# ACADEMIC REGULATIONS,

# COURSE STRUCTURE

# AND

# DETAILED SYLLABI

# A20 Regulation

# FOR

# B.Tech – CSE-IOT III and IV Year

(Applicable for the Batches admitted in the year 2021-2022)

**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

**2023**

# B. Tech (CSE) in Internet of Things Course Structure

## B. Tech. (CSE) in Internet of Things  I Year I Semester

| SNo. | Course Category | Dept. Course | Course Code | Course | L | T | P | C | Max. Marks | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIE | SEE |
| 1 | BS | S&H | 8HC07 | Engineering Physics | 3 | 1 | 0 | 4 | 30 | 70 |
| 2 | PC | IT | 8FC01 | Problem Solving using C | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | BS | S&H | 8HC10 | Linear Algebra and Calculus | 2 | 1 | 0 | 3 | 30 | 70 |
| 4 | ES | ME | 8BC01 | Workshop/Manufacturing Processes | 1 | 0 | 0 | 1 | 30 | 70 |
| 5 | HS | S&H | 8HC02 | Written Communication Skills | 1 | 0 | 0 | 1 | 30 | 70 |
| 6 | BS | S&H | 8HC08 | Basic Mathematics, Analysis and Reasoning | 2 | 1 | 0 | 3 | 30 | 70 |
| 7 | BS | S&H | 8HC66 | Engineering Physics Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 8 | PC | IT | 8FC61 | Problem Solving using C Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 9 | ES | ME | 8BC61 | Workshop/Manufacturing Processes Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 10 | HS | S&H | 8HC62 | Written Communication Skills Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 11 | ES | CSE-IOT | 8I176 | Comprehensive Test and Viva –Voce – I (2 Mids(Viva) and End Semester(Test and Viva) = 30+70) | 1 | 0 | 0 | 1 | 30 | 70 |
| 12 | PS | CSE-IOT | 8I184 | Technical Seminar – I | 0 | 0 | 2 | 1 | 100 | -- |
| 13 | HS | S&H | 8HC18 | Orientation Course* | 1 | 0 | 0 | 0 | Marks and Grade will be given at | |

|  |  |  |  |  |  |  |  |  | the end of I year II semester |  |
|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | **Total:** | **14** | **3** | **10** | **21** | **430** | **770** |

# B. Tech. (CSE) in Internet of Things Course I Year II Semester

| SN o. | Course Categor y | Dept Course | Course Code | Course | L | T | P | C | Max. Marks | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIE | SEE |
| 1 | BS | S&H | 8HC04 | Engineering Chemistry | 4 | 0 | 0 | 4 | 30 | 70 |
| 2 | ES | CSE | 8EC01 | Data Structures and C++ | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | BS | S&H | 8HC13 | Differential Calculus and Numerical Methods | 2 | 1 | 0 | 3 | 30 | 70 |
| 4 | ES | ME | 8BC02 | Engineering Graphics | 1 | 0 | 4 | 3 | 30 | 70 |
| 5 | HS | S&H | 8HC01 | Oral Communication Skills | 1 | 0 | 0 | 1 | 30 | 70 |
| 6 | PC | IT | 8FC02 | Python Programming | 2 | 1 | 0 | 3 | 30 | 70 |
| 7 | PC | IT | 8F262 | IT Workshop and Python Programming Lab | 0 | 0 | 4 | 2 | 30 | 70 |
| 8 | BS | S&H | 8HC64 | Engineering Chemistry Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 9 | ES | CSE | 8EC61 | Data Structures (C/C++) Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 10 | HS | S&H | 8HC61 | Oral Communication Skills Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 11 | ES | CSE-IOT | 8I277 | Comprehensive Test and Viva –Voce – II(2 Mids(Viva) and End Semester(Test and Viva) = 30+70) | 1 | 0 | 0 | 1 | 30 | 70 |
| 12 | PS | CSE-IOT | 8I285 | Technical Seminar – II | 0 | 0 | 2 | 1 | 100 | -- |
| 13 | HS | S&H | 8HC18 | Orientation Course* | 2 | 0 | 0 | 0 | Grade evaluation | |
| | | | | Total : | 16 | 2 | 16 | 24 | 430 | 770 |

## B.Tech CSE (Internet of Things) Course Structure

### Regulation: A20

# B.Tech.CSE (Internet of Things)II Year I Semester

| Sl. No | Course Category | Dept Course | Course Code | Course | L | T | P/D | C | Max. Marks | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIE | SEE |
| 1 | BS | S&H | 8HC16 | Probability and Statistics | 3 | 0 | 0 | 3 | 30 | 70 |
| 2 | ES | ECE | 8AC48 | Elements of Electrical and Electronics Engineering | 2 | 0 | 0 | 2 | 30 | 70 |
| 3 | PC | CSE | 8EC02 | Object Oriented Programming through Java | 2 | 1 | 0 | 3 | 30 | 70 |
| 4 | PC | IT | 8F303 | Discrete Mathematics | 2 | 0 | 0 | 2 | 30 | 70 |
| 5 | ES | ECM | 8DC10 | Computer Organization & Architecture | 2 | 0 | 0 | 2 | 30 | 70 |
| 6 | PC | ECM | 8D310 | Software Engineering | 2 | 0 | 0 | 2 | 30 | 70 |
| 7 | HS | S&H | 8HC17 | Universal Human values | 2 | 1 | 0 | 3 | 30 | 70 |
| 8 | PC | CSE | 8EC62 | Object oriented Programming through Java Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 9 | PC | CSE | 8EC77 | Software Engineering and Computer Organization Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 10 | ES | EEE & ECE | 8AC77 | Elements of Electrical and Electronics Engineering Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 11 | PS | CSE-IOT | 8I378 | Comprehensive Test and Viva-voce – III | 1 | 0 | 0 | 1 | 30 | 70 |
| 12 | PS | CSE-IOT | 8I386 | Technical Seminar – III | 0 | 0 | 2 | 1 | 100 | -- |
| | | | | **Total :** | **16** | **2** | **8** | **22** | **430** | **770** |

# B.Tech. CSE (Internet of Things) II Year II Semester

| Sl. No | Course Category | Dept Course | Course Code | Course | L | T | P/D | C | Max. Marks CIE | Max. Marks SEE |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PC | CSE | **8E445** | Introduction to IOT | 3 | 0 | 0 | 3 | 30 | 70 |
| 2 | PC | CSE | 8EC05 | Data Communications and Networks | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | PC | CSE | 8EC03 | Database Management Systems | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | PC | CSE | 8EC06 | Operating Systems | 3 | 0 | 0 | 3 | 30 | 70 |
| 5 | ES | ECE | 8CC55 | Digital Electronics | 2 | 0 | 0 | 2 | 30 | 70 |
| 6 | HS | MBA | 8ZC01 | Economics, Accountancy and Management Science | 2 | 0 | 0 | 2 | 30 | 70 |
| 7 | HS | S&H | 8HC03 | Soft Skills | 1 | 0 | 0 | 1 | 30 | 70 |
| 8 | HS | CSE | 8EC63 | Database Management Systems Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 9 | PC | CSE | 8EC69 | Operating Systems and Computer Networks Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 10 | HS | S&H | 8HC63 | Soft Skills Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 11 | ES | CSE | 8EC79 | IOT Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 12 | PS | CSE-IOT | 8I479 | Comprehensive Test and Viva –Voce – IV (2 Mids(Viva) and End Semester(Test and Viva) = 30+70) | 1 | 0 | 0 | 1 | 30 | 70 |
| 13 | PS | CSE-IOT | 8I487 | Technical Seminar – IV | 0 | 0 | 2 | 1 | 100 | -- |
| | | | | **Total :** | **19** | **0** | **10** | **23** | **460** | **840** |

**B.Tech. CSE (Internet of Things) III Year I Semester**

| Sl. No | Course Category | Dept Course | Subject Code | Subject Name | L | T | P/D | C | Max. Marks | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIE | SEE |
| 1 | OE | | | **Open Elective-I** | 2 | 0 | 0 | 2 | 30 | 70 |
| 2 | PE | IOT | | **Professional Elective – I** | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | PC | IT | 8FC06 | Information Security | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | PC | CSE-IOT | 8I506 | Introduction to Embedded Systems | 3 | 0 | 0 | 3 | 30 | 70 |
| 5 | PC | CSE | 8EC07 | Web Technologies | 2 | 1 | 0 | 3 | 30 | 70 |
| 6 | PC | CSE | 8EC16 | Introduction to Data Science | 3 | 0 | 0 | 3 | 30 | 70 |
| 7 | HS | S&H | 8HC05 | Environmental Science and Ecology | 2 | 0 | 0 | 2 | 30 | 70 |
| 8 | PC | CSE | 8EC67 | Web Technologies lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 9 | PC | IT | 8FC65 | Information Security Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 10 | PS | CSE-IOT | 8I595 | Evaluation of Summer Internship-I (2 Internal Reviews and External Evaluation) | 0 | 0 | 0 | 1 | 30 | 70 |
| | | | | Total : | 18 | 1 | 4 | 22 | 300 | 700 |

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

| Sl. No | Course Category | Dept Course | Subject Code | Subject Name | L | T | P/D | C | Max. Marks | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIE | SEE |
| 1 | OE | CSE | | **Open Elective – II** | 2 | 0 | 0 | 2 | 30 | 70 |
| 2 | PE | CSE-IOT | | **Professional Elective – II** | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | PC | ECE | 8DCO5 | Microprocessors and Microcontrollers | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | PC | CSE-IOT | 8IC07 | Introduction to Linux Programming | 2 | 0 | 0 | 2 | 30 | 70 |
| 5 | PC | CSE-AIML | 8LC01 | Introduction to Artificial Intelligence | 2 | 0 | 0 | 2 | 30 | 70 |
| 6 | PC | IT | 8FC07 | Automata Theory and Compiler Design | 2 | 1 | 0 | 3 | 30 | 70 |
| 7 | HS | S&H | 8GC49 | Intellectual Property Rights | 1 | 0 | 0 | 1 | 30 | 70 |
| 8 | PC | CSE-IOT | 8IC61 | Programming Using Linux - Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 9 | ES | ECM | 8DC66 | Micro Processors and Microcontrollers Lab (MPMC) | 0 | 0 | 2 | 1 | 30 | 70 |
| 10 | PS | CSE-IOT | 8I680 | Comprehensive Viva Voce | 1 | 0 | 0 | 1 | 30 | 70 |
| 11 | PS | CSE-IOT | 8I691 | Group Project | 0 | 0 | 2 | 1 | 30 | 70 |
| | | | | Total : | 16 | 1 | 6 | 20 | 330 | 770 |

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

| Sl. No | Course Category | Dept Course | Subject Code | Subject Name | L | T | P/D | C | Max. Mark | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIE | SEE |
| 1 | PE | CSE-IOT | | Professional Elective – III | 3 | 0 | 0 | 3 | 30 | 70 |
| 2 | PE | CSE-IOT | | Professional Elective-IV | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | PC | CSE | 8EC20 | Cloud Computing | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | PC | CSE | 8EC17 | Machine Learning | 3 | 0 | 0 | 3 | 30 | 70 |
| 5 | PC | CSE-IOT | 8I708 | Fundamentals of Ad-hoc and Sensor Networks | 2 | 0 | 0 | 2 | 30 | 70 |
| 6 | PC | IT | 8FC08 | Cyber Security and Cyber Laws | 3 | 0 | 0 | 3 | 30 | 70 |
| 7 | PC | CSE-CS | 8JC65 | Cyber Security and Machine Learning Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 8 | PC | CSE-IOT | 8I762 | Cloud Computing and IOT LAB | 0 | 0 | 4 | 2 | 30 | 70 |
| 9 | PE | CSE-IOT | | PE-IV Lab | 0 | 0 | 2 | 1 | 30 | 70 |
| 10 | PS | CSE-IOT | 8I785 | Evaluation of Summer Internship – II(2 Internal Reviews and External Evaluation) | 0 | 0 | 0 | 1 | 30 | 70 |
| | | | | Total : | 17 | 0 | 8 | 22 | 300 | 700 |

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

| Sl. No | Course Category | Dept Course | Subject Code | Subject Name | L | T | P/D | C | Max. Marks | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIE | SEE |
| 1 | OE | | | Open Elective- III | 2 | 0 | 0 | 2 | 30 | 70 |
| 2 | PE | CSE-IOT | | Professional Elective – V | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | PS | CSE-IOT | 8I896 | Major Project | - | - | 10 | 5 | 30 | 70 |
| | | | | Total : | 5 | 0 | 10 | 10 | 90 | 210 |

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**

HS- Humanities and Social Sciences  K/ S /V - Knowledge Course/ Skill Based Course/ Value Added Course
BS- Basic Science courses            CIE – Continuous Internal Evaluation
ES- Engineering Science courses      SEE – Semester End Evaluation
PC- Professional core courses        L – Theory
PE- Professional Elective courses    T – Tutorial
OE- Open Electives                   P/D – Practical/Drawing
PS- Project work, seminar and internship  C – Credits
MC- Mandatory Courses

* a) Orientation Course for B. Tech I year I semester Students take place for 3 weeks duration covering the first Two Units
   b) Orientation Course for B. Tech I year II semester Students take place for covering the remaining Four Units (Units III, IV, V, and VI).

## Professional Elective –I

| | |
|---|---|
| 8I507 | IoT System Architectures |
| 8I508 | Sensor Technology and Instrumentation |
| 8I509 | Architecting Smart IoT Devices |
| 8EC18 | Big Data Analytics |
| 8I510 | IOT Security |

## Professional Elective –II

| | |
|---|---|
| 8EC04 | Data Warehouse and Data Mining |
| 8I610 | Industrial IoT |
| 8I612 | Ethical  Hacking |
| 8EC19 | Business Intelligence |
| 8EC13 | Block Chain Technology |

## Professional Elective –III

| | |
|---|---|
| 8I709 | Mobile Application Development for IoT |
| 8FC13 | Software Project Management |
| 8I712 | Cloud Computing and Virtualization |
| 8I713 | IoT Automation |
| 8I715 | IoT for Real Time Applications |

## Professional Elective-IV

| | |
|---|---|
| 8FC05 | Design and Analysis of Algorithms |
| 8I716 | CYBER FORENSICS |
| 8I718 | Introduction to DevOps |
| 8F711 | Software Automation And Testing |
| 8I717 | Data Analytics |

## Professional Elective Lab -IV

| | |
|---|---|
| **8FC64** | Design and Analysis of Algorithms Lab |
| **8I763** | Cyber Forensics Lab |
| 8I766 | DevOps Lab |
| **8I764** | Software Testing Lab |
| **8MC67** | R Programming Lab |

## Professional Elective –V

| | |
|---|---|
| 8I812 | Multicore Technologies |
| 8FC20 | Augmented Reality & Virtual Reality |
| 8I814 | 5G & IoT Technologies |
| 8I815 | Smart Sensor Technologies |
| 8I816 | Fog Computing |

SNIST          A20                    CSE-Internet of things

# CSE –IOT   Open Electives – A20 Regulations

| Open Elective (OE) | | | | | |
|---|---|---|---|---|---|
| Code | OE – I (3-1) | Code | OE – II (3-2) | Code | OE – III (4-2) |
| 8ZC22 | Basics of Entrepreneurship | 8ZC23 | Advanced Entrepreneur ship | 8ZC24 | Product and Services |
| 8ZC25 | Basics of Indian Economy | 8ZC26 | Basics of Polity and Ecology | 8ZC27 | Indian History, Culture and Geography |
| 8ZC05 | Banking Operations, Insurance and Risk Management | 8ZC19 | Entrepreneur ship Project Management and  Structured Finance | 8ZC15 | Financial Institutions, Markets and Services |
| 8BC51 | Introduction to Additive Manufacturing Process | 8BC53 | Principles of Operations Research | 8AC45 | Fundamentals of Renewable Energy Sources |
| | | 8AC44 | Fundamentals of Measurement s and Instrumentation | 8ZC10 | Entrepreneurs hip & Business Design |

**Computer Science and Engineering-IOT**
**Information Security**

Code : 8FC06                                                                                 L  T  P/D C
Prerequisite : Nil                                                                        3  0  0  3
**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, 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, 4<sup>th</sup> 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.

Syllabus for B. Tech. III Year I semester

Computer Science and Engineering-IOT

**INTRODUCTION TO EMBEDDED SYSTEMS**

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

**Code:  8I506**

**Prerequisite: Computer Organisation**

**COURSE OBJECTIVES :**

The constraints and challenges of an Embedded System design The 8051 Architecture, Assembly Language Programming , Interfacing and Interrupt handling mechanism Modern Embedded System Design case studies

**COURSE OUTCOMES :**

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

1. Classify embedded systems and their applications
2. Write ALP for 8051 architecture
3. Implement interfaces for Embedded System using various protocols and hardware modules.
4. Understand the principles of Communication Interface, Wireless and Mobile Systems Protocols
5.  Design the interrupt routines for variois OS concepts and Memory Management techniques in an RTOS Environment
6. Recognize the issues and design of basic Real-Time Operating System principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations.

**UNIT – I: Introduction to Embedded Systems:** Embedded Systems, Comparing Embedded and General Computing, Complex System Design and Processors, Classification of Embedded Systems, Embedded System Design Process, Formalization of System Design, Embedded SOC and VLSI Circuit Technology, Application examples of Embedded Systems.

**UNIT – II: 8051 Architecture, Memory Organization and Programming:** 8051 Architecture, features, Addressing modes, Instruction set, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data, Input/Output, Interrupts; The Assembly Language programming Process, Programming the 8051, Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, use of C programming for 8051.

**UNIT – III: 8051 Real World Interfacing:** Part A - Real World Interfacing, Performance metrics, Memory map, Processor and Memory selection, Part B - IO Subsystem, Sensors and Actuators, LED and LCD Interfacing, Keyboard Interfacing, Stepper Motor Interfacing, DC motor Interfacing Using PWM

**UNIT – IV: Embedded Communication Interface:** Serial and Parallel Communication, Timer and Counting Devices, Watchdog Timer, Real Time Clock, I$^2$C, SPI protocol, ISA , PCI, Internet Enabled Systems, Wireless and Mobile Systems Protocols

**UNIT – V: Introduction to Real - Time Operating 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. (Chapter 6 and 7 from Text Book 3, SImon).

**UNIT – VI: Basic Design Using a Real-Time Operating System**: Principles, Semaphores and Queues, Hard Real-Tjme Scheduling Considerations, Saving Memory and Power, An example RTOS like uC-OS (Open Source); **Embedded Software Development Tools**: Host and Target machines, Linker! Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging **Techniques:** Testing on Host Machine, Using Laboratory Tools, An Example System. (Chapter 8,9,10 & 11 from Text Book 3, Simon).

**TEXT BOOKS:**

1. Embedded Systems- Architecture, Programming and Design 2E, Raj Kamal, TMH
2. Introduction to Embedded Systems, K.Shibu, Tata McGraw-Hill
3. The 8051 Microcontroller and Embedded Systems Using Assembly and C – Mazidi, Pearson Education India, 2nd edition, 2008.
4. An Embedded Software Primer, David E. Simon, Pearson Education

**REFERENCES:**

1. An Embedded Software Primer, David E. Simon, Pearson Education.
2. Computers and Components: principles of embedded computing system design, Wayne Wolf, Elsevier.
3. 8051 Application Notes by Atmel.

## WEB TECHNOLOGIES

**Code: 8EC07**                                                                     **L T  P/D C**

                                                                                    **2  1  0  3**

**Prerequisite:** Data Communications and Computer Networks, Object Oriented Programming through Java

**Course Objective:**

To understand the basics of Web Designing using HTML and CSS, perform the client-side scripting with JavaScript. Understand the different data stores XML, and JSON with full-stack web application development using Angular and study with Server-side programming using Java Servlets and PHP.

**Course Outcomes:**

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

1.  Demonstrate the use of HTML tags. Apply Styles using CSS and Bootstrap.
    a.  Develop dynamic programs using Javascript and Typescript.
    b.  Develop scripts using XML and validate using parsers, Design a data-interchange format using JSON.
3. Appraise the Expressions, Filters, Directives, Controller, and Modules of Angular.

4. Design responsive web applications with Forms, Scope, Dependency Injection & Services, and Single Page Application (SPA) of Angular.

5. Comprehend the uses of Web servers and design the server-side scripts using Servlets.

6. Design and develop server-side scripts and components using PHP.

**Modified and Approved on Mar 20, 2023**

**UNIT 1: Client-Side Web Development. (Text Book 1)**

**HTML 4-**List, Tables, Images, Forms, Div. (with all attributes and sub-clements)

**Cascading Style sheets 3 -** Types of CSS. Types of Selectors (Basic, Combinatory, Attribute,Pscudo-class, Pseudo Element)

**Bootstrap:** Introduction with example

**UNIT I1:**

**JavaScript** -Introduction, variables, objects (Boolean, Number, String, Date, Math, Regular expression, Array), Function, Event handlers (mouse, keyboard, window), Using CSS with

JavaScript. TypeScript Introduction, Simple and Special Types, Arrays, Tuples, Object Types, Enums,

Aliases and Interfaces, Union Types, Functions, Casting, Classes, Basie Generics, Utility Types, Keyof, Null, Definitely Typed.

**UNIT I11 Data Store**

**XML:** DTD, XML Schemas, Difference between DOM Parser and SAX Parser.

**JSON:** Introduction, JSON vs XML, Data Types, Parsing JSON, stringify (), Objects, Array, and JSON HTML (Refer to Textbook: I and 5)

**UNIT IV: Web Hosting (Text Book 3)**

**Servlets:** Introduction to Servlets, Lifecycle of a Servlet, Servlet API: javax.servlet

Package, Reading Servlet Context Parameters, Reading Initialization parameters, Request

Dispatcher Handling HTTP Requests & Responses. Session Tracking.

**UNIT V: Server Seripting Language: PHP (Text Book 1)**

Declaring variables, data types, array, string, operators, Expression, control statement, function, Reading data from form controls like text boxes, radio buttons, lists, etc.

Handling file upload. Connecting to the database with CRUD operation (Mysql as reference),

Handling séssions and cookies. File handling in PHP**.**

**UNIT VI: Application Development Using Angular: (Basics) (Text Book 2)**

**Basics:** MVC-The Angular way, Features of Angular, My First Angular app.

**Expressions:** Angular Expressions, Angular vs JavaScript.

**Filters:** Built-In Filters, Using Angular Filters, Creating Custom Filters.

**Directives:** Matching directives, Introduction to Directives, Directive Lifecycle, Binding controls to data, Using Angular built-in directives, creating a custom directive.

**Controllers_;** Role of a Controller, Controllers & Modules, Attaching Properties and functions to scope, Nested Controllers, Using Filters in Controllers, Controllers in External Files

**Modules:** Introduction to Angular Modules, Bootstrapping Angular.

**Computer Science and Engineering-IOT**
**INTRODUCTION TO DATA SCIENCE**

Code: 8EC16                                                                L  T  P/D  C

COURSE OBJECTIVES:                                                  3  0  0    3

• Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration

• Exploring data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication

• Understand the basic knowledge of algorithms and reasonable programming experience and some familiarity with basic linear algebra and basic probability and statistics

• Identify the importance of recommendation systems and data visualization techniques

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data

CO-2: Discuss the significance of exploratory data analysis (EDA) in data science and to apply basic tools (plots, graphs, summary statistics) to carry out EDA

CO-3: Apply basic machine learning algorithms and to identify common approaches used for Feature Generation

CO-4: Analyze fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine and to Build their own recommendation system using existing components

## UNIT-I: INTRODUCTION

What is Data Science? - 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, What is an Attribute?, 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 Eigen values and Eigenvectors of Symmetric Matrices, Definitions, Computing Eigen values 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)

**Regression:** Linear Regression Analysis, Multiple Linear regression(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. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, Mining of Massive Datasets, Cambridge University Press

3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:

1.Han, Jiawei, Jian Pei, and Micheline Kamber, "Data mining: concepts and techniques", 3 rd Edition, Elsevier, 2011.

2. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC,          2014.

3.Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.

4.  Paul Teetor, "R Cookbook, O'Reilly, 2011.

**Environmental Science and Ecology**
**III B. Tech I Sem (for CSE, ECE ,IOT and CE)**

**Code:** 8HC05                                                      L  T  P/D  C
**Prerequisite: NIL**                                              2  0  0    2

**Course Objectives:**
1.  To understand structure and function of ecosystem
2.  To learn classification and uses of natural resources
3.  To learn about Understanding the impacts of developmental activities and mitigation measures.
4.  To know the source, causes and preventive methods of pollution
5.  To understand the importance of ecological balance for sustainable development.
6.  To understand the environmental policies and regulations

**Course Outcomes**

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

1.  Understand about ecosystem and energy flow among the organisms.
2.  Know the resources available, use of them and overexploitation of the resources in the nature.

3.  Learn the value, use and value of biodiversity.
4.  Understand the causes and effect of pollution and implement measures in control of pollution.

5.  Understand the sustainable development and implement green technology for sustainable development.

6.  Implement policy to protect the environment.

**UNIT-I**

**Ecosystems**: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity.

**UNIT-II**

**Natural Resources**: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy source.

**UNIT-III**

**Biodiversity and Biotic Resources**: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.

## UNIT-IV

**Environmental Pollution and Control Technologies**: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants. Acid rain-Threshold limit values of chemicals present in environment, Global warming, Ozone layer depletion, Water pollution: Sources and types of pollution. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Sewage water Treatment, Kyoto protocol, and Montréal Protocol.

## UNIT-V

**Sustainable development and Green Technology**: Concept of sustainable development, threats to sustainability population and its explosion, Crazy consumerism, over- exploitation of resources, strategies for achieving sustainable development environmental education, conservation of resources, urban sprawl sustainable cities and sustainable communities, human health , role of IT in Environment, Environmental Ethics, Environmental Economic – Concept of Green Building, Clean Development Mechanism ( CDM ).

## UNIT-VI

**Environmental Policy, Legislation & Environment Impact Assessment**: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

## TEXT BOOKS:

1. Perspectives in **Environmental Studies**: **Kaushik** A. and **Kaushik**, C.P. New Age International (P) Ltd. (2008)

## REFERENCE BOOKS:

1. Environmental Studies by Erach Bharucha, 2005 University Press.
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.

3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.

4. Environmental Science by Daniel B. Botkin& Edward A. Keller, Wiley INDIA edition.
5. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.

6. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

**Code: 8EC67**                                                                                     **L   T   P/D   C**
**Prerequisite: Object Oriented Programming through Java Lab**          **0   0   2      1**

**Course Objectives:**
Implement programs using HTML tags, Java scripts along with Event Handling. Implement scripts using XML, DOM parser, and SAX parser for project development. Also, the student should understand and implement the MVC architecture applications**.**

**Course Outcomes:**

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

1. Demonstrate the use of HTML tags and be able to design web pages.Develop dynamic programs involving Java scripts, popup windows in JavaScript along Event Handling.

2. Develop scripts using XML and XSLT and read XML documents using parsers, DOM parser, and SAX parser.Develop JSON files and access them via HTML pages.

3. Implement Angular with Expressions, Filters, Directives, Controller, and Modules.

4. Develop a Single Page Application with implementation of Scope and Form.

5. Implement Java servlets using Apache Tomcat Server for User authentications

6. Develop an application in PHP with Database connectivity.

**Hardware and Software required:**

1. A working computer system with either Windows or Linux

2. A web browser either Microsoft Edge or Firefox or Chrome

3. Visual Studio IDE or Eclipse IDE

4. XML editor like Altova Xml-spy [www.Altova.com/XMLSpy – free] ,Stylusstudio , etc.,

5. Tomcat web server and Apache web server

6. XAMPP for PHP and Database programs JVM(Java virtual machine) must be installed on your system

**Week-1:**

1. Create a web page with advanced layouts and positioning with CSS and HTML.

2. Design a website with different methods of embedding CSS in a web page.

3. Create a static web page which displays your personal details. (Hint: CSS3 and HTML5)

4. Create a web page through which the user can enter his / her details to become an authenticated user of that page.

**Week-2:**

1.    Create a web page that shows different methods of embedding JavaScript with validation.

2.    Create a web page with rollover menus. Rollover menus should be created using JavaScript.

3.    Create a simple calculator, which can perform the basic arithmetic operations.

**Week-3:**

1.    Write an XML file which will display the Book information which includes the following:

1) Title of the book

2) Author Name

3) ISBN number

4) Publisher name

5) Edition

6) Price

**2.**    Write a Document Type Definition (DTD) or XML Schema Definition (XSD) to validate the above XML file.

**Week-4:**

1.    Prepare a JSON file with Student information and display the content in HTML Table format.

**Week-5:**

1.    Prepare a program that displays the name that we feed in the ng-init directive.

2.    AngularJS expression can contain arithmetic operators which will produce the result based on the type of operands

3.    Program for AngularJS expression can contain variables declared via ng-init directive.

4.    Return the names that contain the letter "i".

5.    Type a letter in the input field, and the list will shrink/grow depending on the match.

6.    By using ng-click directive on the table headers, we can run a function that changes the sorting order of the array.

**7.**    Creating a custom myFormat filter will format every other character to uppercase.

**Week-6:**

1.    Program to implement ay 5 directives from ng-app, ng-init, ng-model, ng-controller, ng-bind, ng-repeat ,ng-show ,ng-readonly, ng-disabled , ng-if, ng-click.

2.    Demonstrates by attaching properties to the $scope object inside a controller and then displaying property value in HTML.

**3.**    Program to handle click events of a button.

**4.**    Program to create the "message" property is defined inside myController, so it will only be available to div1 and div2 but not div3 and div4. The same way, message property defined inside another Controller will only

be available to div4. The div3 element does not come under any controller, so "message" property will be null or undefined.

5.      Program to implement complex and nested controllers

6.      Create a module using controllers

**Week-7:**

1.      Prepare a angular Student information form

2.      Prepare a program to implement Scope & Directives, $apply and $watch

**Week-8:**

1.      Write a program for Single Page Application (SPA) using angular.

**Week-9:**

1.      Install APACHE TOMCAT web server and while installation, assign port number 8181. Make sure that this port is available i.e., no other process is using this port.

2.      Write a servlet program to print welcome messages on the browser.

3.      Develop a web application to pass the parameters from the HTML page and display them using servlet.

**Week-10:**

1.      Develop a web application using servlet to perform Session Tracking with        hidden    form    fields, cookies and url-rewriting and http sessions. (Files to developed- Html,Java, Web.xml)

2.      Write a servlet using the RequestDispatcherclass. Develop a web application using servlet to perform the user Authentication:

A. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following:

1. Create a Cookie and add these four user id's and passwords to this Cookie.

2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.

If he is a valid user(i.e., user-name and password match) you should welcome him by name(user-name) else you should display " You are not an authenticated user ".

Use init-parameters to do this. Store the user-names and passwords in the webinf.xml and access them in the servlet by using the getInitParameters() method.

B. Authenticate the user when he submits the login form using the username and password from the database.

**Week-11:**

1.      Write a PHP to test the database connection

2.      Write a php to create a Table.

**Week-12:**

1.      Write a PHP to insert values form HTML to database(registration Page)

2.        Write a PHP to insert values to a Database.

3.        Write a PHP to select values from a database table.

4.        Write a PHP to update existing records of a database table.

5.        Write a PHP to validate user login

**Code : 8FC65**                                                              **L  T  P/D C**
**Prerequisite :  Nil**                                                        **0   0  2   1**

**Course Objectives:**
1. Learn the fundamental of information security principles and services offered to secure the data.
2. Apply conventional cryptographic techniques in order to do encryption.
3. Apply Public key cryptography techniques in order to do encryption.

**Course Outcomes:**

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

Understanding ofSymmetric Encryption Algorithms, Asymmetric Encryption Algorithms, Hash and Key Exchange, Digital Signature and Digital Envelope, Demonstration of NS3 Tool

**List of Programs**
1. Implement Substitution Cipher.
2. Implement Transposition Cipher.
3. Implement DES
    (a) Generate Cipher text for the given Plaintext.
    (b) Retrieve the Plaintext from the given Cipher text.
4. Implement Diffie Hellman Algorithm and generate Secret Key.
5. Implement RSA algorithm
    (a) Generate Public key and Private key pair
    (b) Generate Cipher text for the Plaintext
    (c) Obtain the Plaintext from the Cipher text
6. Implement Hash Algorithm.
7. Generate Digital Signature
8. Implement Digital Envelope.
9. Installation of NS3.
10. Demonstration of NS3.11. Executing simple projects in NS3.

| | | | |
|---|---|---|---|
| **Code: 8I595** | | | **L  T  P  C** |
| | | | |
| **Prerequisite:** All Courses till this semester | | | **0  0  0  1** |

**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 30 marks of internal evaluation and 70 marks of external

The **internal evaluation** shall consist of:

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

Report                                                                                          :      05 marks

Demonstration / presentation (internal presentation

is evaluated by HOD, senior faculty and internal guide)   :      10 marks

                                                                                                      --------------

                                                                                                      30 marks

End examination                                                                       :      70 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**

**<u>Professional Elective -I</u>**

| | |
|---|---|
| 8I507 | IoT System Architectures |
| 8I508 | Sensor Technology and Instrumentation |
| 8I509 | Architecting Smart IoT Devices |
| 8EC18 | Big Data Analytics |
| 8I510 | IOT Security |

SNIST          A20                    CSE-Internet of things

**Computer Science and Engineering-IOT**
**IOT SYSTEM ARCHITECTURES**
**(Professional Elective-I)**

**CODE: 8I507**
**Course Out comes (CO):**

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

| 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,D ASH7-

**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,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.

**Computer Science and Engineering-IOT**
**Sensor Technology and Instrumentation**
(Professional Elective-I)

**Code: 8I508**

L T  P/D C
**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 zoelectric sensor. Thermo 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. GaryJohnson/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.
3.HermannK.P.Neubert,"InstrumentTransducers"2ndEdition2012,OxfordUniversityPress.

**Computer Science and Engineering-IOT**
**ARCHITECTING SMART IOT DEVICES**
**(Professional Elective-I)**

**CODE:8I509**

**COURSE OUTCOMES:**

1. Get acquainted with different smart devices and smart meters
2. Describe how modern power distribution system functions
3. Develop distributed Device Management system
4. Identify suitable communication networks for Smart Grid applications
5. Develop and deploy metrics for pricing and billing the distributed services

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

**Pre-requisites:**

Fundamentals of Power Distribution System, Transmission and Distribution, Power systemOperation and Control, Communication Networks

**UNIT- I**

**INTRODUCTION TO SMART GRID**

Introduction - Evolution of Electric Grid, Smart Grid Concept - Definitions and Need for Smart Grid – Functions – Opportunities – Benefits and challenges, Difference between conventional & Smart Grid, Technology Drivers

**UNIT- II**

**ENERGY MANAGEMENT SYSTEM**

Energy Management System (EMS) - Smart substations - Substation Automation - Feeder Automation, SCADA – Remote Terminal Unit – Intelligent Electronic Devices – Protocols, Phasor Measurement Unit – Wide area monitoring protection and control, Smart integration of energy resources – Renewable, intermittent power sources – Energy Storage.

**UNIT- III**

**DISTRIBUTION MANAGEMENT SYSTEM**

Distribution Management System (DMS) – Volt / VAR control – Fault Detection, Isolation and Service Restoration, Network Reconfiguration, Outage management System, Customer Information System, Geographical Information System, Effect of Plug in Hybrid Electric Vehicles

**UNIT- IV**

**SMART METERS**

Introduction to Smart Meters – Advanced Metering infrastructure (AMI), AMI protocols – Standards and initiatives, Demand side management and demand response programs, Demand pricing and Time of Use, Real Time Pricing, Peak Time Pricing.

**UNIT- V**

**COMMUNICATION NETWORKS & IOT**

Elements of communication and networking – architectures, standards, PLC, Zigbee, GSM, BPL, Local Area Network (LAN) - House Area Network (HAN).


**UNIT- VI**

**COMMUNICATION NETWORKS & IOT**

Wide Area Network (WAN) - Broadband over Power line (BPL) - IP based Protocols - Basics of Web Service and CLOUD Computing, Cyber Security for Smart Grid.

**TEXT BOOKS:**

1.      Stuart Borlase 'Smart Grid: Infrastructure, Technology and Solutions', CRC Press 2012.
2.      Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, 'Smart Grid: Technology and Applications', Wiley, 2012

**REFERENCE BOOKS:**

1.    Mini S. Thomas, John D McDonald, 'Power System SCADA and Smart Grids', CRCPress, 2015.
2.    Kenneth C.Budka, Jayant G. Deshpande, Marina Thottan, 'Communication Networksfor Smart Grids', Springer, 2014.

**E BOOKS:**

1.   https://books.google.co.in/books?isbn=1119969093
2.   https://books.google.co.in/books?isbn=135123093X

# BIG DATA ANALYTICS

**(PROFESSIONAL ELECTIVE –I)**

**Course Code: 8EC18**

| **Course Outcomes :** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| | **3** | **0** | **0** | **3** |

- Describe Data design its applications
- Apply Analytics for Business
- Use tools and technology for business applications
- Apply programming languages which is used in day to day analytics 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, DecisionModels, 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 Milliway Labs Jeffrey D. Ullman, Stanford Univ.
**(http://www.vistrails.org/index.php/Course:_Big_Data_Analysis)**

# IOT Security

**(PROFESSIONAL ELECTIVE –I)**

**Code : 8I510**
**Prerequisite : Introduction to IOT**

**L  T  P  C**

**3  0  0  3**

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**: Cyber security versus IoT security ,cross-industry collaboration is vital, IoT uses today, IoT in the enterprise,IoT device lifecycle, IoT  future and the need to secure,
**IoTcommunications:**Messaging protocols, Transport protocols, Network protocols, Data link and physical protocols.

**UNIT II : Vulnerabilities, Attacks, and Countermeasures** : Threats,vulnerability,and risks(TVR), attacks and counter measures.

**Common IOT attack**:Types, Attack trees, Building an attack tree, Fault(failure) trees and CPS, Fault tree and attack tree differences, Merging fault and attack tree analysis, Example anatomy of a deadly cyber-physical attack. Today's IoT Attacks **.**

**Threat modelling an IoT system**: Identify the assets: create a system/architecture overview
decompose the IoT system, identify threats, document the threats Step, rate the threats.
Security Engineering for IoT Development, Building security into design and development, Security in agile developments, Focusing on the IoT device in operation , Secure design , Safety , security design and Security Plan.

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

**Operations and maintenance:** Managing identities, roles ,and attributes, Security monitoring, Penetration testing, Compliance monitoring, Asset and configuration management, Incident management, Dispose.

**UNIT–IV**: Examining cryptographic controls for IoT  protocols ,Cryptographic controls built into IoT communication protocols , ZigBee , Bluetooth-LE, Nearfield communication (NFC), Cryptographic controls built into IoT messaging protocols
MQTT ,CoAP , DDS, 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 , environment, Challenges associated with IoT compliance, Examining existing compliance standards support for the IoT , Underwriters Laboratory IoT certification, NISTCPS efforts, NERCCIP, HIPAA/HITECH, PCIDSS, 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 Crypto currency 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

Code : 8DC05

| L | T | P/D | C |
|---|---|-----|---|
| 3 | 0 | 0 | 3 |

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

1. The microprocessor and microcontroller architecture, instructions set and procedures of programming.
2. Understand the assembly language programs, pin diagram and timing diagrams for 8086 & 8051.
3. Understand and practice the interfacing related applications of 8255 with 8086 and serial communication.
4. Learn the usage of multiple interrupts of 8051, USART architecture, RS232.

**Course Outcomes:** After completing this course, Students will be able to

1. Understanding the concepts of 8086 Architecture
2. Understanding the concepts of Instruction set & developing skills in writing assembly language programs.
3. Ability to interface keyboard, stepper motor ADC, DAC to 8086 using 8255
4. Understanding the concepts of 8051 Architecture
5. Exploring the concepts of instruction set of 8051
6. Ability to interface LED, LCD, Keyboard DAC, ADC with 8051

**UNIT – I: Architecture of 8086 Microprocessor:** Memory segmentation, BIU and EU. General purpose registers. 8086 flag register and function of 8086 Flags. Pin diagram of 8086-Minimum mode and maximum mode of operation. Timing Diagram.

**UNIT – II: Instruction set of 8086:** Addressing modes of 8086. Assembler directives. Simple programs, procedures, and macros. Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation. Introduction to DOS and BIOS interrupts.
*Applications: Design of an 8-bit Calculator*

**UNIT – III: Interfacing with 8086:** Interfacing with RAMs, ROMs along with the explanation of timing diagrams. 8255 PPI – various modes of operation. Interfacing with key boards, ADCs, and DACs Stepper Motor .Interrupt structure of 8086. Vector interrupt table. Interrupt service routines. 8259 PIC Architecture and interfacing cascading of interrupt controller and its importance.
*Applications: Interfacing of a Temperature sensor with 8086*

**UNIT – IV: The 8051 Architecture:** Architecture of 8051 Micro controller, Memory Organization. Special Function Registers. Input/Output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts.

**UNIT – V: Instruction set of 8051:** Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, Simple programs.

Programs based on Timer Interrupts, External Hardware Interrupts ,Serial communication interrupts Timers and counters..

**UNIT – VI: Applications of 8051:** Interfacing with keyboards, LEDs, 7 segment LEDs, LCDs, Interfacing with ADCs. Interfacing with DACs, Concept of Multiple Interrupts.

**TEXT BOOKS :**
1. Advanced microprocessor & Peripherals - A.K.Ray&K.M.Bhurchandi, TMH, 2000.
2. Microprocessors and interfacing – Douglas V. Hall, TMH, 2nd Edition, 1999.
3. 8051 Microcontroller–Kenneth J. Ayala, Penram International/ Thomson, 3rd Edition, 2005.
4. The 8051 Microcontroller And Embedded Systems Using Assembly And C – Mazidi, PearsonEducation India,2nd edition, 2008.

**REFERENCES :**
1. Microcomputer systems, The 8086/8088 Family Architecture, Programming and Design – Y.Liu and G.A. Gibson, PHI, 2nd Edition. 8051 Micro Controllers and Embedded Systems – Dr. Rajiv Kapadia, Jaico Publishers

**Code : 8IC07**

| L | T P/D | C |
|---|---|---|
| 2 | 0  0 | 2 |

**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

1. List and demonstrate the  basic Linux utilities
2. Recite and solve problems using Shell Scripting
3. Understand and elaborate File System structure and kernel support for files in Linux.
4. Summarize the fundamentals of process control primitives and signal handling.
5. Classify the techniques of Inter process communication and apply them to real world problems.
6. 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.
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH, 2006.
3. 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

**Syllabus for B. Tech. III Year II semester**
**Computer Science and Engineering-IOT**
**Introduction to Artificial Intelligence**

**CODE: 8LC01**                                                          **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:**

* Ability to formulate an efficient problem space for a problem expressed in natural language.

* Select a search algorithm for a problem and estimate its time and space complexities.

* Possess the skill for representing knowledge using the appropriate technique for a given

* problem.

* 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 wih 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.

# Automata Theory and Compiler Design

**Code : 8FC07**                                                                                     **L   T   P/D   C**
**Prerequisite : Nil**                                                                           **2    1    0     3**

## Course Objectives:

1. Learn principles of Finite state machine, finite automation models, and transition diagrams.
2. Understand regular languages and expressions for writing grammars.
3. Understand context free grammars useful in designing compilers.
4. Study the design and working of a complier .
5. Study the role of grammars in compiler design.
6. 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

**Code: 8GC49**　　　　　　　　　　　　　　　　　　　　　　**L　T　P/D　C**
**Prerequisite : Nil**　　　　　　　　　　　　　　　　　　　　**1　0　　0　　1**

**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. Gopala krishnan& 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 & Khushdeep Dharni, Intellectual Property Rights, Phi Learning Pvt. Ltd
3. Ajit Parulekar 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.

**Code:** 8IC61

**L  T  P/D  C**
**0  0  2    1**

**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.

**MICROPROCESSORS AND MICROCONTROLLERS LAB(MPMC)**

Code: 8DC66

| L | T | P/D | C |
|---|---|-----|---|
| 0 | 0 | 2 | 1 |

### Course Objectives :

a. Familiarize the architecture of 8086 processor, assembling language programming and interfacing with various modules.
b. The student can also understand of 8051 Microcontroller concepts, architecture, programming and application of Microcontrollers.
c. Student able to do any type of VLSI, embedded systems, industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.

### Course Outcomes :

- Analyze and apply working of 8086.
- Compare the various interface techniques. Analyze and apply the working of 8255, 8279,8259, 8251, 8257ICs and design and develop the programs.
- Learning the Communication Standards.

## Cycle - I

Introduction to MASM/TASM, KIEL IDE, Familiarization with 8086, 8051 Kits

## 8086 ALP using kit and MASM

1. Basic arithmetic and logical operations

2. Code conversion decimal arithmetic programs

3. String manipulation programs

4. Display a message on the screen of a computer using DOS / BIOS interrupts.

## Cycle – II

**Following peripherals and interfacing experiments to be implemented on 8086 and 8051 kits**

1. A/D and D/A interfacing

2. Serial interfacing with PC

3. Keyboard and display interfacing

4. Stepper motor controller

5. Traffic light controller

6. Real Time clock interface with 8051 using $1^2$C

## Syllabus for B. Tech. III Year II semester
## Computer Science and Engineering-IOT
### COMPREHENSIVE VIVA VOCE

**Code:** 8I680           **L T P/D C**

**Prerequisite:** All core Courses till this semester     1   0   0    1

**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 30 marks are evaluated internally and 70 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                :       30 Marks

End examination                   :       70 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

## GROUP PROJECT

**Code:  8I691**

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

**Prerequisite:**

## Course Objectives:
To acquire basic 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 which are meeting the current needs of the market and society as a whole.
4. Improve their communicative skills and team skills largely improve.
5. Work as an individual and in a team.

A group project shall be carried out by a group of students consisting of 2 to 3 in number in third year first semester.  This work shall be carried out under the guidance of the faculty assigned as internal guide and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also.

There will be 100 marks in total with 30 marks of internal evaluation and 70 marks of external

The **internal evaluation** shall consist of:

| | | |
|---|---|---|
| Day to day work | : | 15 marks |
| Report | : | 05 marks |
| Demonstration / presentation | : | 10 marks |
| ----------- | | |
| | | 30 marks |
| End examination | : | 70 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 supervisor.

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

**Computer Science and Engineering-IOT**

**<u>Professional Elective –II</u>**

| | |
|---|---|
| 8EC04 | Data Warehouse and Data Mining |
| 8I610 | Industrial IoT |
| 8I612 | Ethical  Hacking |
| 8EC19 | Business Intelligence |
| 8EC13 | Block Chain Technology |

**Computer Science and Engineering-IOT**

**DATA WAREHOUSE AND DATA MINIG**

(Professional Elective - II)

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

**Code: 8EC04**

**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 Backpropagation, 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)

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**CODE:8I610**

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

## Course Objective:

1. To provide students with good depth of knowledge of Designing Industrial IOT Systems for various application.
2. Knowledge for the design and analysis of Industry 4.0Systems for Electronics Engineering students.

## 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. Ability to implement real field problem by gained knowledge of Industrial applications withIoT 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:**
The Various Industrial Revolutions, Role of Internet of Things (IoT) & Industrial Internet of Things (IIoT) in Industry, Industry 4.0 revolutions, Support System for Industry 4.0, Smart Factories.

**UNIT-II: Implementation systems for IIoT:**
Sensors and Actuators for Industrial Processes, Sensor networks, Process automation and Data Acquisitions on 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, RealTime 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, Power Plants, Inventory Management & Quality Control, PlantSafety and Security (Including AR and VR safety applications), Facility Management.

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. Industry 4.0: The Industrial Internet of Things Alasdair Gilchrist Publications: Apress
2. The Concept Industry 4.0 An Empirical Analysis of Technologies and Applications in Production Logistics Authors: Bartodziej, Christoph Jan Springer: Publication in the field of economic science.
3. Embedded System: Architecture, Programming and Design by Rajkamal, TMH3.
4. Dr. OvidiuVermesan, Dr. Peter Friess, "*Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems*", River Publishers

**INTRODUCTION TO ETHICAL HACKING**
**(Professional Elective - II)**

**L   T   P   C**

*CODE:***8I612**                                                                                    **3   0   0   3**

*COURSE OBJECTIVES:*

1.   To understand and analyse Information security threats and countermeasures

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.

*UNIT I   ETHICAL HACKING OVERVIEW & VULNERABILITIES*

Understanding the importance of security-Concept of ethical hacking and essential Terminologies Threat- Attack- Vulnerabilities- Target of Evaluation- Exploit. Phases involved in hacking.

*UNIT II   FOOTPRINTING & PORT SCANNING*

Footprinting - 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-

*UNIT III  SYSTEM HACKING*

Introduction- Enumerating windows OS & Linux OS.

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

*UNIT IV  HACKING WEB SERVICES & SESSION HIJACKING*

Web application vulnerabilities- Application coding errors- SQL injection into Back-end Databases- Cross-site scripting- cross-Site request forging- Authentication bypass- Web services and related flaws-

## UNIT V    HACKING WIRELESS NETWORKS

Protective http headers Understanding Session Hijacking- Phases involved in Session Hijacking-Types of Session Hijacking- Session Hijacking Tools.

## 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. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010.
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010
3. Patrick Engebretson, "The Basics of Hacking and Penetration Testing" Ethical Hacking and Penetration Testing Made Easy, Syngress Media, Second Revised Edition, 2013.
4. Rajat Khare, "Network Security and Ethical Hacking", Luniver Press, 2006.
5. Rama chandran V, "Wireless Penetration Testing Beginner's Guide " 3rd ed.. Packt Publishing, 2011.
6. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003

**BUSINESS INTELLIGENCE**

(Professional Elective - II)

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**CODE: 8EC19**

**COURSE OBJECTIVES:**

1  To become familiar with the ethics and basics of Business Intelligence and Decision Support System
2  To define mathematical models, data mining and data preparation
3  To describe classification problems and clustering methods
4  To study marketing models, Logistic and production models and Data envelopment analysis
5  To be able to grasp the objectives of knowledge management and artificial intelligence and expert systems.

**COURSE OUTCOMES:**

1. Able to: become familiar with the role of mathematical models, Business intelligence architectures, representation of the decision-making process, evolution of information systems

2. Development of a model, representation of input data ,data mining process, analysis methodologies, data validation, data transformation, data reduction

3. Evaluate classification models, Bayesian methods, Clustering methods, Partition methods, Hierarchical methods

4. Study relational marketing, sales force management, optimization models for logistics planning, efficiency measures, efficient frontier, The CCR model

5. Examine and evaluate organizational Learning and Transformation, Knowledge Management Activities,

6. Compare Artificial Intelligence Versus Natural Intelligence

**UNIT-1: Business intelligence:** Effective and timely decisions, Data, informationand knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence
**Decision support systems:** Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system

UNIT-II: **Mathematical models for decision making:** Structure of mathematical models, Development of a model, Classes of models
**Data mining:** Definition of data mining, Representation of input data , Data mining process, Analysis methodologies
**Data preparation**: Data validation, Data transformation, Data reduction.

UNIT-III : **Classification**: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines
**Clustering:** Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering

models

UNIT-IV: **Business intelligence applications:**
**Marketing models**: Relational marketing, Sales force management, **Logistic and production models**: Supply chain optimization, Optimization models for logistics planning, Revenue managementsystems.
**Data envelopment analysis**: Efficiency measures, Efficient frontier,The CCR model, Identification of

good operating practices.

UNIT-V: **Knowledge Management:** Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge ManagementActivities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management.

UNIT-VI: **Artificial Intelligence and Expert Systems:**
Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems,Knowledge Engineering, Development of Expert Systems.

**Books and References:**
1. Business Intelligence: Data Mining and Optimization forDecision Making, Carlo Vercellis, Wiley, First,2009.
2. Efraim Turban,Ramesh Sharda,Dursun Delen, Pearson, Ninth,2011.

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**BLOCKCHAIN TECHNOLOGY**

**CODE: 8EC13**         (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 BOOK:

1. 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. IV Year I semester**
**Computer Science and Engineering-IOT**
**CLOUD COMPUTING**

**Code: 8EC20**                                                          **L   T   P/D   C**
**Prerequisite: NIL**                                                      **3   0   0    3**

**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.Common standards in Cloud Computing, Introduction to fog computing,** 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 Chandrasekharan 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.

**Code: 8EC17**

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**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.

**Fundamentals of Ad-hoc and Sensor Networks**

**CODE: 8I708**

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**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 review Ad Hoc and Wireless Sensor Networks
- Ability to solve the issues in real-time application development based on ASN.
- To understand the MAC and transport protocols for ad hoc networks
- To understand the security of sensor networks
- 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-

**UNIT – II**

**Location Services**-DREAM, Quorum-based; **Forwarding Strategies:** Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

**Data Transmission -** Broadcast Storm Problem, **Rebroadcasting Schemes**-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP.

**UNIT – III**

**Multicasting: Tree-based:** AMRIS, MAODV; **Mesh-based:** ODMRP, CAMP; **Hybrid:** AMRoute**,** MCEDAR.
**Geocasting:** Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR**.**

**UNIT – IV**

 **TCP:** TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over
Ad hoc

**Basics of Wireless, Sensors and Lower Layer Issues:** Applications, Classification of sensor
networks.

**UNIT – V**

Architecture : Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

**UNIT – VI**

**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.

**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).

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**Code: 8FC08**
**Prerequisite: Nil**

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## Course Objectives:
1. To learn fundamentals of cryptography and its application to network security.
2. To understand network security threats, security services, and countermeasures.
3. To learn computer security, Internet, E-commerce and E-governance with reference to Free
4. Market Economy
5. To learn International Efforts relating to Cyberspace laws and Cyber crimes
6. To learn Law relating to electronic records and intellectual property rights in India
7. To understand ethical laws of computer for different countries.
8. To learn Penalties, Compensation and Offences under the Cyberspace and Internet in India
9. To learn Miscellaneous provisions of IT Act and Conclusions

## Course Outcomes:
At the end of this course the student will be able to
1. Familiarize the cryptographic procedures and Understand its primitives
2. Outline Security policy in Legislation and Comprehend E-Commerce frame work, models and its associated threats
3. Justify the role of electronic signatures in E-Commerce and summarize the various laws relating to it.
4. Categorize international cyber laws and cybercrimes.
5. Explore Penalties, Compensation and Adjunction of violations of provisions of IT Act 2000
6. Classify and Outline the offences under the Cyberspace law and the Internet in India

## UNIT-I
**Introduction to cyber Security, cryptography, Types of Attacks, Secrete Key Cryptography**
Introduction: Cyber-attacks, Defense Strategies and Techniques Mathematical background for Cryptography: Modulo arithmetic, The greatest common divisor, Useful Algebraic Structures, Chinese Remainder Theorem Basics of Cryptography: Secret versus Public key Cryptography, Types of attacks, Elementary substitution Ciphers, Elementary Transposition Ciphers, Other Cipher Properties Secrete Key Cryptography: Product Ciphers, DES Construction, Modes of Operation, MAC and other Applications, Attacks, Linear Crypt analysis.

## UNIT-II
**Introduction to Computer Security, Internet, E-commerce and E-governance with reference to Free Market Economy**
Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity, Conceptual Framework of E-commerce: governance, the role of Electronic Signatures in E-commerce with Reference to Free Market Economy in India.

## UNIT-III
**Law relating to electronic records and intellectual property rights in India**
Legal aspects of Electronic records / Digital signatures, Cyber laws, the roles and regulations of Certifying Authorities in India, Protection of Intellectual Property Rights in Cyberspace in India.

## UNIT-IV
**International Efforts relating to Cyberspace laws and Cyber crimes**
International efforts related to Cyber laws, Council of Europe (COE) convention on Cyber Crimes.

## UNIT-V
**Penalties, Compensation**
Penalties, Compensation and Adjunction of violations of provisions of IT Act 2000 and judicial review.

## UNIT-VI
**Offences under the Cyberspace, Internet in India and Miscellaneous provisions of IT Act and Conclusions**
Some important offences under the Cyberspace law and the Internet in India, Other offences under the Information Technology Act in India, The role of Electronic Evidence and miscellaneous provisions of the IT Act.

**TEXT BOOK:**
1. Network security and Cryptography by Bernard Menezes CENGAGE Learning Publications, 2010.
2. Cyber Laws and IT Protection, Harish Chander, PHI, 2012

**REFERENCE BOOKS:**
**1.** Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2ndEdition, O' Reilly Media, 2006.
**2.** Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, New Delhi, 2006.
3. Cyberspace and Cyber security, George Kostopoulos, Auerbach Publications, 2012.
4. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Second Edition, Albert Marcella, Jr., Doug Menendez, Auerbach Publications, 2007

## Cyber Security and Machine Learning Lab

**CODE: 8JC65**                                                                                             **L T  P/D C**
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# Cyber Security lab:

1. Perform an Experiment for port scanning with NMAP
2. Install Jscript/Cryptool tool (or any other equivalent) and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital/PKI signatures.
3. Perform practical approach to implement Foot printing-Gathering target information using Dmitry-Dmagic, UAtester
4. Monitor the network communication with sniffers (like Wireshark).
5. Using Snort, perform real time traffic analysis and packet logging.
6. Perform email analysis, File type detection using the Autopsy tool.
7. Perform Registry analysis and get boot time logging using process monitor tool
8. Perform Memory capture and analysis using FTK imager tool
9. Perform Network analysis using the Network Miner tool

## MACHINE LEARNING LAB

**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

# CLOUD COMPUTING AND IOT LAB

**CODE: 8I762**                                                             **L T  P/D C**
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**Prerequisite of course:** Fundamentals of computer network, wireless sensor network, communication& internet technology, web technology, information security.

## Course Objective:

1. To learn about how to integrate the security aspect into their IoT design taking into consideration all 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. Understand the vision of IoT from a global context for secure and smart city.
2. Use of Devices, Gateways and Data Management in IoT. Its security building state of the artarchitecture in IoT, with Security deployment.
3. Configure various virtualization tools such as Virtual Box, VMware workstation.
4. Design and deploy a web application in a PaaS environment.

## LIST OF EXPERIMENTS: (CLOUD COMPUTING LAB)

1. Install Virtualbox/Vmware Workstation with different flavors of linux or windows OS on top ofwindows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute SimplePrograms

3. Install Google App Engine. Create a hello world app and other simple web applications usingpython/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 trystack (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. Introduction to Open Source Hardware & its Application.
   a. Arduino
   b. Raspberry Pi
2. Exploring various types of Sensors
3. Develop Applications using Arduino and Raspberry Pi
4. Exploring Open Source tools for Security and Privacy issues in IoT.
5. Implement Eclipse IoT Project with Emphasis on Security related issues.
6. Explore the working of AWS IoT Device Defender.

**REFERENCE BOOKS:**

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
3. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493-9357-1.

**SUPPLEMENTARY RESOURCES:**

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. IoT Toolkit (smart object API gateway service reference implementation)
7. Zetta (Based on Node.js, Zetta can create IoT servers that link to various devices and sensors)

**Syllabus for B. Tech. IV Year I semester**
**Computer Science and Engineering-IOT**

**Professional Elective –III**

| 8I709 | Mobile Application Development for IoT |
|-------|----------------------------------------|
| 8FC13 | Software Project Management |
| 8I712 | Cloud Computing and Virtualization |
| 8I713 | IoT Automation |
| 8I715 | IoT for Real Time Applications |

# MOBILE APPLICATION DEVELOPMENT FOR IOT
## (Professional Elective - III)

**CODE: 8I709**

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

**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 Conceptualizations

IoT Programming Fundamentals: Getting Started, IoT Programming setup for LED flashing, Program to display message on screen, Program to read LDR level and display on screen, Android APK to perform read write operation.

## UNIT - II

Particle android APK to control LED intensity, LED switching with HTML interface, Cloud based motion detection, 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 for controlling LED from mobile, Integration of Temperature and Gas Sensor with Blynk Mobile Application, Printing real-time Date and Time values on serial terminal, Display temperature value on serial terminal,Display temperature values on 16*2 LCD display

Interfacing: Interfacing of Nokia 5110 display, display image on Nokia 5110, Particle Electron displaying battery charging level status, GPS tracking device interface to get coordinates.

**UNIT – IV**

**IoT Product Hardware Development:** Product realization, Connection diagram of IoT product, Engineering board development, Product board customization and optimization, Flowchart of IoT warehouse monitoring system, Wireless communication between the multiple kits, Particle cloud IDE.

**UNIT – V**

**IoT Advance Wireless Interfaces:** Bluetooth communication between master and slave module, Data visualization on ThingSpeak cloud using webhook services, Storing data into google excel sheet and sending the sheets to emails.

**UNIT – VI**

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

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

1. Kale, Vivek. Parallel Computing Architectures and APIs: IoT Big Data Stream Processing 1stedition, CRC Press, 2019.
2. IoT Product Development with Programming: Stepwise programming approach with ParticleDevelopment board Kindle Edition by Mahesh Jadhav and Tejas Sarang Patil.

**CODE: 8FC13**

**L T P C**
**3 0 0 3**

**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.

**CLOUD COMPUTING AND VIRTUALIZATION**

**(Professional Elective - III)**

**CODE: 8I712**

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

**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 Modeling, 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 a Service' 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.

**TEXT BOOKS:**

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, Prentice Hall, 2013.

**REFERENCE BOOKS:**

1.Balwinder Singh Sodh, IIT Ropar, Topics in virtualization and cloud computing.
2.T. Mather, S. Kumaraswamy, S. Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O'Reilly Series, 2009.
3.Controlling data in the cloud: outsourcing computation without outsourcing control. In Proceedings of the 2009 ACM workshop on Cloud computing security (CCSW '09). ACM, New York, NY, USA, 85-90, 2009.

## IOT AUTOMATION

### (Professional Elective – III)

**CODE:8I713**

**Course Objectives:**

1. While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choicesto security concerns.
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. Discover key IIoT concepts including identification, sensors, localization, wireless protocols,data storage and security
2. Explore IoT technologies, architectures, standards, and regulation
3. Realize the value created by collecting, communicating, coordinating, and leveraging the datafrom connected devices
4. Examine technological developments that will likely shape the industrial landscape in the future
5. Develop and implement own IoT technologies, solutions, and applications
6. Develop and implementtheir own IoT technologies, solutions, and applications.

## UNIT - I

**Introduction & Architecture:** What is IIoT and the connected world? the difference between IoT and IIoT, Architecture of IIoT, IOT node, Challenges of IIOT. Fundamentals of Control System, introductions, components, closed loop & open loop system.

## UNIT - II

**IIOT Components:** Introduction to Sensors (Description and Working principle): What is sensor? Types of 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), connecting into existing Modbus and Profibus technology, wireless network 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 pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/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. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cyber manufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)

**REFERENCE BOOK:**

1. Jerker Delsing, IoT Automation: Arrowhead Framework, CRC Press.

**Computer Science and Engineering-IOT**
**IoT for Real Time Applications**
**(Professional Elective – III)**

**L  T  P  C**
**3  0  0  3**

**Code 8I715**

Course Outcomes

CO1:Design remote data sensing and aggregation system for healthcare

CO2-Develop energy efficient IoT systems for smartcities

CO3–Design Precision agricultural systems

CO4-Develop smart automation system for Industries

CO5-Investigate various IoT based innovative systems for societal benefits

CO6-Develop multipurpose wearable devices

UNIT-1

### IoT for HEALTH CARE

Architecture of IoT for Healthcare , IoT based Health Monitoring System using Arduino, Healthcare monitoring Technique for Diabetes Patients,Remote Patient Monitoring- IoT Heart Rate Monitoring, remote monitoring of physiological parameters,ECG, EEG,andBP.

Unit -2

### IoT ENABLED SMART CITIES

Smart Energy meters, , , Smart home powered by IoT,Smart Lightining,Smart Traffic Control ,Smart Grid and Solar Energy Harvesting, IntelligentParkingSystem.

Unit -3

### IoT for SMART AGRICULTURE

Smart Agriculture, IoT Based Agriculture,Animal Intrusion detection in farms,soil moisture detection and Irrigation system, Livestock monitoring system, IoT based Green house Environment Monitoring and controlling

Unit -4

### IoT BASED INDUSTRIAL AUTOMATION

IoT based gas leakage monitoring system, Temperature and liquid level monitoring in boilers, Wireless video surveillance robot, Automatic Solar Tracker, IoT in Logistics Sector

Unit -5

### IoT for SOCIETY

Medical Waste Management, Weather update system with IoT,Women security system, wearable glove to enable sign to speech conversation, IoT based air pollution meter, Improved productivity of staff and reduced human labor.

Unit -6

IoT and Spacecraft Informatics Internet of things in space craft Informatics , sensors , digital twins virtual system multi agent system -  (4th Book)

References :

1.   KrishnaP.Venkata, FadiAl-Turjman,Intelligence in IoT-enabled Smart Cities,2019,1st edition,CRC Press,ISBN-10:1138316849

2.   Giacomo Veneri,and Antonio Capasso, Hands- on Industrial Internet of Things: Create a powerful industrial IoT infra structure using Industry 4.0,2018,Packt Publishing.

3.    Sasikumar Gurumoorthy, Mohammad S.Obaidat, Internet of ThingsandPersonalizedHealthcareSystems,Springer-2019.

4. IoT and Spacecraft Informatics,K.L, Yung, Andrew W H , K.K Tseng , Sicnce Direct, 2022

5. Pattnaik, Prasant Kumar, Mohanty, Suneeta, Mohanty, Satarupa, Smart Healthcare Analytics in IoT Enabled Environment , Springer-2020.

6. Avijit Mathur, Thomas New e, Walid Elgenaidi, Muzaffar Rao, Elfed Lewis and Daniel Toal, Medical IoT systems: architecture and security by Wearable Sensors,2017.

**Syllabus for B.Tech IV year I Semester**
**Computer Science and Engineering-IOT**
**Design and Analysis of Algorithms (PE-IV)**

| | L | T | P/D | C |
|---|---|---|---|---|
| **Code : 8FC05** | 3 | 0 | 0 | 3 |

**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, Reliability design.
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 publications                                                                                  pvt.Ltd.


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

**Syllabus for B.Tech IV year I Semester**
**Computer Science and Engineering**
**Design and Analysis of Algorithms Lab(PE-IV)**

**Code: 8FC64**                                                    **L    T    P/D    C**

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

                                                                 **0    0     2     1**

**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.
2.  Implement Prim's algorithm to generate minimum cost spanning tree.
3.  Solve the job sequencing with deadlines problem using greedy algorithm.
4.  Design the solution for the 0/1 knapsack problem using implement Dynamic Programming and implement.
5.  Using Dynamic programming approach solve the Optimal Binary search Tree problem.
6.  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.
2.  Write a C program to implement Character sorting.
3.  Write a C program to implement Dijkstra's algorithm for the single source shortest path problem.
4.  Write a C program that implements Prim's algorithm to generate minimum cost spanning tree.
5.  Write a C program to implement greedy algorithm for job sequencing with deadlines.
6.  Write a C program to implement Dynamic Programming algorithm for the0/1 Knapsack problem.
7.  Write a C program to implement Dynamic programming algorithm for the Optimal Binary search Tree problem.
8.  Write a C program to implement backtracking algorithm for n-queens problems.

**Other Practice Programs:**

1.  Write a C program to implement Quick Sort algorithm for sorting a list of integers in ascending order.
2.  Write a C program to implement the DFS algorithm for a Graph.
3.  Write a C program to implement the BFS algorithm for a graph.
4.  Write a C program that implements kruskal's algorithm to generate minimum cost spanning tree.
5.  Write a C program to implement Floyd's algorithm for all pairs shortest path problem.
6.  Write a C program to implement the backtracking algorithm for the Hamiltonian circuit's problem.
7.  Write a C program to implement backtracking algorithm for the sum of subsets problem.

| Code: 8I716 | | L | T | P/D | C |
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# 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 -6
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,
SpringerInternational edition.
3. Guide to Cyber Laws by Rodney D. Ryder- Wadhwa and Company, Nagpur

**Syllabus for B. Tech  IV year I Semester**
**Computer Science and Engineering-IOT**
**CYBER FORENSICS LAB (PE-IV)**

**Code:  8I763**                                                      **L      T      P/D    C**

**Prerequisite: Information Security**

                                                                       **0      0      2       1**

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

| | **L** | **T** | **P/D** | **C** |
|---|---|---|---|---|
| **Introduction to DevOps  (PE-IV)** | **3** | **0** | **0** | **3** |

**Code :8I718**

**Course Objectives:** The main objectives of this course are to:

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. Implement automated system update and DevOps life cycle.

**Course Outcomes :** On successful completion of this course, students will be able to:

1. Identify components of Devops environment.
2. Describe Software development models and architectures of DevOps.
3.  Apply different project management, integration, testing and code deployment tool.
4.  Investigate different DevOps Software development models.
5.  Assess various Devops practices.
6.  Collaborate and adopt Devops in real-time projects.

## UNIT-I

**Introduction:** Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

## UNIT-II

**Software development models and DevOps:** DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. **DevOps influence on Architecture:** Introducing software architecture, Themonolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Micro services, and the data tier, DevOps, architecture ,and resilience.

## UNIT-III

**Introduction to project management:** The need for source code control, The history of source codemanagement,Rolesandcode,sourcecodemanagementsystemandmigrations,Sharedauthenticat ion, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

## UNIT-IV

**Integrating the system:** Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

**UNIT-V**

**Testing Tools and automation:** Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL –driven development

**UNIT-VI**

**Deployment of the system:** Deployment systems, Virtualization stacks, code execution at the client, Puppetmaster and agents, Ansible, Deployment tools :Chef, Salt Stack and Docker

**TEXTBOOKS:**

1. JoakimVerona.PracticalDevops,SecondEdition.Ingramshorttitle;2ndedition(2018).ISBN-10:1788392574
2. DeepakGaikwad,ViralThakkar.DevOpsToolsfromPractitioner'sViewpoint.Wileypublications.ISBN:9788126579952

**REFERENCEBOOK:**

1.LenBass, IngoWeber,LimingZhu.DevOps: A Software Architect's Perspective. AddisonWesley;  ISBN-10.

# Dev Ops Lab (PE-IV)

**L T P C**

**CODE: 8I766**                                                 **0 0 2 1**

### Course Objectives:

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in
3. DevOps and related methods to reach a continuous delivery capability
4. Implement automated system update and DevOps lifecycle

### Course Outcomes:

1. Identify components of Devops environment
2. Apply different project management, integration, testing and code deployment tool
3. Investigate different DevOps Software development,models
4. Demonstrate continuous integration and development using Jenkins.

### List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written inexercise1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

### TEXTBOOKS:

1. JoakimVerona.PracticalDevops,SecondEdition.Ingramshorttitle;2ndedition(2018).ISBN-10:1788392574
2. DeepakGaikwad,ViralThakkar.DevOpsToolsfromPractitioner'sViewpoint.Wileypublications.ISBN:9788126579952

### REFERENCEBOOKS/LEARNINGRESOURCES:

1. LenBass,IngoWeber,LimingZhu.DevOps:ASoftwareArchitect'sPerspective.Addison Wesley

EdurekaDevOpsFullCourse-https://youtu.be/S_0q75eD8Yc

**SOFTWARE AUTOMATION AND TESTING  (PE-IV)**

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

**Code:  8F711**

**Prerequisite:** Software Engineering and OOAD

**COURSE OBJECTIVES:**

To Understand the Basic concepts in Software testing, concepts ofFlow graphs, Path testing and  Data Flow Testing, understand the concept of metrics and their types. Understand and implement various testing techniques and to make a thorough study on various testing tools. Set a strategy for testing environment and to learn the testing methodologies in detail.

**COURSE OUTCOMES :**

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

1. Describe concepts of  Software testing
2. Describe and apply the concepts Flow graphs, Path testing and Data Flow Testing**.**
3. Practice Software testing strategy and Environment with economics and apply Software Metrics useful in software development and maintenance.
4. Software Testing Methodology, finding defects hard to find, Verification and validation, Functional and structural, Workbench concept, Eight Consideration of software testing methodology, checklist. Describe Agile computing with agile testing
5. Demonstrate Software Testing Techniques  such as JADs, Pareto Analysis ,   Regression Tasting, Structured walkthroughs, Thread testing , Performance testing and White box testing.
6. Describe Graph matrices and applications, and practice and apply automated testing tools such load Runner, UFT and QTP.

**UNIT I** : What is Testing, Characteristics of Test Engineers, Software Testing Life Cycle, Levels of Testing, Testing Approaches, Test Cases: Format for Writing Test Case, Test plan: Format to prepare Test plan Purpose of testing, Dichotomies, Consequences of bugs

**UNIT II: Flow graphs and Path testing: Basics** concepts of path testing, predicates, path predicates and achievable paths, application of path testing. Data Flow Testing: Basics of Data flow Testing Logic Based Testing : Decision Tables

**UNIT III :**Software testing strategy and Environment, Establishing testing policy, structured approach to testing, Test factors, Economics of SDLC testing. Software Metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

**UNIT IV:** Software Testing Methodology, Defects hard to find, Verification and validation, Functional and structural, Defects and Failures, Testing that parallels the software Development process, Workbench concept, Eight Consideration of software testing methodology, testing tactics checklist. Importance of Agility, Building an Agile Testing Process

**UNIT V**: Software Testing Techniques, Black-box, Boundary value, Branch coverage, Cause Effect graphing, CRUD, Database, Histogram, Gray box, Inspections, JADs, Pareto Analysis , Prototyping , Random Testing, Risk based testing , Regression Testing, Structured walkthroughs, Thread testing , Performance testing, Stress Testing, Accepting Testing, White box testing, Alpha and Beta Testing.

**UNIT VI:** Graph matrices and application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm. Need for Automated testing tools, Taxonomy of Testing Tools, Exposure to Software Testing Tools: Load Runner, UFT and QTP.

**TEXT BOOKS**

1. Software testing techniques – Boris Beizer, Dreamtech, second edition.(Unit 1,2,6)
2. Software testing tools – by Dr. K.V.K.K Prasad Dreamtech (Unit 1,6)
3. Effective Methods for Software Testing, 2$^{nd}$ Edition by William E.Perry, Wiley publications.(Unit 3,4)
4. Software Testing and continuous Quality Improvement, by William E.Lewis,Gunasekaran,2$^{nd}$ Edition Auerbach publications (Unit 5,Refer Internet)
5. Software Engineering A practitioner's Approach, Roger S Pressman, 6th edition. McGrawHill International Edition (Unit 3)

**REFERENCES**

1. Software Testing Techniques ,by BoriesBeizer, Second Edition,Dreamtech Press
2. Testing and Quality Assurance for Component based software ,by Gao,Tsao and Wu,Artech House Publishers
3. Managing the Testing Process,by Rex Black,Wiley.
4. Handbook of Software Quality Assurance, by G.GordonSchulmeyer,James I.McManus,2$^{nd}$ Edition,International Thomson Computer Press

**L  T  P  C**

**Code:  8I764   Prerequisite: SE**

**0  0  2  1**

**COURSE OBJECTIVES:**

In software testing lab the various manual and automation testing processes are carried out to efficiently learn the testing activities. Both commercial and open source testing tools are being taught to better the software testing in detail. According to the software industry requirements the testing tools are taught so that the students can directly make use of testing tools in industry. Implement various testing techniques and to make a thorough study on various testing tools.

**COURSE OUTCOMES:**

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

1. Prepare Test Plan document and write Test Cases for Small scale Project (Like for their B.Tech IV Year Project or Post-Graduate Projects), they are learn how to Analyze SRS document in order to prepare Test Plan Document.
2. Demonstrate skills to use modern software testing tools (EX: UFT, TestLink, Bugzilla, Selenium, Test Director and Quality Center) and test application (web, Window application) by using the tools.
3. Demonstrate the ability to differentiate between different Testing tools present in the market (like functional testing tools, Test Management Tools, Bug Tracking Tools and Performance Testing Tools) and  prepare Test Plan document and write Test Cases for Small scale Project (Like for their B.Tech IV Year Project or Post-Graduate Projects).

**Week 1**

1. Write programs in 'C' Language to demonstrate the working of the following constructs:
   i) do…while     ii) while…do     iii) if …else   iv) switch     v) for

2. A program written in 'C' language for matrix multiplication fails" Introspect the causes for its failure and write down the possible reasons for its failure.

**Week 2**

3.  Take any system (e.g. ATM system) and study its system specifications and report the various bugs.
4. Write the test cases for any known application (Ex: Banking application)

**Week 3 &4**

5. Create a test plan document for any application (Ex:  Internet Banking Application)
6.  Overview of  any Test Management Tools (Open source testing tool : Ex - Test Link)

**Week 5 to 10**

7. Study of any Functional and Regression Testing Tools:
    i) Open source Tool: SoapUI

    ii) Licensed Tool: UFT 12.01

**Week 11 & 12**

8. Study of any bug tracking tool (open source testing tool : Bugzilla)
9. Overview of Performance Testing Tools (Open source testing tool : Apache Jmeter)
10. Study of Selenium IDE (open source testing tool)


**TEXT BOOKS**

6. Software testing techniques – Boris Beizer, Dreamtech, second edition.(Unit 1,2,6)
7. Software testing tools – by Dr. K.V.K.K Prasad Dreamtech (Unit 1,6)
8. Effective Methods for Software Testing, 2nd Edition by William E.Perry, Wiley publications.(Unit 3,4)
9. Software Testing and continuous Quality Improvement, by William E.Lewis,Gunasekaran,2nd Edition Auerbach publications (Unit 5,Refer Internet)
10. Software Engineering A practitioner's Approach, Roger S Pressman, 6th edition. McGrawHill International Edition (Unit 3)


**REFERENCES**

1. Software Testing Techniques ,by BoriesBeizer, Second Edition,Dreamtech Press
2. Testing and Quality Assurance for Component based software ,by Gao,Tsao and Wu,Artech House Publishers
3. Managing the Testing Process,by Rex Black,Wiley.
4. Handbook of Software Quality Assurance, by G.Gordon Schulmeyer,James I.McManus,2nd Edition,International Thomson Computer Press

# (PE-IV)

| | L | T | P/D | C |
|---|---|---|---|---|
| | 3 | 0 | 0 | 3 |

**Code: 8I717**

## Data Analytics

### 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

### 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

### 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. AnandRajaramanMilliway Labs Jeffrey D Ullman Stanford Univ.

**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

**Syllabus for B. Tech. IV Year I semester**
**Computer Science and Engineering-IOT**
**R PROGRAMMING LAB(PE-IV)**

L T P/D C

0  0  2  1

## Course code : 8MC67

1. R Environment setup: Installation of R and RStudio in Windows

2. Write R commands for i) Variable declaration and Retrieving the value of the stored variables, ii) Write an R script with comments, iii)Type of a variable using class() Function.

3. Write R command to i) illustrate summation, subtraction, multiplication, and division operations on vectors using vectors.

ii) Enumerate multiplication and division operations between matrices and vectors in R console

4. Write R command to i) illustrates the usage of Vector subsetting&amp; Matrix subsetting

ii) Write a program to create an array of 3×3 matrixes with 3 rows and 3 columns.

iii) Write a program to create a class, object, and function

5. Write a command in R console i)to create a tshirt_factor, which is ordered with levels 'S', 'M', and 'L'.

Is it possible to identify from the examples discussed earlier, if blood type 'O' is greater or less than blood type 'A'?

ii) Write the command in R console to create a new data frame containing the 'age' parameter from the existing data frame. Check if the result is a data frame or not. Also R commands for data frame functions cbind(), rbind(), sort()

6. Write R command for i) Create a list containing strings, numbers, vectors and logical values

ii) To create a list containing a vector, a matrix, and a list. Also give names to the elements in the list and display the list also access the list elements

iii) To add a new element at the end of the list and delete the element from the middle display the same

iv)  To create two lists, merge two lists. Convert the lists into vectors and perform addition on the two vectors. Display the resultant vector.

7. Write R command for i) logical operators—AND (&amp;), OR (|) and NOT (!).

ii) Conditional Statements

iii) Create four vectors namely patientid, age, diabetes, and status. Put these four vectors into a data frame patient data and print the values using a for loop &amp; While loop

iv) Create a user-defined function to compute the square of an integer in R

v) Create a user-defined function to compute the square of an integer in R

vi) Recursion function for a) factorial of a number b) find nth Fibonacci number

8. Write R code for i) Illustrate Quick Sort

ii) Illustrate Binary Search Tree

9. Write R command to i) illustrate Mathematical functions &amp; I/O functions

ii) Illustrate Naming of functions and sapply(), lapply(), tapply() &amp;mapply()

10. Write R command for i) Pie chart &amp; 3D Pie Chart, Bar Chart to demonstrate the percentage conveyance of various ways for traveling to office such as walking, car, bus, cycle, and train

ii)Using a chart legend, show the percentage conveyance of various ways for traveling to office such as walking, car, bus, cycle, and train.

(a) Walking is assigned red color, car – blue color, bus – yellow color, cycle – green color, and train – white color; all these values are assigned through cols and lbls variables and the legend function.

(b) The fill parameter is used to assign colors to the legend.

(c) Legend is added to the top-right side of the chart, by assigning

iii) Using box plots, Histogram, Line Graph, Multiple line graphs and scatter plot to demonstrate the relation between the cars speed and the distance taken to stop, Consider the parameters data and x

Display the speed and dist parameter of Cars data set using x and data parameters

TEXT BOOK:

1. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

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

| Sl. No | Course Category | Dept Course | Subject Code | Subject Name | L | T | P/D | C | Max. Marks | |
|--------|-----------------|-------------|--------------|--------------|---|---|-----|---|-----|-----|
| | | | | | | | | | CIE | SEE |
| 1 | OE | | 82C15 | Open Elective- III | 2 | 0 | 0 | 2 | 30 | 70 |
| 2 | PE | CSE-IOT | 8I811 | Professional Elective – V | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | PS | CSE-IOT | | Major Project | - | - | 10 | 5 | 30 | 70 |
| | | | | **Total :** | **5** | **0** | **10** | **10** | **90** | **210** |

## Professional Elective –V

| | |
|------|---------------------------------|
| 8I812 | Multicore Technologies |
| 8FC20 | Augmented Reality & Virtual Reality |
| 8I814 | 5G & IoT Technologies |
| 8I815 | Smart Sensor Technologies |
| 8I816 | Fog Computing |

**MULTICORE TECHNOLOGIES**

**(Professional Elective – V)**

**CODE: 8I812**

| L | T | P/D | C |
|---|---|-----|---|
| 3 | 0 | 0   | 3 |

**Course Objective:**

- To understand the need for multi-core processors, and their architecture.
- To understand the challenges in parallel and multi-threaded programming.
- To learn about the various parallel programming paradigms,
- To develop multicore programs and design parallel solutions.

## Course Outcome:

At the end of the course, the students should be able to:

- Describe multicore architectures and identify their characteristics and challenges.
- Identify the issues in programming Parallel Processors.
- Write programs using OpenMP and MPI.
- Design parallel programming solutions to common problems.
- Compare and contrast programming for serial processors and programming for parallel processors.

## UNIT-I

### Introduction

The power and potential of parallelism, Examining sequential and parallel programs, Parallelism using multiple instruction streams, The Goals: Scalability and performance portability, Balancing machine specifics with portability, A look at six parallel computers: Chip multiprocessors, Symmetric multiprocessor architectures, Heterogeneous chip designs, Clusters, Supercomputers, Observations from the six parallel computers.

## UNIT-II

### Reasoning about Performance

Motivation and basic concepts, Sources of performance loss, Parallel structure, Performance trade-offs, Measuring performance, Scalable performance.

## UNIT-III

### Examples of Multi-Core Architectures

Introduction to Intel Architecture, How an Intel Architecture System works, Basic Components of the Intel Core 2 Duo Processor: The CPU, Memory Controller, I/O Controller

Intel Core i7: Architecture, The Intel Core i7 Processor, Intel QuickPath Interconnect, The SCH; Intel Atom Architecture. Introduction to Texas Instruments' Multi-Core Multilayer SoC architecture for communications, infrastructure equipment

**UNIT-IV**

**Parallel Algorithm Design**

Introduction, The Task / Channel model, Foster's design methodology, Examples: Boundary value problem, Finding the maximum, The n-Body problem, Adding data input.

**UNIT-V**

**Solutions to Common Parallel Programming Problems**

Too many threads, Data races, deadlocks, and live locks, Heavily contended locks, Non-blocking algorithms, Thread-safe functions and libraries, Memory issues, Cache-related issues, Avoiding pipeline stalls, Data organization for high performance.

**UNIT-VI**

**Threading in the Processor**

Single-Core Processors: Processor architecture fundamentals, Comparing Superscalar and EPIC architectures. Multi-Core Processors: Hardware-based threading, Hyper-threading technology, Multi-Core processors, Multiple processor interactions, Power consumption, Beyond multi-core architecture.

**TEXT BOOKS:**

1. Peter S. Pacheco, An Introduction to Parallel Programming, Morgan-Kauffman/Elsevier, 2011.

2. Darryl Gove, Multicore Application Programming for Windows, Linux, and Oracle Solaris, Pearson, 2011

**REFERENCES:**

1. Michael J Quinn, Parallel programming in C with MPI and OpenMP, Tata McGraw Hill,2003.

2. Victor Alessandrini, Shared Memory Application Programming, 1st Edition, Concepts and Strategies in Multicore Application Programming, Morgan Kaufmann, 2015.

3. Yan Solihin, Fundamentals of Parallel Multicore Architecture, CRC Press, 2015.

**Code: 8FC20**

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

**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.
3. Illustrate the fundamentals or advanced topics of Computer Graphics.
4. Analyze the Interactive Techniques on VR in respect of Body Track, Hand Gesture, 3D Manus, and Object Grasp.
5. Understand the development tools of VR.
6. 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 II semester**
**Computer Science and Engineering-IOT**
**5G & IOT TECHNOLOGIES**

**(Professional Elective – V)**

| L | T | P/D | C |
|---|---|-----|---|
| 3 | 0 | 0 | 3 |

**CODE: 8I814**

**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 IoT and M2M for societal applications .
5. Develop applications using Raspberry PI and Python.

**UNIT - I**

Overview of 5G Broadband Wireless Communications: Evolution of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro), An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G.

**UNIT - II**

The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mmWave MIMO Systems, 3GPP standards for 5G,IEEE 802.15.4

**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 Lifestyle.

**UNIT - V**

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANGNETCONF, YANG, SNMP NETOPEER

**UNIT - VI**

IoT Physical Devices and Endpoints - Introduction to Raspberry PI - Interfaces (serial, SPI, I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controllingoutput, reading input from pins.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk "Essentials of LTE and LTE-A", Cambridge UniversityPress.
3. Athanasios G. Kanatos, Konstantina S. Nikita, Panagiotis Mathiopoulos, "New Directions inWireless Communication Systems from Mobile to 5G", CRC Press.
4. Theodore S. Rappaport, Robert W. Heath, Robert C. Danials, James N. Murdock "MillimeterWave Wireless Communications", Prentice Hall Communications.

**SMART SENSOR TECHNOLOGIES**

**(Professional Elective – V)**

| L | T | P/D | C |
|---|---|-----|---|
| 3 | 0 | 0   | 3 |

### CODE: 8I815

**Course Objectives:** Obtain knowledge on sensors, sensors with microcontrollers and their applications.

**Course Outcomes:**
1. Analyze the sensors available in IoT based on application requirements and the Sensingmethods.
2. Create a Real-time application by choosing appropriate sensors for temperature monitoring.
3. Interfacing different types of Sensors with MCU.
4. Infer Wireless Sensing, RF Sensing and RF MEMS.
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 – thermoelectric 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, RF Sensing, Telemetry, RF MEMS, 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, "Understanding smart sensors", Artech House integrated microsystems series,3rd Edition, 2013.
2. Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", 5th Edition,Springer, 2016.

**REFERENCE BOOKS:**

1. Vlasios Tsiatsis, Stamatis Karnouskos, Jan Holler, David Boyle, Catherine Mulligan, "Internet of Things: Technologies and Applications for a New Age of Intelligence", Academic Press, 16-Nov- 2018.
2. Henry Leung, Subhas Chandra Mukhopadhyay, "Intelligent Environmental Sensing", Springer,22-Jan-2015.

| L | T | P/D | C |
|---|---|-----|---|
| 3 | 0 | 0 | 3 |

**Syllabus for B. Tech. IV Year II semester**
**Computer Science and Engineering-IOT**

**FOG COMPUTING (Professional Elective – V)**

**CODE: 8I816**

**Course Objectives:** This course gives an overview of Fog Computing and its architecture, challenges and applications in different contexts.

**Course Outcomes:**
1. Apply concepts of Fog in application development.
2. Design the architecture and its components and working of components and its performance.
3. Explore Fog on security, multimedia and smart data.
4. Model the fog computing scenario.
5. Apply SND in fog computing.

## UNIT - I

**Introduction to Fog Computing**: Fog Computing, Characteristics, Application Scenarios, Issues and challenges. Fog Computing Architecture: Communication and Network Model, Programming Models, Fog Architecture for smart cities, healthcare and vehicles. Fog Computing Communication Technologies: Introduction, IEEE 802.11, 4G, 5G standards.

## UNIT – II

WPAN, Short-Range Technologies, LPWAN and other medium and Long-Range Technologies. Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds: Introduction, Background, Network Slicing in 5G, Network Slicing in Software-Defined Clouds, Network Slicing Management in Edge and Fog, Middleware for Fog and Edge Computing, Need for Fog and Edge Computing Middleware, Clusters for Lightweight Edge Clouds, IoT Integration, Security Management for Edge Cloud Architectures.

## UNIT – III

Fog Computing Realization for Big Data Analytics: Introduction to Big Data Analytics, Data Analytics in the Fog, Prototypes and Evaluation.

Fog computing requirements when applied to IoT: Scalability, Interoperability, Fog-IoT architectural model, Challenges on IoT Stack Model via TCP/IP Architecture, Data Management, filtering, Event Management.

## UNIT – IV

Device Management, cloudification, virualization, security and privacy issues. Integrating IoT, Fog, Cloud Infrastructures: Methodology, Integrated C2F2T Literature by Modeling Technique by Use-Case Scenarios.

Exploiting Fog Computing in Health Monitoring: An Architecture of a Health Monitoring IoT Based System with Fog Computing, Fog Computing Services in Smart E-Health Gateways, Discussion of Connected Components.

**UNIT – V**

Fog Computing Model for Evolving Smart Transportation Applications: Introduction, Data-Driven Intelligent Transportation Systems, Fog Computing for Smart Transportation Applications Case Study: Intelligent Traffic Lights Management (ITLM) System.

Software Defined Networking and application in Fog Computing: Open Flow Protocol, Open Flow Switch.

**UNIT-VI**

SDN in Fog Computing, Home Network using SDN. Security and Privacy issues: Trust and privacy issues in IoT Network, web Semantics and trust Management for Fog Computing, Machine Learning based security in Fog Computing, Cyber- Physical Energy Systems over Fog Computing.

**TEXT BOOKS:**

1. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya.
2. Fog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and DistributedComputing) by Rajkumar Buyya and Satish Narayana Srirama.
3. Amir Vahid Dastjerdi and Rajkumar Buyya, ―Fog Computing: Helping the Internet of Things
   Realize its Potential, University of Melbourne.

**REFERENCE BOOKS:**

1. Flavio Bonomi, Rodolfo Milito, Jiang Zhu, Sateesh Addepalli, ―Fog Computing and Its Role inthe Internet of Things, MCC' 12, August 17, 2012, Helsinki, Finland. Copyright 2012 ACM 978-1-4503-1519-7/12/08... $15.00.
2. Shanhe Yi, Cheng Li, Qun Li, ―A Survey of Fog Computing: Concepts, Applications and Issues, Mobidata' 15, ACM 978-1-4503-3524-9/15/06, DOI: 10.1145/2757384.2757397, June 21, 2015, Hangzhou, China.
3. Amir M. Rahmani, Pasi Liljeberg, Preden, Axel Jantsch, ―Fog Computing in the Internet of Things - Intelligence at the Edge‖, Springer International Publishing, 2018.
4. Ivan Stojmenovic, Sheng Wen, "The Fog Computing Paradigm: Scenarios and Security Issues", Proceedings, Federated Conference on Computer Science and Information Systems,pp. 1–8, 2014.

# CSE –IOT   Open Electives – A20 Regulations

| Open Elective (OE) | | | | | |
|---|---|---|---|---|---|
| Code | OE – I (3-1) | Code | OE – II (3-2) | Code | OE – III (4-2) |
| 8ZC22 | Basics of Entrepreneurship | 8ZC23 | Advanced Entrepreneur ship | 8ZC24 | Product and Services |
| 8ZC25 | Basics of Indian Economy | 8ZC26 | Basics of Polity and Ecology | 8ZC27 | Indian History, Culture and Geography |
| 8ZC05 | Banking Operations, Insurance and Risk Management | 8ZC19 | Entrepreneur ship Project Management and  Structured Finance | 8ZC15 | Financial Institutions, Markets and Services |
| 8BC51 | Introduction to Additive Manufacturing Process | 8BC53 | Principles of Operations Research | 8AC45 | Fundamentals of Renewable Energy Sources |
| | | 8AC44 | Fundamentals of Measurement s and Instrumentation | 8ZC10 | Entrepreneurs hip & Business Design |

| PO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Level | H | | | | M | L | L | | | | M | M |

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

**Syllabus for B. Tech. III Year I semester**    **L  T  P  C**

**Computer Science and Engineering-IOT**    **2  -  -  2**

## BASICS OF ENTREPRENEURSHIP

### (Open Elective –I)

**Code:  8ZC22**

**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 I semester**
**Computer Science and Engineering-IOT**
**BASICS OF INDIAN ECONOMY**
**(Open Elective –I)**

**L  T  P  C**

**2  -  -  2**

**Code: 8ZC25**

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

## Syllabus for B. Tech. III Year I semester
## Computer Science and Engineering-IOT
## BANKING OPERATIONS, INSURANCE AND RISK MANAGEMENT
### (Open Elective –I)

| L | T | P | C |
|---|---|---|---|
| 2 | - | - | 2 |

**Code:  8ZC05**

**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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| Level | H | | | M | L | | | | | | | |

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

**Syllabus for B. Tech. III Year I semester**
**Computer Science and Engineering-IOT**
**INTRODUCTION TO ADDITIVE MANUFACTURING PROCESS**
**(Open Elective –I)**

**L T P C**

**Code: 8BC51**

**2 - - 2**

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

**Syllabus for B. Tech III Year II semester**
**Computer Science and Engineering-IOT**
**ADVANCED ENTREPRENEURSHIP**               **L T P C**
**(Open Elective –II)**

**2 0 0 2**

**Code: 8ZC23**

**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

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

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| **Syllabus for B. Tech. III Year II semester**<br>**Computer Science and Engineering-IOT**<br>**BASICS OF POLITY AND ECOLOGY**<br>**(Open Elective –II)** | **2 - - 2** |

**Code: 8ZC26**

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

**Syllabus for B. Tech. III Year II semester**
**Computer Science and Engineering-IOT**

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| **ENTREPRENEURSHIP PROJECT MANAGEMENTAND STRUCTURED FINANCE**<br>**(Open Elective –II)** | **L  T  P  C**<br><br>**2   -   -   2** |

**Code:  8ZC19**

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

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**Syllabus for B. Tech. III Year II semester**
**Computer Science and Engineering-IOT**
**PRINCIPLES OF OPERATIONS RESEARCH**
**(Open Elective –II)**

**Code: 8BC53**

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

**Syllabus for B. Tech. III Year II semester**
**Computer Science and Engineering-IOT**
**FUNDAMENTALS OF MEASUREMENTS AND INSTRUMENTATION**
**(Open Elective –II)**

**L  T  P  C**

**2  -  -  2**

**Code: 8AC44**

**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, $5^{th}$ Edition, Wheeler Publishing.
2. Transducers and Instrumentation– D.V.S Murthy, Prentice Hall of India, $2^{nd}$ Edition.
3. A course in Electrical and Electronic Measurements and Instrumentation -A.K. Sawhney, Dhanpatrai & Co. $18^{th}$ 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, $3^{rd}$ Edition.
4. Modern Electronic Instrumentation and Measurement techniques – A.D Helfrick and W.D.Cooper, Pearson/Prentice Hall of India.

| PO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
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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**
**Computer Science and Engineering-IOT**
**PRODUCT AND SERVICES**
**(Open Elective –III)**

| L | T | P | C |
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**Code: 8ZC24**

**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)**

**L T P C**

**2 - - 2**

**Code: 8ZC27**

**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.
4. Review earth evolution and world climatic change.
5. Understand India Oceanography,
6. 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
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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| Level | | M | | | | M | L | L | | | M | |

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

**Syllabus for B. Tech. IV Year II semester**
**Computer Science and Engineering-IOT**
**FINANCIAL INSTITUTIONS, MARKETS AND SERVICES**
**(Open Elective –III)**

L T P C
2 - - 2

**Code: 8ZC15**

**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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| Level | M | M | | | | M | M | L | | | | |

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

**Syllabus for B. Tech. IV Year II semester**
**Computer Science and Engineering-IOT**
**FUNDAMENTALS OF RENEWABLE ENERGY SOURCES**
**(Open Elective –III)**

| L | T | P | C |
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**Code: 8AC45**

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

**Syllabus for B. Tech IV Year II semester**
**Computer Science and Engineering-IOT**
**ENTREPRENEURSHIP AND BUSINESS DESIGN**
**(Open Elective –III)**

L  T  P  C

2  -  -  2

**Code: 8ZC10**

**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.