41) [[Fault tree and attack tree differences, Merging fault and attack tree analysis,](#_bookmark26)](#_bookmark42) [Example anatomy of a deadly cyber-physical attack.](#_bookmark44) [[Today's IoT Attacks](#_bookmark44)**[.](#_bookmark44)**](#_bookmark47)

[**Threat modeling an IoT system**:](#_bookmark51) [Identify the assets:](#_bookmark53) [create a system/architecture overview](#_bookmark54)

[decompose the IoT system,](#_bookmark55) [identify threats,](#_bookmark57) [document the threats](#_bookmark59) [Step, rate the threats.](#_bookmark60)

[Security Engineering for IoT Development,](#_bookmark62) [Building security into design and development,](#_bookmark63) [Security in agile developments](#_bookmark64), [Focusing on the IoT device in operation ,](#_bookmark65)[Secure design ,](#_bookmark67) Safety , security design and Security Plan.

**UNIT–III:**I**oT Security Lifecycle-**Secure IoT system implementation lifecycle, Implementation and integration, [IoT security CONOPS document](#_bookmark93), [Network and security integration](#_bookmark95), System security verification and validation (V&V), [Security training](#_bookmark100), [Secure configurations](#_bookmark101).

**Operations and maintenance:** [Managing identities, roles, and attributes](#_bookmark104), [Security monitoring](#_bookmark108), [Penetration testing](#_bookmark109), [Compliance monitoring](#_bookmark113), [Asset and configuration management](#_bookmark113), [Incident management](#_bookmark115), Dispose.

UNIT–IV:Examining cryptographic controls for IoT protocols ,Cryptographic controls built into IoT communication protocols , [ZigBee ,](#_bookmark148) [Bluetooth-LE,](#_bookmark150) Near field communication (NFC), Cryptographic controls built into IoT messaging protocols

MQTT ,CoAP , [DDS,](#_bookmark153) REST

Identity and Access Management Solutions for the IoT, The identity lifecycle, Authentication credentials, IoT IAM infrastructure.

**UNIT – V:Mitigating IoT Privacy Concerns:** Privacy challenges introduced by the IoT, Guide to performing an IoT PIA, PbD principles, Privacy engineering recommendations.

**UNIT – VI:** [Setting Up a Compliance Monitoring Program](#_bookmark205) , environment, Challenges associated with IoT compliance, Examining existing compliance standards support for the IoT , Underwriters Laboratory IoT certification, [NISTCPS efforts,](#_bookmark224) [NERCCIP,](#_bookmark225) [HIPAA/HITECH, PCIDSS,](#_bookmark226) NIST Risk Management Framework(RMF).

**TEXT BOOKS:**

1. B. Russell and D. Van Duren, “Practical Internet of Things Security,” Packt Publishing, 2016.
2. FeiHU, “Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations”, CRC Press, 2016.
3. Narayanan et al., “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction,” Princeton University Press, 2016.

**REFERENCE BOOKS:**

1. A. Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies,” O’Reilly, 2014.
2. T. Alpcan and T. Basar, “Network Security: A Decision and Game-theoretic Approach,” Cambridge University Press, 2011.
3. Security and the IoT ecosystem, KPMG International, 2015.
4. Internet of Things: IoT Governance, Privacy and Security Issues” by European Research Cluster.
5. Ollie Whitehouse, “Security of Things: An Implementers' Guide to Cyber-Security for Internet of Things Devices and Beyond”, NCC Group, 2014

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**Syllabus for B. Tech. IV Year I semester**

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**Computer Science and Engineering-IOT**

**INTRODUCTION TO DATA SCIENCE**

**(Professional Elective- IV)**

**Code:**

**Prerequisite:** Python Programming, Probability and Statistics

**COURSE OBJECTIVES:**

1. Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
2. Exploring data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication
3. Understand the basic knowledge of algorithms and reasonable programming experience and some familiarity with basic linear algebra and basic probability and statistics
4. Identify the importance of recommendation systems and data visualization techniques

**COURSE OUTCOMES:**

After completion of the course, the student should be able to

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| 1. Understand basic terms related to Big Data, Data Science and Analysis of Data. Learn Statistical Inference, Probability Distributions and Fitting a model |
| 2. Implement Data analysis techniques for solving practical problems. |
| 3. Perform Data analysis on variety of data using R |
| 4. Exercise appropriate manipulation techniques on lists and vectors using operators in R. Comprehend the significance and use the iterative programming and functions in R |
| 5. Learn and describe the various Dimensionality Reduction techniques available |
| 6. Apply the suitable visualization techniques to output analytical results. |

**UNIT-I: INTRODUCTION**

Data Science Introduction - Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting. (Text Book-1)

**Basics of R:** Introduction, R-Environment Setup, Programming with R, Basic Data Types (Text Book-4)

**UNIT-II DATA TYPES & COLLECTION:**

**Types of Data:** Attributes and Measurement, Attribute Definition, The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute (Pg.No:22-29, Text Book-2), Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes (Pg. No. 39-44, Ref Book-1)

Types of Data Sets, General Characteristics of Data Sets, Record Data, Transaction or Market Basket Data, The Data Matrix, The Sparse Data Matrix, Graph Based Data, Graph- Based Data, Ordered Data. Handling Non-Record Data, Data Quality, Measurement and Data Collection Issues, Precision, Bias and Accuracy. (Pg. No. 29-39, Text Book-2)

**UNIT-III**

**Vectors:** Creating and Naming Vectors, Vector Arithmetic, Vector Subsetting,

**Matrices:** Creating and Naming Matrices, Matrix Subsetting, Arrays, Class.

**Factors and Data Frames:** Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

**Lists:** Introduction, Creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors (Text Book-4)

**UNIT-IV**

**Conditionals and Control Flow:** Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

**Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List.

**Functions in R:** Introduction, Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R. (Text Book -4)

**UNIT-V:DIMENSIONALITY REDUCTION** Eigenvalues and Eigenvectors of Symmetric Matrices, Definitions, Computing Eigenvalues and Eigenvectors, The Matrix of Eigenvectors, Principal-Component Analysis, An Illustrative Example, Using Eigenvectors for Dimensionality Reduction, Singular-Value Decomposition, Definition of SVD, Interpretation of SVD, Dimensionality Reduction Using SVD (Pg. No.405-422, Text Book-3)

**UNIT-VI: DATA VISUALIZATION**

**Data Visualization:** Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations. (Pg. No. 56-64, Ref. Book -1)

**Charts and Graphs:** Introduction, Pie Chart: Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot. (Text Book-4)

**TEXT BOOKS:**

1. Doing Data Science, Straight Talk From The Frontline. Cathy O’Neil and Rachel Schutt, O’Reilly, 2014

2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education Inc.

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**Syllabus for B. Tech. IV Year I semester**

**Computer Science and Engineering-IOT**

**CYBER FORENSICS**

**(Professional Elective - IV)**

Prerequisites: Information Security  
Course Objectives:  
• A brief explanation of the objective is to provide digital evidences which are obtained from digital  
media.  
• In order to understand the objectives of computer forensics, first of all, people have to recognize  
the different roles computer plays in a certain crime.  
• According to a snippet from the United States Security Service, the functions computer has in  
different kinds of crimes.  
Course Outcomes:  
• Students will understand the usage of computers in forensic, and how to use various forensic  
tools for a wide variety of investigations.  
• It gives an opportunity to students to continue their zeal in research in computer forensics

**UNIT- I**  
Introduction of Cybercrime: Types, The Internet spawns crime, Worms versus viruses, Computers' roles  
in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology –  
Steps - Activities in Initial Response, Phase after detection of an incident  
**UNIT-II**  
Initial Response and forensic duplication, Initial Response & Volatile Data Collection from Windows  
system -Initial Response & Volatile Data Collection from Unix system – Forensic Duplication: Forensic  
duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements,  
Creating a Forensic. Duplicate/Qualified Forensic Duplicate of a Hard Drive  
**UNIT - III**  
Forensics analysis and validation: Determining what data to collect and analyze, validating forensic  
data, addressing data-hiding techniques, performing remote acquisitions  
Network Forensics: Network forensics overview, performing live acquisitions, developing standard  
procedures for network forensics, using network tools, examining the honey net project.  
**UNIT -IV**  
Current Forensic tools: evaluating computer forensic tool needs, computer forensics software tools,  
computer forensics hardware tools, validating and testing forensics software E-Mail Investigations:  
Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail,  
investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail  
forensic tools.  
Cell phone and mobile device forensics: Understanding mobile device forensics, understanding  
acquisition procedures for cell phones and mobile devices.  
**UNIT- V**  
Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File  
Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft  
startup tasks, MS-DOS startup tasks, virtual machines.

**Unit -VI**

Provisions in Indian Laws, Penalties Under IT Act., Offences Under IT Act, Establishment of Authorities under IT Act and their functions, powers, etc. ,Controller, Certifying Authorities  
 Cyber Regulation Appellate Tribunal, Adjudicating officer, Investigation of Cyber Crimes  
, Agencies for Investigation in India, their Powers and their  
Constitution as per Indian Laws.

**TEXT BOOKS:**  
1. Kevin Mandia, Chris Prosise, “Incident Response and computer forensics”, Tata McGraw Hill,2006.

2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.  
3. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning

4 Cyber Law in India by Farooq Ahmad- Pioneer Books  
4 The Indian Cyber Law by Suresh T. Vishwanathan- Bharat Law House New Delhi  
5 Guide to Cyber and E- Commerce Laws by P.M. Bukshi and R.K. Suri- Bharat Law  
House, New Delhi  
  
**REFERENCE BOOKS:**  
1. Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison- Wesley  
Pearson Education  
2. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer International edition.

3. Guide to Cyber Laws by Rodney D. Ryder- Wadhwa and Company, Nagpur

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**Syllabus for B.Tech IV year I Semester**

**B.Tech. Computer Science and Engineering- IOT**

**Ad hoc Wireless Sensor Networks(PE-IV)**

**Prerequisites**

1. A course on “Computer Networks”.
2. A course on “Mobile Computing”.

# **Course Objectives**:

* To understand the concepts of sensor networks.
* To understand the MAC and transport protocols for ad hoc networks.
* To understand the security of sensor networks.
* To understand the applications of adhoc and sensor networks.

# **Course Outcomes:**

* Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
* Ability to solve the issues in real-time application development based on ASN.
* Ability to conduct further research in the domain of ASN

**UNIT - I**

**Introduction to Ad Hoc Networks -** Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

**Routing in MANETs -** Criteria for classification, Taxonomy of MANET routing algorithms, Topology- based routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-Location Services-DREAM, Quorum-based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

**UNIT - II**

**Data Transmission -** Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. **Multicasting: Tree-based:** AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

**UNIT - III**

**Geocasting:** Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

**UNIT - IV**

**Basics of Wireless, Sensors and Lower Layer Issues:** Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

**UNIT - V**

**Upper Layer Issues of WSN:** Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

**UNIT - VI**

# Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

# **TEXT BOOKS:**

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

# **REFERENCES:**

1. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh, 1st Ed. Pearson Education.

2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.

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**Syllabus for B.Tech IV year I Semester**

**Computer Science and Engineering-IOT**

# **EDGE COMPUTING (Professional Elective – IV)**

**Course Objectives:** Knowledge on how edge computing and Internet of Things (IoT) can be used as a way to meet application demands in intelligent IoT systems.

# **Course Outcomes:**

1. Understand use of the IoT architecture with its entities and protocols, from the IoT devices.
2. Security and privacy issues related to the area of edge computing and IoT.
3. Understand the Raspberry Pi architecture and its components.
4. Work with Raspberry Pi components and evaluate its performance.

# **UNIT - I**

IoT and Edge Computing Definition and Use Cases: Introduction to Edge Computing Scenario's and Use cases - Edge computing purpose and definition, Edge computing use cases,

Edge computing hardware architectures, Edge platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M.

# **UNIT - II**

IoT Architecture and Core IoT Modules-A connected ecosystem, IoT versus machine-to-machine versus, SCADA, The value of a network and Metcalfe's and Beckstrom's laws.

# **UNIT - III**

IoT and edge architecture, Role of an architect, Understanding Implementations with examples-Example use case and deployment, Case study – Telemedicine palliative care, Requirements, Implementation, Use case retrospective.

# **UNIT - IV**

Raspberry Pi: Introduction to Raspberry Pi, About the Raspberry Pi Board: Hardware Layout and Pinouts, Operating Systems on Raspberry Pi, Configuring Raspberry Pi, Programming Raspberry Pi, Connecting Raspberry Pi via SSH, Remote access tools,

# **UNIT - V**

Implementation of Microcomputer RaspberryPi and device Interfacing, Edge to Cloud Protocols- Protocols, MQTT, MQTT publish-subscribe, MQTT architecture details, MQTT state transitions, MQTT packet structure, MQTT data types, MQTT communication formats, MQTT 3.1.1 working example.

# **UNIT - VI**

Edge computing with Raspberry Pi, Industrial and Commercial IoT and Edge, Edge computing and solutions, Interfacing DHT Sensor with Pi, Pi as Webserver, Pi Camera, Image & Video Processing using Pi.

# **TEXT BOOKS:**

1. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020, ISBN: 9781839214806.
2. Raspberry Pi Cookbook, 3rd Edition, by Simon Monk, Publisher: O'Reilly Media, Inc., 2019, ISBN: 978149204322.

# **REFERENCE BOOKS:**

1. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama, wiley publication, 2019, ISBN: 9781119524984.
2. David Jensen, “Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE.

**Syllabus for B.Tech IV year I Semester**

**Computer Science and Engineering-IOT**

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**(Professional Elective-IV)**

**Code:**

# **DATA ANALYTICS**

**Course Outcomes:**

After completion of this course students will be able to

1. Understand the impact of data analytics for business decisions and strategy

2. Carry out data analysis/statistical analysis

3. To carry out standard data visualization and formal inference procedures

4. Design Data Architecture

5. Understand various Data Sources

###### Unit-I

**Data Management:**

Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

###### Unit-II

**Data Analytics:**

Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

###### Unit-III Regression

**Regression –** Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

###### Unit-IV

**Object Segmentation:**

Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc.

**Unit-V Time Series Methods**

**Time Series Methods:**Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

###### Unit-VI

**Data Visualization:**

Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

**TEXT BOOKS:**

1. Student’s Handbook for Associate Analytics – II, III.

2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

**REFERENCE BOOKS:**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, AddisionWisley, 2006.

2. Data Mining Analysis and Concepts, M. Zaki and W. Meira

3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

**Syllabus for B Tech IV Year I Semester**

**Computer Science and Engineering – IOT**

**Cognitive computing (PE-V)**

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Prerequisites: Probability theory

**Course Objectives:**

1. To provide an understanding of the central challenges in realizing aspects of human cognition.

2. To provide a basic exposition to the goals and methods of human cognition.

3. To develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions.

4. To support human reasoning by evaluating data in context and presenting relevant findings along with the evidence that justifies the answers.

**Course Outcomes:**

1. Understand what cognitive computing is, and how it differs from traditional approaches.

2. Plan and use the primary tools associated with cognitive computing.

3. Plan and execute a project that leverages cognitive computing.

4. Understand and develop the business implications of cognitive computing.

**UNIT - I**

Introduction to Cognitive Science: Understanding Cognition, IBM’s Watson, Design for Human Cognition, Augmented Intelligence

**UNIT – II**

Cognition Modeling Paradigms: Declarative/ logic-based computational cognitive modeling, connectionist models of cognition, Bayesian models of cognition, a dynamical systems approach to cognition.

**UNIT - III**

Cognitive Models of memory and language, computational models of episodic and semantic memory, modeling psycholinguistics.

**UNIT - IV**

Cognitive Modeling: modeling the interaction of language, memory and learning, Modeling select aspects of cognition classical models of rationality, symbolic reasoning and decision making.

**UNIT - V**

Formal models of inductive generalization, causality, categorization and similarity, the role of analogy in problem solving, Cognitive Development Child concept acquisition. Cognition and Artificial cognitive architectures such as ACT-R, SOAR, OpenCog, CopyCat, Memory Networks**.**

**UNIT - VI**

DeepQA Architecture, Unstructured Information Management Architecture (UIMA), Structured Knowledge, Business Implications, Building Cognitive Applications, Application of Cognitive Computing and Systems.

**TEXT BOOKS:**

1. The Cambridge Handbook of Computational Psychology by Ron Sun (ed.), Cambridge University Press.

2. Formal Approaches in Categorization by Emmanuel M. Pothos, Andy J. Wills, Cambridge University Press.

**REFERENCE BOOKS:**

1**.** Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles Cognitive Computing and Big Data Analytics, Wiley

2. Vijay V Raghavan, Venkat N. Gudivada, Venu Govindaraju, Cognitive Computing: Theory and Applications: Volume 35 (Handbook of Statistics), North Holland.

**Syllabus for B. Tech. IV Year I Semester**

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**Computer Science and Engineering (CSE/IT)**

**AUGMENTED AND VIRTUAL REALITY**

**(Professional Elective –V)**

**Code:**

**Pre-Requisites:** Data Structures

**Course Objectives**:

This course provides students with an opportunity to explore the research issues in Augmented Reality and Virtual Reality (AR &VR). It also makes the students know the basic concepts and framework of virtual reality.

**Course Outcomes:** After completion of course, students will be able to

1. Understand the fundamentals of Virtual Reality.
2. Analyze multiple Models of Input and Output Interface in Virtual Reality like Gloves,

Video-based Input, 3D Menus & 3DScanner etc.

1. Illustrate the fundamentals or advanced topics of Computer Graphics.
2. Analyze the Interactive Techniques on VR in respect of Body Track, Hand Gesture,

3D Manus, and Object Grasp.

1. Understand the development tools of VR.
2. Explore the Conceptual idea on Augmented Reality and relate the illustrations.

**UNIT-I**

Introduction of Virtual Reality: Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality.

**UNIT-II**

Multiple Models of Input and Output Interface in Virtual Reality: Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory Haptic Devices.

**UNIT-III**

Visual Computation in Virtual Reality: Fundamentals of Computer Graphics. Software and Hardware Technology on Stereoscopic Display. Advanced Techniques in CG: Management of Large Scale Environments & Real Time Rendering.

**UNIT -IV**

Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, And Object Grasp.

**UNIT-V**

Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools etc. Application of VR in Digital Entertainment: VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

**UNIT-VI**

Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

**TEXTBOOKS:**

1) Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.

2) Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

**REFERENCES:**

1) Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009**.**

**Syllabus for B. Tech. IV Year I semester**

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**Computer Science and Engineering-IOT**

**5G and IOT TECHNOLOGIES**

# **(Professional Elective–V)**

**CODE:9I814**

**Course Objectives:** Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design &develop IoT Devices.

# **Course Outcomes:**

1. Apply 5G for the new application areas of IoT.
2. Realize the revolution of Internet in Mobile Devices, Cloud& Sensor Networks.
3. Apply building blocks of Internet of Things and characteristics.
4. Use IoTandM2M for societal applications.
5. Develop applications using Raspberry PI and Python.

# **UNIT - I**

Overviewof5GBroadbandWirelessCommunications:Evolutionofmobiletechnologies1Gto4G(LTE,LTEA, LTEA Pro), An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis andSharingfor5G.

# **UNIT - II**

The 5G wireless Propagation Channels: Channel modelling requirements, propagation scenarios and challenges in the 5Gmodeling, Channel Models form m Wave MIMO Systems,3GPP standards for 5G, IEEE802.15.4

# **UNIT - III**

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs, IoT enabled Technologies.

# **UNIT - IV**

Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Life style.

# **UNIT - V**

IoTandM2M Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANGNETCONF, YANG, SNMPNETOPEER.

# **UNIT - VI**

IoT Physical Devices and Endpoints - Introduction to Raspberry PI - Interfaces (serial, SPI, I2C). Programming–PythonprogramwithRaspberryPIwithfocusofinterfacingexternalgadgets, controllingoutput,readinginputfrompins.

# **TEXTBOOKS:**

1. Internet of Things-A Hands on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press,2015, ISBN:9788173719547
2. Getting Started with RaspberryPi Matt Richardson & Shawn Wallace, O'Reilly(SPD),2014,ISBN:9789350239759

**REFERENCEBOOKS:**

1. Jonathan Rodriguez, “Fundamentalsof5GMobileNetworks”,JohnWiley&Sons.
2. Amitabha Ghosh and RapeepatRatasuk “Essentials of LTEandLTE

A”,CambridgeUniversityPress.

1. AthanasiosG.Kanatos,KonstantinaS.Nikita,PanagiotisMathiopoulos,“NewDirectionsinWirelessCommunication SystemsfromMobileto 5G”,CRC Press.
2. TheodoreS.Rappaport,RobertW.Heath,RobertC.Danials,JamesN.Murdock“MillimeterWaveWirelessCommunications”,Prentice HallCommunications.

**Syllabus for B. Tech. IV Year I semester**

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**Computer Science and Engineering-IOT**

# **SMART SENSOR TECHNOLOGIES**

# **(Professional Elective –V)**

**CODE:9I815**

# **Course Outcomes:**

1. AnalyzethesensorsavailableinIoTbasedonapplicationrequirementsandtheSensingmethods.
2. CreateaReal-timeapplicationbychoosingappropriatesensorsfortemperaturemonitoring.
3. Interfacing different types of Sensors with MCU.
4. Infer Wireless Sensing, RF Sensing and RFMEMS.
5. Design a real-time application for landslide monitoring and hazard mitigation.

# **UNIT - I:**

**Basics of Sensors:** Introduction Sensor Vs Transducer, Nature of Sensors, Sensor Output Characteristics, Sensing Technologies, Digital Output Sensors.

# **UNIT - II:**

**Application Specific Sensors:** Occupancy and motion detectors : ultrasonic–microwave–capacitive detectors- optical presence sensor, Light Detectors: Photo diodes – phototransistor – photoresistor-CCD and CMOS image sensors

# **UNIT - III:**

Temperature Sensors: thermos-resistive sensors – thermo electric contact sensor.

**Sensor with Microcontroller:** Introduction, Amplification and Signal Conditioning, Integrated Signal Conditioning, Digital Conversion, MCU Control,

# **UNIT - IV:**

MCUs for Sensor Interface, Techniques and Systems Considerations, Sensor Integration. **Wireless Sensing:** Wireless Data and Communications, Wireless Sensing Networks, Industrial Wireless Sensing Networks, RFSensing,Telemetry ,RFMEMS, Complete System Consideration.

# **UNIT - V:**

**Smart Applications and System Requirements:** Automotive Applications, Industrial (Robotic)Applications, Consumer Applications

# **UNIT-VI:**

Future Sensor Plus Semiconductor Capabilities, Future System Requirements.

# **TEXT BOOKS:**

1. Frank,Randy,“Understandingsmartsensors”,ArtechHouseintegratedmicrosystemsseries,3rdEdition,2013.
2. JacobFraden,“HandbookofModernSensors:Physics,Designs,andApplications”,5thEdition,Springer,2016.

# **REFERENCEBOOKS:**

1. Vlasios Tsiatsis, Stamatis Karnouskos, Jan Holler, David Boyle, Catherine Mulligan, "Internetof Things: Technologies and Applications for a New Age of Intelligence", Academic Press, 16-Nov-2018.
2. HenryLeung,SubhasChandraMukhopadhyay,"IntelligentEnvironmentalSensing",Springer,22-Jan-2015.

**Syllabus for B. Tech. IV Year I semester**

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**Computer Science and Engineering-IOT**

**Quantum Computing(PE-V)**

**Course Objectives:**

1. To introduce the fundamentals of quantum computing
2. The problem-solving approach using finite dimensional mathematics

**Course Outcomes:**

1. Understand basics of quantum computing
2. Understand physical implementation of Qubit
3. Understand Quantum algorithms and their implementation
4. Understand the Impact of Quantum Computing on Cryptography

# **UNIT - I**

**Introduction to Essential Linear Algebra:** Some Basic Algebra, Matrix Math, Vectors and Vector Spaces, Set Theory. **Complex Numbers:** Definition of Complex Numbers, Algebra of Complex Numbers, Complex Numbers Graphically, Vector Representations of Complex Numbers, Pauli Matrice, Transcendental Numbers.

# **UNIT - II**

**Basic Physics for Quantum Computing:** The Journey to Quantum, Quantum Physics Essentials, Basic Atomic Structure, Hilbert Spaces, Uncertainty, Quantum States, Entanglement.

# **UNIT - III**

**Basic Quantum Theory:** Further with Quantum Mechanics, Quantum Decoherence, Quantum Electrodynamics, Quantum Chromo-dynamics, Feynman Diagram Quantum Entanglement and QKD, Quantum Entanglement, Interpretation, QKE.

# **UNIT - IV**

**Quantum Architecture:** Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, The D-Wave Quantum Architecture. **Quantum Hardware:** Qubits, How Many Qubits Are Needed? Addressing Decoherence, Topological Quantum Computing, Quantum Essentials.

# **UNIT - V**

**Quantum Algorithms:** What Is an Algorithm? Deutsch’s Algorithm, Deutsch-Jozsa Algorithm, Bernstein-Vazirani Algorithm, Simon’s Algorithm, Shor’s Algorithm, Grover’s Algorithm.

# **UNIT - VI**

**Current Asymmetric Algorithms:** RSA, Diffie-Hellman, Elliptic Curve.

**The Impact of Quantum Computing on Cryptography:** Asymmetric Cryptography, Specific Algorithms, Specific Applications.

# **TEXT BOOKS:**

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press
2. Dr. Chuck Easttom, Quantum Computing Fundamentals, Pearson

# **REFERENCE BOOKS:**

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. Basic Concepts. Vol. Basic Tools and Special Topics, World Scientific.
3. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

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H: High, M: Medium, L: Low Correlation

**Syllabus for B. Tech. III Year II semester**

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**Computer Science and Engineering-IOT**

**BASICS OF ENTREPRENEURSHIP**

**(Open Elective –I)**

**Code :**

**Prerequisite:** Economics, Accountancy and Management Science

**COURSE OBJECTIVES:**

The objective of the course is to make students understand the nature of Entrepreneurship, and its importance to business to the engineering students, which will allow them to get the required intuition and interest in starting their own start-up’s

**COURSE OUTCOMES:**

At the end of this course, the students will be able to

1. The students will acquire basic knowledge on Skills of Entrepreneurship.
2. The students will understand the techniques of selecting the customers through the process of customer segmentation and Targeting
3. Business Models and their validity are understood by the students.
4. The basic cost structure, Revenue Streams and the pricing strategies are understood by the students.
5. The students will acquire knowledge about the project management and its techniques.
6. The students get exposure on marketing strategies and business regulations for the Start up.

**Unit – I: Introduction to Entrepreneurship & Self Discovery: -** Define Entrepreneurship, Entrepreneurship as a Career option, Find your Flow, Stock of Your Means, Characteristics, Qualities and Skills of Entrepreneurship, Effectuation, Principles of Effectuation, Life as an Entrepreneur, Stories of Successful Entrepreneurs.

**Unit – II: Opportunity & Customer Analysis: -** Identify your Entrepreneurial Style, Methods of finding and understanding Customer Problems, Run Problem Interview, Process of Design Thinking, Identify Potential Problems worth Solving, Customer Segmentation, Niche Marketing and Targeting, Craft your Values Proportions, Customer-driven Innovation.

**Unit – III: Business Model & Validation: -** Introduction to Business Models, Lean approach to Business Model Canvas, Blue and Red Ocean Strategies, the Problem-Solution Fit, Build your Solution Demo, Solution Interview Method, Identify Minimum Viable Product (MVP), Product-Market fit test.

**Unit – IV: Economics & Financial Analysis: -** Revenue Analysis, Identify different Revenue Streams and Costs Analysis – Startup Cost, Fixed Cost and Variable Cost, Break Even Analysis, Profit Analysis, Introduction to Pricing, different Pricing Strategies, Sources of Finance, Bootstrapping and Initial Financing, Practice pitching to Investors and Corporate.

**Unit – V: Team Building & Project Management: -** Leadership Styles, Shared Leadership Model, Team Building in Venture, Roles and Responsibilities of team in venture, Explore collaboration tools and techniques, Brainstorming, Introduction to Project Management, Project Life Cycle, Create a Project Plan.

**Unit – VI: Marketing & Business Regulations: -** Positioning, Positioning Strategies, Branding, Branding Strategies, Selecting and Measuring Channels , Customer Acquisition, Selling Process, Selling Skills, Sales Plans. Business regulations – List of Required Registrations, Compliance Check List, Business Structures and Legal Entities.

**References:**

1. Robert D Hisrich, Michael P Peters, Dean A Shepherd, Entrepreneurship, Sixth Edition, New Delhi, 2006.
2. Thomas W. Zimmerer, Norman M. Scarborough, Essentials of Entrepreneurship And Small Business Management, Fourth Edition, Pearson, New Delhi, 2006
3. Alfred E. Osborne, Entrepreneur’s Toolkit, Harvard Business Essentials, HBS Press, USA, 2005.
4. MadhurimaLall, ShikhaSahai, Entrepreneurship, Excel Books, First Edition, New Delhi, 2006.
5. S.S. Khanka, Entrepreneurial Development, S. Chand and Company Limited, New Delhi, 2007.
6. H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
7. S.R. Bhowmik, M. Bhowmik, Entrepreneurship-A tool for Economic Growth   And A   
   key to Business Success, New Age International Publishers, First Edition,  (formerly   
   Wiley Eastern Limited), New Delhi, 2007.
8. https://www.wfglobal.org/
9. <https://www.learnwise.org/#/IN/en/home/login>,

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H:High,M:Medium,L:Low correlation

**Syllabus for B. Tech. III Year II semester**

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**Computer Science and Engineering-IOT**

**BASICS OF INDIAN ECONOMY**

**(Open Elective –I)**

**Code:**

**Prerequisite: NIL**

**COURSE OBJECTIVES :**

To provide basic knowledge relating to the Indian Economy thus making the students aware of the current aspects taking place in the Indian and world economy.

**COURSE OUTCOMES :**

At the end of this course, the students will be able to

1. Gain knowledge relating to Economics, various sectors and its growth
2. Will gain knowledge relating to various concepts of National income and related aggregates
3. Students will learn about Indian Industrial policy and benefits of LPG to India
4. Comprehend knowledge relating to Fiscal policy & Taxation system in India
5. Learn about inflation & business cycles.
6. Know about the BoP and its influence on economy.

**Unit 1:Introduction to Economics**: Definition, Economics and economy, back ground of economy, sectors of the economy, types of economy, growth of economy, primary moving force of Economic growth in India, mixed economy.

**Unit 2: National Income and related aggregates:** Aggregates related to National Income: Gross National Product (GNP), Net National Product (NNP), Gross and Net Domestic Product (GDP and NDP) - at market price, at factor cost; National Disposable Income (gross and net), Private Income, Personal Income and Personal Disposable Income; Real and Nominal GDP.

**Unit 3: Industrial policy & Liberalization of Economy:** Industrial policy in India, its objectives, Review of Industrial policies up to 1986, Industrial policy 1991 - causes of its implementation, benefits of Liberalization, privatization & Globalization to the Indian economy.

**Unit 4: Fiscal policy & Taxation system:** Fiscal policy- Definition, objectives, importance, setbacks, recent fiscal policy of India, Reforms to strengthen the fiscal policy in India. Taxation system in India, methods of taxation, a good tax system, VAT, GST, Reforms in taxation.

**Unit 5: Inflation & Business Cycles**: Inflation – Definition, types, effects of inflation on various segments of the population and sectors of the economy, measures to control inflation, Business cycles: Introduction, Depression, Recovery, Boom, and Recession.

**Unit 6: Balance of Payments:** Balance of payments account - meaning and components; balance of payments deficit-meaning. Foreign exchange rate - meaning of fixed and flexible rates and managed floating. Determination of exchange rate in a free market

**Reference Books:**

1. Indian Economy, Datt& Mahajan, 70th Edition, Sultan Chand publishers.
2. Indian Economy, Misra&Puri, 33rd Edition, Himalaya publishing house.
3. Latest Budget document by Ministry of Finance
4. Latest Economic survey
5. 12th Five year plan
6. News articles in The Hindu, The Business Line

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| **Level** |  |  |  |  |  | **M** | **M** | **L** | **M** |  | **M** | **L** |

H: High, M: Medium, L: Low Correlation

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**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

**BANKING OPERATIONS, INSURANCE AND RISK MANAGEMENT**

**(Open Elective –I)**

**Code:**

**Prerequisite: NIL**

**COURSE OBJECTIVES :**

To make the students understand the concepts and principles of Indian Banking Business, Insurance Business and Capital market business products and services, which facilitate them to understand the nature of market.

**COURSE OUTCOMES :**

At the end of this course, the students will be able to

1. Describe the new dimensions and products served by the banking system in INDIA.
2. Explain the credit control system and create awareness on NPA’s
3. Apply the knowledge of Insurance concepts in real life scenarios
4. Recognize the importance of regulatory and legal frame work of IRDA
5. Identify the risk management process and methods.
6. Calculate the diversity of risk and return

**Unit 1**

**INTRODUCTION TO BANKING BUSINESS:** Introduction to financial services - History of banking business in India, Structure of Indian banking system: Types of accounts, advances and deposits in a bank. KYC norms, New Dimensions and products- E-Banking: Mobile-Banking, Net Banking, Digital Banking, Negotiable Instruments: Cheque system.

**Unit 2**

**BANKING SYSTEMS AND ITS REGULATION: Banking Systems:** Branch Banking, Unit Banking, Correspondent Banking, Group Banking, Deposit Banking, Mixed Banking and Investment Banking - Banking Sector Reforms with special reference to Prudential Norms, Capital Adequacy Norms, Classification of Assets and NPA’s, Functions of RBI, Role of RBI in regulating Indian Banking. Banking Ombudsman scheme.

**Unit 3**

**INTRODUCTION TO INSURANCE:** Introduction to insurance, Need and importance of Insurance, principles of Insurance, characteristics of insurance contract, branches of insurance and types of insurance: Life insurance and its products, General Insurance and its variants.

**Unit 4**

**INSURANCE BUSINESS ENVIRONMENT:** Procedure for issuing an insurance policy –Nomination - Surrender Value - Policy Loans – Assignment - Revivals and Claim Settlement; Insurance as a tax mitigation tool, Role of IRDA in Insurance Regulation.

**Unit 5**

**FINANCIAL MARKETS AND RISK MANAGEMENT:** Introduction to Financial Markets: Money Market – Capital market; Introduction to Risk Management, meaning and classification of risks, Risk management process, Risk Management Approaches and Techniques.

**Unit 6**

**DERIVATIVES AS A RISK MANAGEMENT TOOL:** Introduction to Financial Derivatives, Advantages of Derivatives - types of Derivative Contracts - Forwards, Futures,

Options and Swaps - Differences among Forwards, Futures and Option Contracts.

**Reference Books:**

1. Varshney, P.N., Banking Law and Practice, Sultan Chand & Sons, New Delhi.
2. General Principles of Insurance Harding and Evantly
3. Mark S. Dorfman: Risk Management and Insurance, Pearson, 2009.
4. Scott E. Harringam Gregory R. Nichanus: Risk Management & Insurance, TMH, 2009.
5. Geroge E. Rejda: Principles of risk Management & Insurance, 9/e, pearson Education. 2009.
6. G. Koteshwar: Risk Management Insurance and Derivatives, Himalaya, 2008.

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H: High, M: Medium, L: Low Correlation

**Syllabus for B. Tech. III Year II semester**

**Computer Science and Engineering-IOT**

**INTRODUCTION TO ADDITIVE MANUFACTURING PROCESS**

**(Open Elective –I)**

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**Code:**

**Prerequisite: NIL**

**COURSE OBJECTIVES:**

To teach students the fundamental concepts of Additive Manufacturing, techniques involved and their advantages and limitations and various applications of these technologies in relevant fields such as mechanical, Bio-medical, Aerospace, electronics etc.

**COURSE OUTCOMES:**

1. Understand the Additive manufacturing processes and their relationship with subtractive manufacturing.

2. Demonstrate comprehensive knowledge of the broad range of liquid based rapid prototype processes, devices, capabilities and materials that are available.

3. Apply the principles of casting in Additive manufacturing processes

4. Articulate the various tradeoffs of Additive manufacturing software’s/data format that must be made in selecting advanced/additive manufacturing processes, devices and materials to suit particular product requirements.

5. Learn various applications of additive manufacturing, such as in architecture art, health care direct part production and mass customization.

**UNIT-I**

**Introduction:**

Development of AM, Fundamentals of AM, Classification of AMS, Advantages, Standards on AM, Commonly used terms, AM process chain

**UNIT-II Liquid-based Additive manufacturing Systems:** Stereo lithography Apparatus (SLA), process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, 3D bioprinting **Solid-based Additive manufacturing Systems:**, Laminated Object Manufacturing (LOM): process, working principle, Applications, Advantages and Disadvantages, Fused Deposition Modeling (FDM): working principle, Applications, Advantages and Disadvantages

**UNIT-III**

**Powder Based Additive manufacturing Systems**: Selective laser sintering (SLS): working principle, Applications, Advantages and Disadvantages, Color Jet printing, working principle, Applications, Advantages and Disadvantages, **Build time calculations –** SLA, FDM**,** Problems

**UNIT-IV**

**Additive manufacturing Data Formats:** STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Features of various AM software’s like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor. **Design for AM** – Basic Principles and Practices

**UNIT-V**

**Rapid Tooling:** Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification, Spray Metal Deposition, Silicone rubber molds, , Casting-Sand Casting ,Investment Casting, evaporative Casting

**Reverse engineering** – what is RE, Why use RE, RE Generic process, Overview of RE-Software and Hardware, CMMs-applications and types

**UNIT-VI**

**Applications and examples :** Application - Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, Arts and Architecture. Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants and Prosthesis, Design and Production of Medical Devices, Bionic ear, dentistry

**Text Books:**

1.Chua C.K., Leong K.F. and LIM C.S, Rapid prototyping; Principles and Applications, World Scientific Publications , Third Edition, 2010.

2. Reverse Engineering: An Industrial Perspective, Springer- Verlag, 2008. ISBN: 978-1-84628-855-5

Reference Books:

1. Ian\_Gibson\_· David\_Rosen, Brent\_Stucker, AdditiveManufacturingTechnologies3D Printing, Rapid Prototyping, and Direct Digital Manufacturing,Springer

2.PaulF.Jacobs, Rapid Prototyping and Manufacturing ASME Press, 1996.

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**Syllabus for B. Tech IV Year I semester**

**Computer Science and Engineering-IOT**

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**ADVANCED ENTREPRENEURSHIP**

**(Open Elective –II)**

**Code:**

**Prerequisite:** Basics of Entrepreneurship

**COURSE OBJECTIVES:**

The course is designed to impart the necessary managerial skills and tactics required for an emerging Entrepreneur for the Engineering students to enhance their prospects as an Entrepreneur.

**COURSE OUTCOMES:**

At the end of this course, the students will be able to

1. Gain knowledge on the stages of Startup and the turbulence environment it undergoes and the stages related to growth of the Startup.
2. Exposed to the various business models and critically evaluating the effectiveness of the business models and products
3. Understand the method of business traction, create roles and build their A- team
4. Understand the various channels of revenue building and exploration of new revenue avenues.
5. Understand the need of sales planning and people plan and also financial modeling
6. Exposed to the legal implications affecting the company’s prospects and identifying right mentors and advisors to support startups

**Unit – I:**

**Fundamentals of Entrepreneurship & Refining Business Model and Product:**

Fundamentals and key concepts of entrepreneurship, refining the business model, products and services, pivoting, types of business models, business model evolution, generating new business models, analyzing the business model, adding new customer segment, product manager, significance and role of product manager.

**Unit – II:**

**Business Planning & Exploring Revenue:** Business plan, sales plan, hiring sale team, people plan, financial planning, financial forecasting, create a procurement plan, negotiating role play, understanding primary revenue sources, exploring customer lifecycle for growth customers, exploring and identify secondary sources of revenue,

**Unit- III:**

**Funding the Growth & Building the A-Team:** Overview of funding, funding options for an entrepreneur, explore the right funding options, create funding plan, pitch deck, introduction to building A-Team, pitching to attract the talent, setting your team, defining roles, hiring the A-Team members.

**Unit- IV:**

**Brand and Channel Strategy & Leveraging Technologies:** Introduction to branding, drawn the venture’s golden circle, positioning and positioning statements, creating brand name, logo, social media handle, Identify right channels, leaping ahead with technology, digital marketing for startups, plan a social media campaign, digital collaboration, store documents online, other technology platforms, make tech plan, platform wish list.

**Unit V:**

**Measuring Progress and Legal Matters:** Metrics for customer acquisition (CAC, CLV, and ARPU), metrics for customer retention and satisfaction, find CAC, CLV and ARPU, key

financial metrics, communicate metrics, new revenue stream through key financial metrics, re-forecasting of financial plan, identify professional help for legal and compliance requirements, searching of trademark and brand name and company name.

**Unit –VI:**

**Seeking Support and Final Project:** Mentors help to create successful startups, identify mentors and advisors, importance of mentors and advisors, scout the board of directors, overview on final project, capstone project presentation, contents of capstone project.

**TEXT BOOKS:**

1. Entrepreneurship Rajeev Roy “” oxford ,2012
2. Entrepreneurship Development Khanka, ,S.Chand 2012

**REFERENCES:**

1. Small Scale industries and Entrepreneurship Vasanth Desai “Himalya publishing 2012
2. Robert Hisrich et al “enterpreneruship TMH 2012
3. Entrepreneurship Development Khanka, ,S.Chand 2012
4. Entrepreneurship Development B.Janikairam and M Rizwana
5. e-source: - [www.learnwise.org](http://www.learnwise.org)

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H:High,M: Medium, L: Low Correlation

**Syllabus for B. Tech. IV Year I semester**

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**Computer Science and Engineering-IOT**

**BASICS OF POLITY AND ECOLOGY**

**(Open Elective –II)**

**Code:**

**Prerequisite: NIL**

**COURSE OBJECTIVE :**

To provide basic knowledge relating to the Indian Polity and Ecology, thus making the students appreciate the current aspects related to both polity and ecology.

**COURSE OUTCOMES :**

At the end of this course, the students will be able to

1. Outline knowledge relating to the Indian Constitution and the Preamble to the Constitution.
2. Relate to the fundamental rights and duties of the Indian citizens and the directive principles of state policy.
3. Identify about the federal structure and judiciary of India.
4. Understand knowledge relating to the conservation of the environment.
5. Analyse about bio-diversity and climatic changes occurring in the environment.
6. Discuss about the international treaties, conventions and organizations active in the field of environmental protection.

**Unit 1:**

**Introduction to Salient Features of Constitution** Significance of the Constitution, Distinction between Written and Unwritten Constitution, Composition of the Constituent Assembly and the role and objectives of the Drafting Committee, Main features and the nature of the Constitution of India. Preamble to the Constitution and its relevance; Basic principles of Preamble and their reflection in the constitutional provisions.

**Unit 2:**

**Fundamental Rights, Duties and Directive Principles of State Policy** Fundamental Rights and Duties of Citizens- Importance of Rights and Duties, Dignity of an individual, Safeguards against deprivation of life and personal liberty; Writs for the protection of Fundamental Rights; Meaning of Directive Principles of State Policy, Classification of the Directive Principles, Role of Directive Principles, Role of Directive Principles in the establishment of economic and social democracy.

**Unit 3:**

**Government and Judiciary** Legislative, financial and judicial powers of the President; Appointment of Prime Minister and constitution of Council of Ministers; Powers and functions of Prime Minister; Individual and collective responsibility; Powers and discretionary powers of the Governor; Appointment of the Chief Minister, Formation of the Council of Ministers; Powers and jurisdiction of the Supreme Court and High Courts of India.

**Unit 4:**

**Ecology and Environment** Environment-Origin, Evolution of Environment and its uses by Humans; Degradation of Natural Environment, Principles of Ecology; Composition and various types of Ecosystem; International Solar Alliance.

**Unit 5:**

**Bio-diversity and Climate Change** Classification of Biodiversity, Biodiversity loss, Methods of biodiversity conservation, Conservation of Natural Resources such as Soil, Land, Water and Energy. Sustainable Development and Cleaner Technology. Green house effect and Global Warming, Strategies to cope with Green House Effect, Desertification, Depletion of ozone layer.

**Unit 6:**

**International Treaties, Conventions & Organizations:** Indian Board for Wildlife (IBW). United Nations Environmental Programme (UNEP), United Nations Framework Convention for Climate Change (UNFCCC). International Union for conservation of Nature and National Resources (IUCN), World Wide Fund for Nature (WWF).Montreal Protocol (1987), Kyoto Protocol (1997), Paris Agreement (2016).

**REFERENCE BOOKS:**

1. Indian Polity - M. Laxmikanth, 5th Edition, McGraw Hill Education, Chennai
2. Environment And Ecology A Complete Guide for Civil Services Preliminary and Main Examinations – R. Rajgopalan, 2017, Oakbridge Publishing Pvt. Limited.
3. Introduction to Constitution of India – Dr. Durga Das Basu, 22nd Edition, 2015, LexisNexis
4. Our Constitution – Subhash C Kashyap, 5th Edition, 2015, National Book Trust, India
5. Environment and Ecology – Anil Kumar De and Arnab Kumar De, 2009, New Age International (P) Limited.
6. ICSE Environment Education for Class X – Dr. M.P. Mishra , 2009, S.Chand and Company

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**Syllabus for B. Tech. IV Year I semester**

**Computer Science and Engineering-IOT**

**ENTREPRENEURSHIP PROJECT MANAGEMENTAND STRUCTURED FINANCE**

**(Open Elective –II)**

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**Code:**

**Prerequisite:** Basics of Entrepreneurship

**COURSE OBJECTIVES :**

Make students understand the nature of Entrepreneurship, its importance and to create an awareness regarding the systematic planning and implementation of projects; highlight the components of structured finance and establish a framework of CMBS with respect to Servicing Agreements

**COURSE OUTCOMES :**

At the end of this course, the students will be able to

1. Students will understand the nature of Entrepreneurship and its importance
2. Will gain knowledge regarding project, its life cycle and organization
3. Will gain knowledge relating to project formulation and implementation
4. Comprehend the components of structured finance
5. Establish a framework of CMBS
6. Students will gain knowledge relating to the CRE Servicing

**UNIT I**

**CONCEPTS OF ENTREPRENEURSHIP:** Definition of Entrepreneurship, Evolution of Entrepreneurship, Classification of Entrepreneurs**,** Characteristics of Entrepreneur**,** Selection of Product and the means required for starting an enterprise, Financing and Financial incentives available, Success rate of entrepreneurs – a case study.

**UNIT-II**

**BASICS OF PROJECT MANAGEMENT:** Concept and characteristics of a project - types of projects - Objectives of project management - Project Organizational structure - Project life cycle - Challenges and problems of project management - Qualities & functions of a project manager.

**UNIT III**

**PROJECT FORMULATION AND IMPLEMENTATION:** Generation of Project Ideas; Monitoring the environment; Preliminary Screening of Projects; Feasibility study; Project Selection. Detailed Project Report: Market, Technical, Financial and Economic aspects. Pre-requisites for Successful Project Implementation; Control of in-progress Projects (Gantt chart, PERT, CPM); Project Risk Management Process, Post-audit; Abandonment Analysis

**UNIT-IV**

**INTRODUCTION TO STRUCTURED FINANCE**: Term Loans, Bonds/Debentures, Types of debentures, Issue of debt instruments. Structured Finance: Evolution, Securitization process, characteristics, and structured finance products (ABS, CDO, MBS, CDS)

**UNIT-V**

**COMMERCIAL MORTAGAGE LOAN BASICS**: Definition and characteristics of CMBS, CMBS Vs other Mortgage Backed Securities, CMBS three level perspective: property level, loan level, bond level; Life cycle of commercial real estate loans – Loan cycle, Key players in loan cycle; Property types and characteristics, property performance.

**UNIT-V1**

**BASICS OF CRE SERVICING:** Introduction to servicing, Role of the Servicer, Servicing approaches, Influence of technology, Ethics in commercial servicing, Servicing – sources of income, Overview of servicing agreements, Pooling & Servicing agreement, Sub servicing agreement.

**REFERENCE BOOKS:**

1. H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
2. Jeffrey K. Pinto “Project Management”, 2nd edition, Pearson
3. DhandapaniAlagiri “Structured Finance – Concepts & Perspectives”, ICFAI University press.
4. Projects by Prasanna Chandra, McGraw-Hill Publishing Co. Ltd
5. Project Management: Systems approach to Planning Scheduling and Controlling, H. Kerzner.
6. The Complete Real Estate Documents by Mazyar M. Hedayat, John J. Oleary
7. The Fundamentals of Listing and Selling Commercial Real Estate - By Keim K. Loren (Author)

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**Syllabus for B. Tech. IV Year I semester**

**Computer Science and Engineering-IOT**

**PRINCIPLES OF OPERATIONS RESEARCH**

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**(Open Elective –II)**

**Code:**

**Prerequisite :** Linear Algebra and Calculus, Differential Calculus and Numerical Methods

**Course Objectives:**

The course aims at building capabilities in the students for analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.

**Course Outcomes:**

1. Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.
2. Recognize and Solve the problem of transportation involving a large number of shipping routes with least transportation cost and generate optimal assignment strategy for different situations
3. Use Johnson’s rule to create the optimal sequencing schedule for a sequencing problem and make decisions about replacing an item using replacement policy
4. Analyze the performance measures of Queing system and Calculate the EOQ for minimizing the total inventory cost
5. Apply simulation techniques for solving various types of problems and general idea development about Markov chains

**UNIT – I**

**INTRODUCTION:** Definition, Characteristics and Phases and Types of models, applications.

**LINEAR PROGRAMMING PROBLEM**- Formulation – Graphical solution, Simplex method-Types of variables, Unique and Multiple optimal solution, Redundancy & Degeneracy in LPP, Unbounded solution, Artificial variables techniques - Big-M method with feasible and infeasible solutions, Two–phase method, Primal to Dual formation with Duality Principle.

**UNIT – II**

**TRANSPORTATION PROBLEM** – Formulation – methods of finding initial solution (NW corner, VAM, Least cost Method) Optimal solution (Stepping stone Method, MODI method) Special cases in TP: unbalanced, Degeneracy, Restriction and maximization case.

**ASSIGNMENT PROBLEM** – Formulation – Optimal solution (Hungarian Method) - Variants of Assignment Problem-Unbalanced, Restriction, Maximization, Airlines layover case, Traveling Salesman problem.

**UNIT – III**

**SEQUENCING** – Introduction – Terminology, Assumptions, Johnson’s procedure- Processing n jobs through two machines – Processing n jobs through three machines – Processing two jobs through ‘m’ machines (Gantt Chart).

**REPLACEMENT:** Introduction – Types of failure, Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, Group replacement.

**UNIT – IV**

**THEORY OF GAMES:** Introduction andTerminologies, Criterion and optimal strategy – Solution of games with saddle points: Mixed Strategies-Rectangular games without saddle points, Dominance principle, Average Relational Dominance, m X 2 & 2 X n games -Graphical method and Sub Game Method, Matrix Method, Application of LPP in game theory.

**UNIT – V**

**WAITING LINES:** Introduction, Terminology, Structure of a queue, calling population characteristics-size, behavior, pattern of arrivals, Kendall-Lee notation, Queuing Models: Single Channel: Poisson arrivals: exponential service times: with finite and infinite population, Multichannel: Poisson arrivals: exponential service times with infinite population

**INVENTORY :** Introduction, Inventory costs, Concept of EOQ, Single item Deterministic models with and without shortages, Single item inventory models with one price break and multiple price breaks, Stochastic models – Instantaneous demand and no set up cost.

**UNIT – VI**

**SIMULATION:** Definition – Types of simulation – phases of simulation– applications of simulation – Inventory and Queuing problems – Advantages and Disadvantages

Markov chains: Introduction to Markov chains, Analysis Assumptions, Input output probabilities, Applications (Only basic understanding)

**TEXT BOOKS:**

1. Operations research / Hira & Gupta

2. Operation Research /J.K.Sharma/Macmillan Publishers.

**REFERENCES:**

1. Quantitative Techniques in Management: N D Vohra, TMH

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**Syllabus for B. Tech. IV Year I semester**

**Computer Science and Engineering-IOT**

**FUNDAMENTALS OF MEASUREMENTS AND INSTRUMENTATION**

**(Open Elective –II)**

**Code:**

**Prerequisite: NIL**

**COURSE OBJECTIVES :**

The basic principles of all measuring instruments and in measurement of electrical and non-electrical parameters viz., Resistance, Inductance, Capacitance, voltage, current Power factor, Power, Energy, Strain, Temperature, Torque, Displacement etc. and the different types of electrical and non-electrical transducers. It introduces the different signal analyzers and oscilloscopes.

**COURSE OUTCOMES :**

At the end of this course, the students will be able to

1. Understand the principle of operation of different types of instruments viz., PMMC, moving iron type of instruments, the required characteristics of an instrument in general. The student demonstrates the ability to compensate for the errors in the instruments and to extend the range of the instruments.
2. Demonstrates the knowledge of Potential and Current transformers; the errors in them and the effect of having an open/short in the secondary circuits; Understand the principle of operation of Dynamometer and Moving-iron type of Power factor meters.
3. Understand the principle of operation of dynamometer type of Wattmeter and Induction type of Energy meter; use the wattmeter to measure the Active and Reactive power and demonstrates the ability to extend the range of them.
4. Identify and use different techniques of measurement of Resistance, Inductance and Capacitance values.
5. Understand the principle of operation of Different type of digital voltmeters, wave analysers, spectrum analysers and Cathode ray Oscilloscope.
6. Demonstrates the ability in characterizing the different types of transducers and uses them to measure Strain, Gauge Sensitivity, Displacement, Velocity, Acceleration, Force, Torque and Temperature.

**UNIT-I MEASURING INSTRUMENTS- INSTRUMENT TRANSFORMERS:** Significance of Measurement, static characteristic of system- Linearity, Sensitivity, Precision, Accuracy - Classification - Deflecting, Control and Damping torques, Ammeters and Voltmeters, PMMC, Moving iron type instruments, Expression for the Deflecting torque and Control torque, Errors and Compensations, Extension of range using Shunts and Series resistance.

**UNIT –II:**

**INSTRUMENT TRANSFORMERS** Introduction, advantages, burden of instrument transformer, Current Transformer - errors in current transformer, Effect of secondary open circuit, Potential transformer- errors in potential transformer, Testing of current transformers with silsbee’s method. Power Factor Meters: Type of P.F. Meters, Dynamometer and Moving iron type, 1- ph and 3-ph meters.

**UNIT –III**

**MEASUREMENT OF POWER& ENERGY:** Single phase dynamometer wattmeter-LPF and UPF-Double element and three element dynamometer wattmeter, Expression for deflecting and control torques, Extension of range of wattmeter using instrument transformers, Measurement of active and reactive powers in balanced and unbalanced systems, Single phase induction type energy meter, Driving and braking torques, Testing by phantom loading, Three phase energy meter .

**UNIT – IV**

**MEASUREMENT OF RESISTANCE - MAGNETIC MEASUREMENTS- A.C. BRIDGES:** Principle and operation of D.C. Crompton’s potentiometer, Standardization, Measurement of unknown resistance, current, voltage. Method of measuring low- Medium and High resistance, sensitivity of Wheatstone’s bridge, Carey Foster’s bridge, Kelvin’s double bridge for measuring low resistance, Measurement of high resistance, loss of charge method, Measurement of inductance, Quality Factor, Maxwell’s bridge, Hay’s bridge, Anderson’s bridge, Owen’s bridge. Measurement of capacitance and loss angle, Desauty Bridge, Wien’s bridge, Schering Bridge.

**UNIT-V**

**DIGITAL VOLTMETERS- SIGNAL ANALYZERS- CRO:** Digital voltmeters, Successive approximation, Ramp, Dual slope integration continuous balance type, Wave Analyzers, Frequency selective analyzers, Heterodyne, Application of Wave analyzers, Harmonic Analyzers, Total Harmonic distortion, spectrum analyzers, Basic spectrum analyzers, Spectral displays, Q meter and RMS voltmeters . CRO- Cathode Ray Tube (CRT), Screens, Probes, Applications of CRO, Measurement of frequency and phase using CRO, Block diagram.

**UNIT-VI**

**MEASUREMENT OF NON-ELECTRICAL QUANTITIES:** Transducers - Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers, Principle operation of Resistor, Inductor, LVDT and Capacitor transducers, LVDT Applications, Strain gauge and its principle of operation, Guage factor- Thermistors, Thermocouples, Piezo electric transducers, Photovoltaic, Photo conductive cells. Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Acceleration, Force, Torque, Measurement of Temperature.

**TEXT BOOKS:**

1. Electrical Measurements and measuring Instruments – E.W. Golding and F.C. Widdis, 5th Edition, Wheeler Publishing.
2. Transducers and Instrumentation– D.V.S Murthy, Prentice Hall of India, 2nd Edition.
3. A course in Electrical and Electronic Measurements and Instrumentation -A.K. Sawhney, Dhanpatrai & Co. 18th Edition.

**REFERENCE BOOKS:**

1. Measurements Systems, Applications and Design – D O Doeblin- Tata MC Graw-Hill.
2. Principles of Measurement and Instrumentation – A.S Morris, Pearson /Prentice Hall of India.
3. Electronic Instrumentation- H.S.Kalsi Tata MC Graw – Hill Edition, 3rd Edition.
4. Modern Electronic Instrumentation and Measurement techniques – A.D Helfrick and W.D.Cooper, Pearson/Prentice Hall of India.

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| **Level** |  | **M** | **H** | **L** |  | **L** | **L** |  |  |  |  |  |

H: High, M: Medium, L: Low Correlation

**Syllabus for B. Tech. IV Year II semester**

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**Computer Science and Engineering-IOT**

**PRODUCT AND SERVICES**

**(Open Elective –III)**

**Code:**

**Prerequisite: NIL**

**Course Objectives**:

This course helps to provide the basic concepts of Product and Services. This course will enable the students to study areas of basic insights in product management and Services Design.

**Course Outcomes**:

At the end of this course the student will be able to

1. Understand the basic concepts of product.
2. Determine the process of new product development and stages in the process.
3. Understand the concept of product testing, product planning and the preparatory groundwork for launching a new product
4. Differentiate various types of services, its differences with the goods and the application of marketing principles for services.
5. Understand the attributes of a good service design and the tools for producing and distributing the services.
6. Identify the importance of quality of services and also introduce some measurement scales to evaluate the service quality.

**UNIT- I**

**PRODUCT AS A COMMERCIAL FACTOR**

Product concept: premarketing, product definition, product dimensions. Product classification- by its nature, by final use by reasons for purchase, by consumer groups.

**UNIT- II**

**PRODUCT INNOVATION**

New products-What is a new product, Concept, Reasons, Succeed and failure factors, Launch process, Opportunities identification, Idea generation Systems, Evaluation, Check list, Financial analysis, Product concept.

**UNIT- III**

**PRODUCT MANAGEMENT**

Concept test, Product testing, Pre-launch, Market test, Final evaluation “Stage / Gate Process” A sequence system for a product launch. Product planning and development-Product planning, Price planning, Bake even point analysis, Communications Planning, Advertising Planning, Distribution planning

**UNIT - IV:**

**INTRODUCTION TO SERVICE:**

Meaning and Definition of Service, Characteristics of Services, Classification of Service, Five levels of Service, Service verses Physical Goods, 7 P’s for Marketing of Services, Marketing Mix for Tourism, Hospitality, Education, and Health Industry.

**UNIT – V:**

**SERVICE PROCESS DESIGN:**

Challenges & Critical Success Factors, Distribution Methods for Service, Process of Service Delivery, Tools for Service Design, Customer involvement in the Production Process, Tools for Innovation, Role of Intermediaries, Attributes of a Good Design.

**UNIT – VI:**

**QUALITY OF SERVICE:**

Definition of Service Quality, Elements of Service Quality, Service Quality Measuring Tools; SERVQUAL Scale, Service Quality Gap Analysis, Objective Service Metrics, Cost of Quality in Service. Challenges and Problems of Service Quality in India.

**References:**

1. Dr. S.L. Gupta, Product Management, Wisdom Publications
2. C.Merle Crawford ,New Product Management
3. Valarie A.Zeithaml & Mary Jo-Bitner: Services Marketing—Integrating Customer Focus Across the Firm, 3/e, Tata McGraw Hill, 2007.
4. Thomas J.Delong & Asish Nanda: Managing Professional Servies—Text and Cases, McGraw-Hill International, 2006.
5. Christopher Lovelock: Services Marketing People, Technology, Strategy, Fourth Edition, Pearson Education, 2006

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H: High, M: Medium, L: Low Correlation

**Syllabus for B. Tech. IV Year II semester**

**Computer Science and Engineering-IOT**

**INDIAN HISTORY, CULTURE AND GEOGRAPHY**

**(Open Elective –III)**

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**Code:**

**Prerequisite: NIL**

**COURSE OBJECTIVES:**

To equip the students with necessary knowledge related to ancient, medieval and modern Indian and its culture and also facts relating to existence of earth.

**COURSE OUTCOMES:**

At the end of this course, the students will be able to

1. Understand our Indian History, Culture and Indian heritage.
2. Understand secularism of our country.
3. Analyze and understand the social reformers who brought revolutionary changes in

Indian society.

1. Review earth evolution and world climatic change.
2. Understand India Oceanography,
3. Relate the effects of Indian monsoons on Indian agriculture.

**UNIT I:**

**Ancient Indian History** Fundamental Unity of Indian Harappan and Vedic Civilization – Evolution of Caste System – ainism and Buddhism – Gandhara Art., Political unification of India under Mauryas and Guptas, Historical evolution of Satavahanas., Contribution of Pallavas and Cholas to Art – Chola Administrative Systems .

**UNIT II:**

**Medieval India and Culture** Influence of Islam on Indian Culture – The Sufi, Bhakthi and Vishnavite movements, Historical Achievements of Vijayanagara Rulers., Contribution of Shershah and Akbar to the evolution of administration system in India – Cultural Development under Mughals.

**UNIT III:**

**Modern India** Western Impact on India – Introduction of Western Education – Social and Cultural awakening and social reform movements – Raja Rama Mohan Roy – Dayananda Saraswathi – Theosophical Society – Ramakrishna Paramahamsa and Vivekananda – Iswara Chandra Vidyasagar and Veeresalingam – Emancipaition of women and struggle against Caste. Rise of Indian Nationalism – Mahatma Gandhi – Non Violence and Satyagraha – Eradication of untouchability – Legacy of British rule.

**Unit IV:**

**Geo Morphology and Climatology** The Origin and Evolution of the Earth, Interior of the Earth, Distribution of Oceans and Continents , Minerals and Rocks, Geomorphic Processes, Landforms and their Evolution Composition and Structure of Atmosphere, Solar Radiation, Heat Balance and Temperature.  
Atmospheric Circulation and Weather Systems, World Climate and Climate Change

**Unit V:**

**Oceanography** Water (Oceans), Movements of Ocean Water, Physical features of India viz., The Mountains in the North , The Northern Plains, The Peninsular Plateau, The Great

Indian Desert, The Coast; and The Islands.

**Unit VI:**

**Physical Features Of India And India’s Monsoon** India’s monsoon., Winter, Summer(pre-monsoon),rainy (monsoon),autumn (post-monsoon)., Indian Agriculture, Agriculture and colonialism, Indian Agriculture after Independence Major crops and yields, Horticulture, Organic farming.

**References:**

1. Sharma .R.S., (2011).Indian Ancient past.,Oxford Publications.
2. Nitin Singhaniya.,(2017). Indian Culture and Heritage., Publisher: McgrawTestPrep., Second Edition.
3. Certificate of Physical and Human Geography,Goh Cheng Leong,Oxford University Press.
4. Bipin Chandra.(2000). India’s Struggle for Independence., Penguin Global Publishers
5. Saveendra Singh: Physical Geograpghy.,PrayagPustakBhavan ISBN-10: 8186539298. Edition : 1st Edition Number of Pages : 641 Pages Publication : Year 2006.
6. Majumdar, R. C. et al. *An Advanced History of India* London: Macmillan. 1960. [ISBN 0-333-90298-X](http://en.citizendium.org/wiki/Special:BookSources/033390298X)
7. Basham, A.L. : The wonder that was India ,New York: Grove Press, 1954. (OUP, Madras 1983)Basham, A.L. : Cultural heritage of India , Vols.I to IV ,Oxford University Press, Delhi, 1975***.***

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**Syllabus for B. Tech. IV Year II semester**

**Computer Science and Engineering-IOT**

**FINANCIAL INSTITUTIONS, MARKETS AND SERVICES**

**(Open Elective –III)**

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**Code:**

**Prerequisite:** Banking Operations, Insurance and Risk Management

**COURSE OBJECTIVES:**

The objective of the course is to provide to students an understanding of Financial Markets, the major Institutions involved and the Services offered within this framework.

**COURSE OUTCOMES:**

At the end of this course, the students will be able to

1. Understand the financial structure and the financial sector reforms after 1991.
2. Identify the role of RBI and the Regulating and credit policies adopted by the RBI.
3. Analyze the role of Non-Banking financial institutions and the role of financial institutions in India.
4. Understand the role of regulatory bodies like SEBI and also to know the capital and money market instruments.
5. Understand about the asset fund based financial services
6. Expose to investment banking and merchant banking.

**UNIT I**

**INTRODUCTION:** The structure of financial system, Equilibrium in financial markets, Indicators of Financial Development, Financial system and Economic Development, Financial Sector Reforms after 1991.

**UNIT II**

**BANKING INSTITUTIONS**: Structure and Comparative performance, Functions and Role of RBI, Competition, Interest rates, Spread; Bank Capital Adequacy norms; Banking Innovations – BPLR to Base rate, Core Banking System, Financial Inclusion, Current rates: Policy rates, Reserve Ratios, Exchange rates, Lending/ Deposit rates.

**UNIT III**

**NON BANKING FINANCIAL INSTITUTIONS:** Structure and functioning of Unit Trust of India and Mutual Funds, Growth of Indian Mutual funds and their Regulation, Role of AMFI. Performance of Non-Statutory Financial Organizations: IFCI, IRBI, NABARD, SIDBI and SFCs.

**UNIT IV**

**FINANCIAL AND SECURITIES MARKETS**: -, Role and functions of SEBI, Structure and functions of Call Money Market, Government Securities Market – T-bills Market, Commercial Bills Market, Commercial paper and Certificate of Deposits; Securities Market – Organization and Structure, Listing, Trading and Settlement, SEBI and Regulation of Primary and Secondary Markets.

**UNIT V**

**ASSET/FUND BASED FINANCIAL SERVICES:** Lease Finance, Consumer Credit and Hire purchase Finance, Factoring - Definition, Functions, Advantages, Evaluation, Forfeiting, Bills Discounting, Housing Finance, and Venture Capital Financing. Fee-based Advisory services: Stock Broking, Credit Rating.

**UNIT VI**

**INVESTMENT BANKING AND MERCHANT BANKING**: Investment Banking: Introduction, Functions and Activities, Underwriting, Banker to an Issue, Debenture Trustees and Portfolio managers, Challenges faced by Investment Bankers. Merchant Banking: Definition, Merchant Banks Vs Commercial Banks, Services of Merchant Banks.

**References:**

1. L.M. Bhole: Financial Institutions and Markets, TMH, 2009.
2. E. Gordon, K. Natarajan: Financial Markets and Services, Himalaya Publishing House, 2013.
3. Vasant Desai: Financial Markets and Financial Services, Himalaya,2009
4. Pathak: Indian Financial Systems, Pearson, 2009
5. M.Y. Khan: Financial Services, TMH, 2009.
6. S. Gurusamy: Financial Services and System, Cengage,2009
7. Justin Paul and Padmalatha Suresh: Management of Banking and Financial Services, Pearson, 2009.
8. Gomez, Financial Markets, Institutions and Financial Services, PHI, 2012.
9. R M Srivatsava: Dynamics of Financial Markets and Institutions in India, Excel, 2013.

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**Syllabus for B. Tech. IV Year II semester**

**Computer Science and Engineering-IOT**

**FUNDAMENTALS OF RENEWABLE ENERGY SOURCES**

**(Open Elective –III)**

**Code:**

**Prerequisite: Nil**

**COURSE OBJECTIVES:**

Becomes familiar with solar energy, its radiation, Collection, storage and application and also gets introduced to other forms of Renewable Energy sources viz., the Wind energy, Biomass energy, geothermal energy and ocean energy.

**COURSE OUTCOMES:**

At the end of this course, the students will be able to

1. Understand the role and potential of new and renewable energy sources realize the potential of solar energy, its impact on environment; define and understand the terms describing the different angles that one may incur in setting up a solar panel and be able to use the instruments for measuring solar radiation.
2. Demonstrates the knowledge of different techniques of solar collection and storage.
3. Classify different types of horizontal and vertical axis wind mills and understands the performance characteristics of the same. The student also demonstrates the knowledge of different Bio-gas digesters and factors influencing its yield.
4. Understand the potential of geothermal energy in India and will be able to characterize different types of geothermal wells.
5. Differentiate the different methods of kinetic energy extraction from Ocean waves and tides and thermal energy extraction from Oceans.
6. Demonstrates the knowledge of Direct Energy Conversion in different phenomena viz., Joule Thomson effect, Seebeck effect, Peltier effect etc. and the principle of operation of Fuel Cells.

**UNIT – I**

**-PRINCIPLES OF SOLAR RADIATION**: Role and potential of new and renewable source, The solar energy option, Environmental impact of solar power, Physics of the sun, the solar constant, Extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, Solar radiation data.

**UNIT-II-**

**SOLAR ENERGY COLLECTION STORAGE AND APPLICATIONS**: Flat plate and concentrating collectors, Classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Different methods, Sensible, Latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

**UNIT – III**

**WIND ENERGY**: Sources and potentials, Horizontal and vertical axis windmills, Performance characteristics, Betz criteria

**BIO-MASS**: Principles of Bio-Conversion, Anaerobic/aerobic digestion, Types of Bio-gas digesters, Gas yield, Combustion characteristics of bio-gas, Utilization for cooking, I.C.Engine operation and economic aspects.

**UNIT – IV**

**GEOTHERMAL ENERGY**: Resources, types of wells, methods of harnessing the energy, Potential in India.

**UNIT-V**

**OCEAN ENERGY**: OTEC, Principles utilization, Setting of OTEC plants, Thermodynamic cycles. Tidal and wave energy, Potential and conversion techniques, Mini-hydel power plants and their economics.

**UNIT-VI**

**DIRECT ENERGY CONVERSION**: Need for DEC, Carnot cycle, Limitations, principles of DEC. Thermoelectric generators, seebeck, Peltier and joul Thomson effects, Figure of merit, materials, Applications, MHD generators, Principles, Dissociation and ionization, Hall effect, Magnetic flux, MHD accelerator, MHD Engine, Power generation systems, Electron gas dynamic conversion, economic aspects. Fuel cells – principles - Faraday’s law’s - Thermodynamic aspects - selection of fuels and operating conditions.

**TEXT BOOKS:**

1. Non-Conventional Energy Sources - G.D. Rai

2. Renewable Energy Technologies - Ramesh & Kumar /Narosa.

**REFERENCE BOOKS:**

1. Renewable energy resources - Tiwari and Ghosal/ Narosa.

2. Non-Conventional Energy - Ashok V Desai /Wiley Eastern.

3. Non-Conventional Energy Systems - K Mittal /Wheeler

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**Syllabus for B.Tech IV Year II semester**

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**Computer Science and Engineering-IOT**

**ENTREPRENEURSHIP AND BUSINESS DESIGN**

**(Open Elective –III)**

**Code:**

**Prerequisite:**

**Course Objective:**

The objective of the course is to make students understand the essentials of building their startups and to familiarize with business design process develop business models, and market their product.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the essentials of entrepreneurship and the key role played by the entrepreneurs.
2. Differentiate the different phases of UI /UX.
3. Outline the attentiveness on designing a business strategy.
4. Explore on designing and delivery of services.
5. Understand reverse engineering methods in product development.
6. Indicate information on IPR, and patent application.

**Unit – I:**

**Introduction to Entrepreneurship**: Meaning of Entrepreneurship. Reasons feeding the Entrepreneurial fire. Understanding Entrepreneurship as a Process. Multiple roles of Entrepreneur: Intrapreneur, Inventor, Coordinator, Manager and Controller. Psychological and behavioral aspects of First-Generation Entrepreneur.

**Unit – II:**

**Introduction to UI/UX:** Human centered design and benefits, the distinction between UX and UI, UX process – user research, prototyping strategies, UI principles, UI analysis, UI design, UI components and Responsive design.

**Unit – III:**

**Designing a Business Strategy:** Define a problem and frame a strategic question, map the lives of users, journey mapping and ideation, color theory, killing the ideas through Stage Gate Models, pitching of full-fledged, idea, choosing the Start-Up Team.

**Unit – IV:**

**Designing Services and Services Delivery:** Services as solutions, Service delivery pathways, rapid branding and marketing strategies, key metrics for Design thinking. Types of New services, Mix of core services and secondary and enhancing services, service flower and service design matrix.

**Unit – V:**

**Business Model:** Meaning of business model, Difference between business model and business planning, the business model canvas, Risks and Assumptions, Validation of business models, building solution demo and MVP, revenue streams and pricing strategies.

**Unit – VI:**

**Entrepreneurial Funding and Risk Management:** Bootstrapping, Angel Investors, Venture capitalists, Private equity funding, customer acquisition, return on equity and Break even analysis, Risk propensity Vs. Risk avoidance, Locus of control of entrepreneur, Risk estimation techniques, risk avoidance strategies.

**Text Books:**

1. Adrian McEwen, Hakim Cassimally – “Designing the Internet of Things”, Wiley Publications, 2012
2. Hedman, J., &Kalling, T. (2003). The business model concept: theoretical underpinnings and empirical illustrations. European journal of information systems, 12(1), 49-59.
3. Cabrera, J. (2017). Modular Design Frameworks: A Projects-based Guide for UI/UX Designers. Apress.

**References:**

1. J. Chris Leach & Ronald W. Melicher “Entrepreneurial Finance, Fourth Edition”, South Western, Cengage Learning, 2012.
2. Robert D. Hisrich&VelandRamadani – “ E­ffective Entrepreneurial Management, Strategy, Planning, Risk Management, and Organization” , Springer, 2017.
3. Mæhlum, A. R. (2017). Extending the TILES Toolkit-from Ideation to Prototyping (Master's thesis, NTNU).
4. Norman, D. (2013). The design of everyday things: Revised and expanded edition. Basic books.

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**Computer Science and Engineering-IOT**

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**REALTIME ANALYTICS**

**CODE: 9I801**

# **Course Outcomes:**

At the end of this course students will be able to:

1. Understand the architecture of the streaming data system and the operational aspects of the system.
2. Construct and coordinate a data motion system.
3. Introduce popular streaming processing software and options for storing the data.
4. Delivered from the streaming environment to the end user.
5. Implement Algorithms Associated with Streaming Data Problems

# **UnitI: Introduction to Streaming Data**

Sources of Streaming Data, Operational Monitoring, Web Analytics, Online Advertising, SocialMedia, Mobile Data and the Internet of Things,Why Streaming Data Is Different Always On, Always Flowing Loosely Structured, High-Cardinality Storage, Infrastructures and Algorithms.

**DesigningRealTimeStreamingArchitectures:**RealTimeArchitectureComponents,Collection Data Flow, Processing, Storage, Delivery, Features of a Real-Time Architecture, HighAvailability,LowLatency,HorizontalScalability,LanguagesforReal-TimeProgramming.

# **Unit II: Service Configuration and Coordination**

Motivation for Configuration and Coordination Systems, Maintaining Distributed State, Unreliable Network Connections, Clock Synchronization, Consensusinan Unreliable World, Apache ZooKeeper.

# **Unit III:**

**Data-Flow Management in Streaming Analysis:** Distributed Data Flows, At Least Once Delivery, the “n+1” Problem, Apache Kafka: High-Throughput Distributed Messaging, Design and Implementation, Configuring a Kafka Environment, Interacting with Kafka Brokers,

ApacheFlume:DistributedLogCollection,TheFlumeAgent,ConfiguringtheAgent,TheFlumeData Model, Channel Selectors, Flume Sources, Flume Sinks, Sink Processors, Flume Channels,FlumeInterceptors,IntegratingCustomFlumeComponents,Running Flume Agents,

# **Unit IV: Processing Streaming Data**

DistributedStreamingDataProcessing,Coordination,PartitionsandMerges,Transactions,Processing Data with Storm, Components of a Storm Cluster, Configuring a Storm Cluster, Distributed Clusters, Local Clusters, Storm Topologies, Implementing Bolts, Implementing and Using Spouts, Distributed Remote Procedure Calls, Trident: The Storm DSL, Processing Data with Samza, Apache YARN, Getting Started with YARN and Samza, Integrating Samza into the DataFlow, Samza Jobs.

# **Unit V: Delivering Streaming Metrics**

Streaming Web Applications, Working with Node, Managing a Node Project with NPM, Developing Node Web Applications, A Basic Streaming Dashboard, adding Streaming to Web Applications, Visualizing Data, HTML5 Canvas and Inline SVG, Data-Driven Documents: D3.js, High-Level Tools, Mobile Streaming Applications.

# **Unit VI**

**Approximating Streaming Data with Sketching:** Registers and Hash Functions, Registers, Hash Functions, Working with Sets, The Bloom Filter, The Algorithm, Choosing a Filter Size, Unions and Intersections, Cardinality Estimation, Interesting Variations, Distinct Value Sketches, The Min-Count Algorithm, The Hyper Log Algorithm, The Count-Min Sketch, Point Queries , Count-Min SketchImplementation,Topand“HeavyHitters”,RangeandQuantileQueries,OtherApplications

# **Text Books:**

1. Byron Ellis, Real-Time Analytics: Techniques to Analyze and Visualize Streaming Data, Wiley Publications, 2014.
2. Shilpi Saxena and Saurabh Gupta, Practical Real-time Data Processing and Analytics, Packet Publications, 2017.

# **References:**

1. Shilpi Saxena and Sumit Gupta, Real time Big Data Analytics, Packt publications, 2016.