SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

B.Tech. in COMPUTER SCIENCE AND ENGINEERING (IOT)
COURSE STRUCTURE, III YEAR & IV YEAR SYLLABUS

(BR22 Regulations)

Applicable from Academic Year: 2022-23 BATCH

III YEAR I SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	CS510PC	Automata Theory and Compiler Design	3	0	0	3
2	EC507PC	Microprocessors &Microcontrollers	3	1	0	4
3	CS508PC	Database Management Systems	3	0	0	3
4	MBA501HS	Business Economics & Financial Analysis	3	0	0	3
5		Professional Elective-I	3	0	0	3
6	CS528PC	Database Management Systems Lab	0	0	2	1
7	EC513PC	Microprocessors & Microcontrollers Lab	0	0	2	1
8	EN501HS	Advanced English Communication Skills Lab	0	0	2	1
9	CS523PC	UI design-Flutter	0	0	2	1
10	*MC501	Intellectual Property Rights	3	0	0	0
		Total	**18**	**1**	**08**	**20**

III YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS612PC	IoT Security	3	0	0	3
2	CS613PC	Computer Vision and Robotics	3	0	0	3
3	CS614PC	IoT Cloud Processing and Analytics	3	0	0	3
4		Professional Elective–II	3	0	0	3
5		Open Elective-I	3	0	0	3
6	CS631PC	IoT Security Lab	0	0	3	1.5
7	CS632PC	Computer Vision Lab	0	0	3	1.5
8	CS623PC	Industrial Oriented MiniProject/Internship/Skill Development Course (Bigdata-Spark)	0	0	4	2
9	*MC601	Environmental Science	3	0	0	0
		Total	**18**	**0**	**10**	**20**

Environmental Science in IIIY r II Sem should be Registered by Lateral Entry Students Only.

***MC – Satisfactory/Unsatisfactory**

Professional Elective – I

CS572PE	Architecting Smart IoT Devices
CS573PE	Data Analytics for IoT
CS574PE	IoT System Architectures
CS575PE	IoT Communication Protocols
CS576PE	Algorithms Design and Analysis

Professional Elective – II

CS647PE	Machine Learning
CS656PE	Real Time Systems
EC624PE	Embedded Hardware Design
EE601ES	Energy Sources and Power Management
CS659PE	Software Engineering

Open Electives(OE–I)

CS689OE	INTRODUCTION TO IOT
CS690OE	IOT SENSORS

AUTOMATA THEORY AND COMPILER DESIGN

(Course code: CS510PC)

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

Course Objectives

- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation

Course Outcomes

- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool and design LR parsers

UNIT - I

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems. **Nondeterministic Finite Automata:** Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions.

Conversion of NFA to DFA

UNIT - II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages: Statement of the pumping lemma Applications of the Pumping Lemma.

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar,Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT - III

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

UNIT - IV

Introduction: The structure of a compiler

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator

Lex Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers

UNIT - V

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax- Directed Translation Schemes, Implementing L-Attributed SDD's.

Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code

Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science- Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

REFERENCE BOOKS:

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, 2nd Edition, Pearson.
2. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
3. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
4. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
5. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

MICROPROCESSORS & MICROCONTROLLERS

(Course code: EC507PC)

B.Tech. III Year I Sem. **L T P C**
3 1 0 4

Prerequisite: Nil

Course Objectives:

- To familiarize the architecture of microprocessors and micro controllers
- To provide the knowledge about interfacing techniques of bus & memory.
- To understand the concepts of ARM architecture
- To study the basic concepts of Advanced ARM processors

Course Outcomes:

- Understands the internal architecture, organization and assembly language programming of 8086 processors.
- Understands the internal architecture, organization and assembly language programming of 8051/controllers
- Understands the interfacing techniques to 8086 and 8051 based systems.
- Understands the internal architecture of ARM processors and basic concepts of advanced ARM processors.

UNIT - I

8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

UNIT - II

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

UNIT - III

I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

UNIT - IV

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

UNIT - V

Advanced ARM Processors: Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH, 2nd Edition 2006.
2. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012

REFERENCE BOOKS:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition 2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao, Andhe Pallavi, Pearson, 2009.

4. Digital Signal Processing and Applications with the OMAP- L138 Experimenter, Donald Reay, WILEY 2012.

DATABASE MANAGEMENT SYSTEMS

(Course code: CS508PC)

B.Tech. III Year II Sem. L T P C
3 0 0 3

Prerequisites: A course on "Data Structures".

Course Objectives:

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Course Outcomes:

- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

UNIT - I

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS **Introduction to Database Design:** Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT - II

Introduction to the Relational Model: Integrity constraint over relations, enforcing

integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multivalued dependencies, FOURTH normal form, FIFTH normal form.

UNIT - IV

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity,Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT - V

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM),

B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition. 3rd Edition
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.

2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education

3. Introduction to Database Systems, C. J. Date, Pearson Education

4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.

5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.

6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

(Course code: MBA501HS)

B.Tech. III Year I Sem. L T P C

3 0 0 3

Prerequisites: None

Course Objective: To learn the basic Business types, impact of the Economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

Course Outcome: The students will understand th e various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analyzing the Financial Statements of a Company.

UNIT - I

Introduction to Business and Economics:

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II

Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand

Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT - III

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT - V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

TEXT BOOKS:

1. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.

2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

ARCHITECTING SMART IOT DEVICES (Professional Elective – I)

(Course code: CS572PE)

B.Tech. III Year II Sem. L T P C
3 0 0 3

Prerequisite:

- Embedded hardware design

Course Objectives:

- To understand the architectural overview of IoT devices.
- To acquire skills on data acquisition and communication in IoT.
- To understand the threats of loT.

Course Outcome:

- Understand the design principles of IoT connected devices.
- Demonstrate the revolution of internet in mobile and cloud.
- Examine the architecture and operation of IoT.
- Learn embedded programming to connect IoT devices.
- Learn multi scheduling tasks with IoT devices.

UNIT- I

Design Principles of IoT

Design principles of connected devices, data acquiring organizing and analytics in IoT, system architecture of loT

UNIT- II

Prototyping the Embedded Devices for IoT

System hardware and prototyping, sensors and actuators for IoT, Radio module and wireless sensor network, gateways internet and web, software components

UNIT- III

Embedded Programming for IoT

Programming connected devices, C and python for IoT, Case study: Temperature controller, Smart irrigation system.

UNIT- IV

Embedded RTOS

Program structure and real time, multitasking and scheduling, RTOS services, signals, semaphores, Nucleus SE, application timers, interrupts in nucleus ES, Nucleus SE initialization and starn1p

UNIT- V

Tools for IoT

Introduction, chef puppet, NETCONF-YANG case studies

loT physical Devices

Basic building blocks of an IoT device and endpoints, family of ploT devices, pcDuino, Beagle bone black, cubie board, domain specific IoTs

TEXT BOOKS:

1. Raj Kamal, Internet of Things, Architecture and Design Principles, lst edition, McGraw Hill Education, May 2017
2. Arsheep Baga and Vijay Madisetti, Internet of Things: A Hands-On Approach, 1st Edition, Universities press, 2015

REFERENCE BOOKS:

1. David Etter, IoT (Intemet of Things Programming: A simple and fast way of Learning IoT, Kindle edition 2016
2. Fei HU, Security and Privacy in Internet of Things (loTs): Models, Algorithms,

and Implementations Edition, CRC Press, 2016

3. Colin Walls, Embedded RTOS Design Insights and Implementation. 1st edition. Elsevier. December 2020

DATA ANALYTICS FOR IOT (Professional Elective – I)

(Course code: CS573PE)

B.Tech. III Year II Sem. L T P C
3 0 0 3

Course Objectives:

- To understand IoT Analytics and Challenges
- To Analyze the IoT data to infer the protocol and device characteristics
- To Explore and visualize data, and techniques to understand data quality

Course Outcomes:

- Understand the fundamentals of IoT Analytics and Challenges
- Understand and analyze IoT Devices and Networking Protocols
- Apply IoT Analytics for the Cloud
- Understand exploring and visualizing data

UNIT - I

Defining IoT Analytics and Challenges

Introduction to IoT, applications, IoT architectures, introduction to analytics, IoT analytics challenges

UNIT - II

IoT Devices and Networking Protocols

IoT devices, Networking basics, IoT networking connectivity protocols, IoT networking data messaging protocols, Analyzing data to infer protocol and device characteristics

UNIT - III

IoT Analytics for the Cloud

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

UNIT - IV

Exploring IoT Data

Exploring and visualizing data, Techniques to understand data quality, Basic time series analysis, Statistical analysis

UNIT - V

Data Science for IoT Analytics

Introduction to Machine Learning, Feature engineering with IoT data, Validation methods, Understanding the bias–variance tradeoff, Use cases for deep learning with IoT data

TEXT BOOK:

1. Minteer, Andrew, Analytics for the Internet of Things (IoT), Packt Publishing Ltd. July 2017, ISBN 9781787120730

REFERENCE BOOKS:

1. Kai Hwang, Min Chen, Big-Data Analytics for Cloud, IoT and Cognitive Computing, Wiley
2. Hwaiyu Geng, Internet of Things and Data Analytics Handbook, Wiley
3. John Soldatos, Building Blocks for IoT Analytics Internet-of-Things Analytics, River Publishers Gerardus Blokdyk,
4. IoT Analytics a Complete Guide, 5starcooks.

IOT SYSTEM ARCHITECTURES (Professional Elective – I)

(Course code: CS574PE)

B.Tech. III Year II Sem. L T P C

3 0 0 3

Course Objectives:

- Knowledge on concepts of IoT applications and IoT architectures, Event driven analysis and security testing IoT systems

Course Outcomes:

- Understand IoT applications and IoT Architectures.
- Learn about IoT devices and event driven analysis
- Understand and analyze IIoT.
- Understand safety and security testing of IoT systems

UNIT - I

The IoT Landscape: Introduction to IoT, Applications, Architectures, Wireless Networks, Devices, Security and Privacy, Event-Driven Systems

IoT System Architectures: Introduction, Protocols Concepts, IoT-Oriented Protocols,

Databases, Time Bases, Security

UNIT - II

IoT Devices & Event-Driven System Analysis: The IoT Device Design Space, Cost of Ownership and Power Consumption, Cost per Transistor and Chip Size, Duty Cycle and Power Consumption, Platform Design

Event-Driven System Analysis: Introduction, Motivating Example, IoT Network Model, Events, Networks, Devices and Hubs, Single-Hub Networks, Multi-hub Networks, Network Models and Physical Networks, IoT Event Analysis, Event Populations, Stochastic Event Populations, Environmental Interaction Modeling, Event Transport and Migration

UNIT - III

Industrial Internet of Things: Introduction, Industry 4.0, Industrial Internet of Things (IIoT), IIoT Architecture, Basic Technologies, Applications and Challenges

UNIT - IV

Security and Safety: Introduction, Systems Security, Network Security, Generic Application Security, Application Process Security and Safety, Reliable-and-Secure-by-Design IoT Applications, Run-Time Monitoring, The ARMET Approach, Privacy and Dependability

UNIT - V

Security Testing IoT Systems: Introduction, Fuzz Testing for Security, White-Box Fuzzing, Black-Box Fuzzing, Fuzzing Industrial Control Network Systems, Fuzzing Modbus, The Modbus Protocol, Modbus/TCP Fuzzer

TEXT BOOK:

1. Dimitrios Serpanos, Marilyn Wol, Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies, ISBN 978-3-319-69714-7

REFERENCE BOOKS:

1. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015
2. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit 2).
3. "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.

4. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017.

IOT COMMUNICATION PROTOCOLS (Professional Elective – I)

(Course code: CS575PE)

B.Tech. III Year II Sem. L T P C

3 0 0 3

Prerequisites: Nil

Course Objectives:

- In this course, learners will be going to learn about various protocols designed for the implementation of the Internet of Things (IoT) applications.

Course Outcomes:

- Understand fundamentals of IoT architecture outline and standards.
- Understand and analyze different architectural views.
- Understand the importance of IoT Data Link Layer & Network Layer Protocols
- Understand the importance of Iot Transport & Session Layer Protocols

UNIT - I

Introduction

IoT architecture outline, standards - IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics

UNIT - II

IoT Reference Architecture

Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant Architectural views. Real-World Design Constraints- Introduction, Technical Design constraints

UNIT - III

IoT Data Link Layer

PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7

UNIT - IV

Network Layer Protocols

Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL,CORPL, CARP

UNIT - V

IoT Transport & Session Layer Protocols

Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

TEXT BOOKS:

1. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications ,2016
2. 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, Academic Press, 2015

REFERENCE BOOKS:

1. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3- 642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016

2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

ALGORITHMS DESIGN AND ANALYSIS (Professional Elective – I)

(Course code: CS576PE)

B.Tech. III Year II Sem. L T P C

3 0 0 3

Prerequisites: Programming for problem solving and Data Structures

Course Objectives:

- Introduces the notations for analysis of the performance of algorithms.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst, average, and bestcase analysis.

- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Course Outcomes:

- Analyze the performance of algorithms
- Choose appropriate data structures and algorithm design methods for a specified application
- Understand the choice of data structures and the algorithm design methods

UNIT - I

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation. Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT - II

Disjoint Sets: Disjoint set operations, union and find algorithms, Priority Queue- Heaps, Heapsort

Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph Coloring, Hamiltonian cycles.

UNIT - III

Dynamic Programming: General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

UNIT - IV

Greedy method: General method, applications- Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem. Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

UNIT - V

Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution. NP-**Hard and NP-Complete problems:** Basic concepts, non-deterministic algorithms, NP -

Hard and NP-Complete classes, Cook's theorem.

TEXT BOOK:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.

REFERENCE BOOKS:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R.Tamassia, John Wiley and sons.

DATABASE MANAGEMENT SYSTEMS LAB

(Course code: CS528PC)

B.Tech. III Year I Sem. L T P C
0 0 2 1

Co-requisites: "Database Management Systems"

Course Objectives:

- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

Course Outcomes:

- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.

- Develop solutions for database applications using procedures, cursors and triggers

List of Experiments:

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A. Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)

   B. Nested, Correlated subqueries
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.

5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

MICROPROCESSORS & MICROCONTROLLERS LAB

(Course code: EC513PC)

B.Tech. III Year I Sem. L T P C
0 0 2 1

Course Objectives:

- To familiarize the architecture of microprocessors and micro controllers

Course Outcomes:

- Understand the internal architecture, organization and assembly language programming of 8086 processors.
- Understand the internal architecture, organization and assembly language programming of 8051/controllers
- Understand the interfacing techniques to 8086 and 8051 based systems.

- Understand the internal architecture of ARM processors and basic concepts of advanced ARM processors.

List of Experiments:

Using 8086 Processor Kits and/or Assembler

- Write Assembly Language Programs to 8086 to Perform

1. Arithmetic, Logical, String Operations on 16 Bit and 32-Bit Data.
2. Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.

Using 8051 Microcontroller Kit

- Introduction to IDE

1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
2. Time delay Generation Using Timers of 8051.
3. Serial Communication from / to 8051 to / from I/O devices.
4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer 0 8051 in 8 bit Auto reload Mode and Connect a 1 HZ Pulse to INT1 pin and Display on Port 0. Assume Crystal Frequency as 11.0592 MHZ

Interfacing I/O Devices to 8051

1. 7 Segment Display to 8051.
2. Matrix Keypad to 8051.
3. Sequence Generator Using Serial Interface in 8051.
4. 8-bit ADC Interface to 8051.
5. Triangular Wave Generator through DAC interfaces to 8051.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals by A K Ray, Tata McGraw-Hill Education, 2006
2. The 8051 Microcontrollers: Architecture, Programming & Applications by Dr. K. Uma Rao, Andhe Pallavi, Pearson, 2009.

REFERENCE BOOKS:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition 2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao, Andhe Pallavi, Pearson, 2009.
4. Digital Signal Processing and Applications with the OMAP- L138 Experimenter, Donald Reay, WILEY 2012.

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

(Course code: EN501HS)

B.Tech. III Year I Sem. L T P C
0 0 2 1

1. Introduction

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context. The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organise ideas relevantly and coherently.

2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by educated English speakers
- To respond appropriately in different socio-cultural and professional contexts
- To communicate their ideas relevantly and coherently in writing
- To prepare the students for placements.

3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers – Subskills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice.
2. **Activities on Writing Skills:** Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of

writing – Free Writing and Structured Writing - Letter Writing –Writing a Letter of Application –Resume vs. Curriculum Vitae – Writing a Résumé – Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.

3. **Activities on Presentation Skills** - Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation
4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Do's and Don'ts - GD Strategies – Exercises for Practice.
5. **Interview Skills:** Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.

4. Minimum Requirement:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector

- Public Address system
- One PC with latest configuration for the teacher
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. Suggested Software: The software consisting of the prescribed topics elaborated above should be procured and used.

- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **Oxford Advanced Learner's Dictionary,** 10th Edition
- **Cambridge Advanced Learner's Dictionary**
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider,** by Dreamtech

6. Books Recommended:

1. Rizvi, M. Ashraf (2018). Effective Technical Communication. (2nd ed.). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). Engineering English. Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). Academic Writing: A Handbook for International Students. (5th Edition). Routledge.
4. Koneru, Aruna. (2016). Professional Communication. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). Technical Communication, Principles and Practice. (4TH Edition) Oxford University Press.
6. Anderson, Paul V. (2007). Technical Communication. Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). English Vocabulary

in Use Series. Cambridge University Press

8. Sen, Leela. (2009). Communication Skills. PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998). Writing with Power. Oxford University Press.
10. Goleman, Daniel. (2013). Emotional Intelligence: Why it can matter more than IQ. Bloomsbury Publishing.

UI DESIGN-FLUTTER

(Course code: CS523PC)

B.Tech. III Year I Sem. L T P C

0 0 2 1

Course Objectives:

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widges and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

Course Outcomes:

- Implements Flutter Widgets and Layouts
- Responsive UI Design and with Navigation in Flutter
- Create custom widgets for specific UI elements and also Apply styling using themes and custom styles.
- Design a form with various input fields, along with validation and error handling
- Fetches data and write code for unit Test for UI components and also animation

List of Experiments: Students need to implement the following experiments

1. a) Install Flutter and Dart SDK.
   b) Write a simple Dart program to understand the language basics.
2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
   b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.
   b) Implement media queries and breakpoints for responsiveness.
4. a) Set up navigation between different screens using Navigator.
   b) Implement navigation with named routes.
5. a) Learn about stateful and stateless widgets.
   b) Implement state management using set State and Provider.
6. a) Create custom widgets for specific UI elements.
   b) Apply styling using themes and custom styles.
7. a) Design a form with various input fields.

b) Implement form validation and error handling.

8. a) Add animations to UI elements using Flutter's animation framework.

b) Experiment with different types of animations (fade, slide, etc.).

9. a) Fetch data from a REST API.

b) Display the fetched data in a meaningful way in the UI.

10. a) Write unit tests for UI components.

b) Use Flutter's debugging tools to identify and fix issues.

TEXT BOOK:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

INTELLECTUAL PROPERTY RIGHTS

(Course code: *MC501)

B.Tech. III Year I Sem. L T P C
3 0 0 0

Course Objectives:

- Significance of intellectual property and its protection
- Introduce various forms of intellectual property

Course Outcomes:

- Distinguish and Explain various forms of IPRs.
- Identify criteria to fit one's own intellectual work in particular form of IPRs.
- Apply statutory provisions to protect particular form of IPRs.
- Appraise new developments in IPR laws at national and international level

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copyrights: Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

TEXT BOOK:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

REFERENCE BOOK:

1. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

IOT SECURITY

(Course code: CS612PC)

B.Tech. III Year II Sem. L T P C
3 0 0 3

Course Objectives:

- Understand the various attacks and importance of Security aspects in IoT
- Understand the techniques, protocols and security towards Gaming models
- Understand security and privacy challenges of IoT
- Understand the application of block chain technology for IoT Security

Course Outcomes:

- Incorporate the best practices learnt to identify the attacks and mitigate the same
- Adopt the right security techniques and protocols during the design of IoT products
- Assimilate and apply the skills learnt on ciphers and block chains when appropriate
- Describe the essential components of IoT
- Find appropriate security/privacy solutions for IoT

UNIT - I

Fundamentals of IoT and Security and its need, Prevent Unauthorized Access to Sensor Data, Block ciphers, Introduction to Blockchain, Introduction of IoT devices, IoT Security Requirements, M2M Security, Message integrity Modeling faults and adversaries Difference among IoT devices, computers, and embedded devices.

UNIT - II

IoT and cyber-physical systems RFID Security, Authenticated encryption Byzantine Generals problem sensors and actuators in IoT, IoT security (vulnerabilities, attacks, and countermeasures), Cyber Physical Object Security, Hash functions Consensus algorithms and their scalability problems Accelerometer, photoresistor, buttons

UNIT - III

Security engineering for IoT development Hardware Security, Merkle trees and Elliptic curves digital signatures, verifiable random functions, Zero-knowledge systems motor, LED, vibrator, IoT security lifecycle, Front-end System Privacy Protection, Management, Secure

IoT Databases, Public-key crypto (PKI), blockchain, the challenges, and solutions, analog signal vs. digital signal

UNIT - IV

Data Privacy Networking Function Security Trees signature algorithms proof of work, Proof of stake, Networking in IoT Device/User Authentication in IoT IoT Networking Protocols, Crypto-currencies, alternatives to Bitcoin consensus, Bitcoin scripting language and their use Real-time communication

UNIT - V

Introduction to Authentication Techniques, Secure IoT Lower Layers, Bitcoin P2P network, Ethereum and Smart Contracts, Bandwidth efficiency, Data Trustworthiness in IoT, Secure IoT Higher Layers, Distributed consensus, Smart Contract Languages and verification challenges, Data analytics in IoT - simple data analyzing methods

TEXT BOOKS:

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

REFERENCE BOOKS:

1. A. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Crypto currencies," 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" 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.
6. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing

Platform, 2017.

COMPUTER VISION AND ROBOTICS

(Course code: CS613PC)

B.Tech. III Year II Sem. L T P C

3 0 0 3

Pre-Requisites: Linear Algebra and Probability.

Course Objectives:

- To understand the Fundamental Concepts Related To sources, shadows and shading
- To understand the The Geometry of Multiple Views

Course Outcomes:

- Implement fundamental image processing techniques required for computer vision
- Implement boundary tracking techniques
- Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques and Implement motion related techniques.
- Develop applications using computer vision techniques.

UNIT - I

CAMERAS: Pinhole Cameras

Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases

Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models

Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

UNIT - II

Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates

Edge Detection: Noise, Estimating Derivatives, Detecting Edges

Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

UNIT - III

The Geometry of Multiple Views: Two Views

Stereopsis: Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras

Segmentation by Clustering: Segmentation, Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

UNIT - IV

Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness

Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations

Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization

UNIT - V

Introduction to Robotics: Social Implications of Robotics, Brief history of Robotics, Attributes of hierarchical paradigm, Closed world assumption and frame problem, Representative Architectures,Attributes of Reactive Paradigm, Subsumption Architecture, Potential fields and Perception

Common sensing techniques for Reactive Robots: Logical sensors, Behavioural Sensor Fusion, Pro- prioceptive sensors, Proximity Sensors, Topological Planning and Metric Path Planning

TEXT BOOKS:

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.
2. Robin Murphy, Introduction to AI Robotics, MIT Press.

REFERENCE BOOKS:

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities,

Elsevier (Academic Press), 4th edition, 2013.

2. The Robotics premier, Maja J Matari, MIT Press.
3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag London Limited 2011.

IOT CLOUD PROCESSING AND ANALYTICS
(Course code: CS614PC)

B.Tech. III Year II Sem. L T P C

3 0 0 3

Course Objectives

- To analyze the data generated from IoT device, store in cloud, to be able to manage IoT data stored in cloud.

Course Outcomes

- Learn IoT Big data challenges.
- Integrate Cloud and Big Data for IOT analytics.
- Analyze sensor data streams for events.
- Know open-source framework for IoT analytics.
- Review tools for semantic and data stream analytics.

UNIT - I

Introducing IoT Analytics

IoT Data and Big Data, Challenges of IoT Analytics, Applications, IoT Analytics Lifecycle and Techniques IoT

Cloud and Big Data Integration for IoT Analytics

Introduction, IaaS, PaaS and SaaS Paradigms, Requirements of IoT Big Data Analytics, Platform 3, Functional Architecture, Data Analytics for the IoT, Data Collection Using Low-power, Long-range Radios, WAZIUP Software Platform, iKaaS Software Platform

UNIT - II

Searching the Internet of Things

Introduction, A Search Architecture for Social and Physical Sensors, Local Event Retrieval,

Using Sensor Metadata Streams to Identify Topics of Local, Events in the City, Venue Recommendation

UNIT - III

Development Tools for IoT Analytics Applications

Introduction, Related Work, The VITAL Architecture for IoT Analytics Applications, VITAL Development Environment, Development Examples

UNIT - IV

An Open-Source Framework for IoT Analytics as a Service

Introduction, Architecture for IoT Analytics-as-a-Service, Sensing-as-a-Service Infrastructure Anatomy, Scheduling, Metering and Service Delivery, Sensing-as-a-Service Example, From Sensing-as-a-Service to IoT-Analytics- as-a-Service

UNIT - V

A Review of Tools for IoT Semantics and Data Streaming Analytics

Introduction, Related Work, Semantic Analysis, Tools and Platforms

Data Analytics for Smart Cities

Introduction, Cloud-based IoT Analytics, Cloud-based City Platform, Solutions, Edge, State of the Art, Edge-based City Platform, Workflow ,Task and Topology, IoT-friendly Interfaces, Use Case of Edgebased Data Analytics

TEXT BOOKS:

1. Building Blocks for IoT Analytics by John Soldatos, River Publisher

REFERENCE BOOKS:

1. Analytics for the Internet of Things (IoT)by Andrew miller, Packt Publishing.
2. Big Data Analytics for Internet of Things by Tausifa Jan Saleem, Mohammad Ahsan Chishti, Wiley Publishing.

MACHINE LEARNING (Professional Elective – II)

(Course code: CS647PE)

B.Tech. III Year II Sem. L T P C
3 0 0 3

Course Objectives:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

Course Outcomes:

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensembler to increase the classification accuracy

UNIT - I

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – 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 – Linear Discriminants: – Perceptron – Linear Separability – Linear Regression.

UNIT - II

Multi-layer Perceptron– 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 – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

UNIT - III

Learning with Trees – 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 – 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

UNIT - V

Reinforcement Learning – Overview – Getting Lost Example

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that MakeSense of Data‖, First Edition, Cambridge University Press, 2012.
3. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014
4. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.

REAL TIME SYSTEMS (Professional Elective – II)

(Course code: CS656PE)

B.Tech. III Year II Sem. L T P C

3 0 0 3

Prerequisite: Basic Programming/C/C++ Programming, Computer Organization and Operating System

Course Objectives

- To provide a broad understanding of the requirements of Real Time Operating Systems.
- To make the student understand, applications of these Real Time features using case studies.

Course Outcomes:

- Understand the key concepts of Real-Time systems.
- To facilitate task scheduling and designing concurrency within an application using Semaphores, Message queues.
- Explore other kernel objects common to embedded system development.
- Attain knowledge of exception and interrupt handling in real time systems
- Understand real time operating systems like RT Linux, VxWorks, MicroC /OSII,

TinyOs

UNIT – I

Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT - II

Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

UNIT - III

Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

UNIT - IV

Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT - V

Case Studies of RTOS: RT Linux, MicroC/OS-II, VxWorks, Embedded Linux, and Tiny OS.

TEXT BOOK:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011
2. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.

REFERENCE BOOKS:

1. Advanced UNIX Programming, Richard Stevens
2. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

EMBEDDED HARDWARE DESIGN (Professional Elective – II)

(Course code: EC624PE)

B.Tech. III Year II Sem. L T P C
3 0 0 3

Course Objectives:

- Knowledge on fundamental concepts on building hardware, Serial ports, AVR Microcontrollers and CAN.

Course Outcomes:

- Understand and analyze Forth/Open Firmware, interaction with hardware and memory
- Discussion on how to add Peripherals Using SPI and I2C
- Understand the significance of serial ports, IrDA and USB
- Understand various microcontrollers.

UNIT - I

An Introduction to Computer Architecture - Processors, Basic System Architecture, Interrupts, CISC and RISC, Digital Signal Processors, Memory and its types, Input/Output, DMA, Parallel and Distributed Computers, Embedded Computer Architecture

Forth/Open Firmware - Introducing Forth, String Word, Stack Manipulation, Creating New Words, Comments, if ... else, Loops, Data Structures, Interacting with Hardware and

Memory, Forth Programming Guidelines

UNIT - II

Building Hardware - Tools, Soldering, Quick Construction, Printed-Circuit Boards, Building it, JTAG

Adding Peripherals Using SPI - Serial Peripheral Interface , SPI-Based Clock/Calendar, SPI-Based Digital Potentiometer

Adding Peripherals Using I2C – Overview of I2C, Adding a Real-Time Clock with I2C, Adding a Small Display with I2C

UNIT - III

Serial Ports – UARTs, Error Detection, Old Faithful: RS-232C, RS-422, RS-485

IrDA - Introduction to IrDA, An IrDA Interface, Other Infrared Devices

USB – Introduction to USB, USB Packets, Physical Interface, Implementing USB Interface

UNIT - IV

Networks – Controller Area Network (CAN), Ethernet

Analog – Amplifiers, A to D conversion, Interfacing an External ADC, Temperature Sensor, Light sensor, Accelerometer, Pressure Sensor, Magnetic-Field Sensor, D to A conversion, PWM, Motor Control,

The PIC Microcontrollers - A Tale of Two Processors, Starting simple, A Bigger PIC, Motor control with a PIC

UNIT - V

The AVR Microcontrollers - The AVR Architecture, The ATtiny15 Processor, Downloading Code, A Bigger AVR, Bus interfacing

68000-Series Computers – Architecture, A Simple 68000-Based Computer

DSP-Based Controllers - The DSP 56800, A DSP 56805-Based Computer, JTAG

TEXT BOOK:

1. John Catsoulis, Designing Embedded Hardware, 2nd Edition, O'Reilly Media, Inc.

REFERENCE BOOK:

1. K. Shibu, Introduction to Embedded Systems, McGraw Hill Education.

ENERGY SOURCES AND POWER MANAGEMENT (Professional Elective – II)

(Course code: EE601ES)

B.Tech. III Year II Sem. L T P C
3 0 0 3

Course objectives:

- To facilitate the students to achieve a clear conceptual understanding of technical and commercial aspects of Conventional energy Sources, Power distribution management system.

Course Outcomes:

- Understand conventional energy sources and energy management system.
- Understand the significance of intelligent electronic devices
- Knowledge on energy distribution management system
- Understand the importance of smart meters

UNIT - I

Introduction to Energy Sources: Conventional energy sources---Thermal, Hydel, Nuclear,

Gas power stations (Single line diagrams –qualitative approach only)

UNIT - II

Renewable energy sources--Solar, wind, Tidal, wave, OTEC, Fuel cells, Geothermal, Energy Storage.

UNIT - III

Energy Management System: Energy Management System (EMS) – SMART GRID - Smart Grid Concept - Definitions and Need for Smart Grid – Functions – Opportunities – Benefits and challenges, Difference between conventional & Smart Grid, 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

UNIT - IV

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 - V

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.

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
3. Generation, distribution and utilization of Electric power, C. L. Wadhwa, New Age

Publications

4. Renewable sources and emerging technologies, D.P. Kothari, K.C. Singal, Rakesh Ranjan, PHI 2/e.

REFERENCE BOOKS:

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

E BOOKS:

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

SOFTWARE ENGINEERING (Professional Elective – II)
(Course code: CS659PE)

B.Tech. III Year II Sem. L T P C
3 0 0 3

Course Objectives:

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes:

- Ability to translate end-user requirements into system and software requirements, using e.g.UML, and structure the requirements in a Software Requirements Document (SRD).
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.

- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

UNIT - I

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths.

A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI).

Process models: The waterfall model, Spiral model and Agile methodology

UNIT - II

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. **Requirements engineering process:** Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT - III

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

Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT - IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT - V

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM.

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

REFERENCE BOOKS:

1. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-HillCompanies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

INTRODUCTION TO IOT (Open Elective – I)

(Course code: CS689OE)

B.Tech. III Year II Sem. L T P C
3 0 0 3

Course Objectives: The objectives of the course are to:

- Understand the concepts of Internet of Things and able to build IoT applications
- Learn the programming and use of Arduino and Raspberry Pi boards.
- Known about data handling and analytics in SDN.

Course Outcomes: Upon completing this course, the student will be able to:

- Known basic protocols in sensor networks.
- Program and configure Arduino boards for various designs.
- Python programming and interfacing for Raspberry Pi.
- Explore IoT applications in different domains.

UNIT - I

Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT - II

Machine-to-Machine Communications, Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

UNIT - III

Introduction to Python programming, Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi, Case studies.

UNIT - IV

Implementation of IoT with Raspberry Pi, Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

UNIT - V

Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid,Industrial IoT. Case Study: Agriculture, Healthcare, Activity Monitoring

TEXT BOOKS:

1. Pethuru Raj and Anupama C. Raman "The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", (CRC Press)
2. Terokarvinen, kemo, karvinen and villey valtokari, “Make sensors”: 1st edition, maker media, 2014.

REFERENCE BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”
2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013

IOT SENSORS (Open Elective – I)

(Course code: CS690OE)

B.Tech. III Year II Sem. L T P C

3 0 0 3

Course Objectives:

- Understand the concepts of Internet of Things and able to build IoT applications
- Learn the programming and use of Arduino and Raspberry Pi boards.
- Known about data handling and analytics in SDN.

Course Outcomes:

- Understand the basic protocols in sensor networks.
- Program and configure Arduino boards for various designs.
- Implement interfacing Raspberry Pi with sensors using python programming

- Design IoT applications in different domains.

UNIT - I

Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT - II

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

UNIT - III

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, Temperature Sensors: thermos-resistive sensors – thermoelectric contact sensor

UNIT - IV

Sensor with Microcontroller: Introduction, Amplification and Signal Conditioning, Integrated Signal Conditioning, Digital Conversion, MCU Control, MCUs for Sensor Interface, Techniques and Systems Considerations, Sensor Integration

UNIT - V

Wireless Sensing: Wireless Data and Communications, Wireless Sensing Networks, Industrial Wireless Sensing Networks, RF Sensing, Telemetry, RF MEMS, Complete System Consideration.

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
3. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities
4. Press, 2015, ISBN: 9788173719547

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.

IOT SECURITY LAB

(Course code: CS631PC)

B.Tech. III Year II Sem.

L T P C
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Course Objectives:

- Understand the various attacks and importance of Security aspects in IoT
- Understand the techniques, protocols and security towards Gaming models
- Understand security and privacy challenges of IoT
- Understand the application of block chain technology for IoT Security

Course Outcomes:

- Incorporate the best practices learnt to identify the attacks and mitigate the same

- Adopt the right security techniques and protocols during the design of IoT products
- Assimilate and apply the skills learnt on ciphers and block chains when appropriate
- Describe the essential components of IoT
- Find appropriate security/privacy solutions for IoT

List of Experiments:

1. Implement a basic block cipher algorithm to understand how encryption secures data in IoT devices.
2. Create a simple block chain to understand its structure and relevance in IoT security.
3. Set up an IoT device (like a Raspberry Pi) and identify potential security vulnerabilities.
4. Integrate various sensors and actuators into an IoT system, understanding their role in cyber physical systems and exploring common security challenges.
5. Conduct experiments to read RFID tags, and discuss security implications.
6. Use cryptographic libraries to create digital signatures using elliptic curves, understanding their application in IoT security.
7. Implement Merkle trees and experiment with elliptic curve digital signatures to secure Communication on basic IoT hardware like Arduino.
8. Simulate the working of Proof of Work and Proof of Stake algorithms in the context of crypto currencies and IoT.
9. Set up different IoT networking protocols and analyze their security features.
10. Create a simple smart contract using Ethereum to understand its application and the challenges in verification.

TEXT BOOKS:

1. B. Russell and D. Van Duren, “Practical Internet of Things Security,” Packt Publishing, 2016.
2. FeiHU, “Security and Privacy Internet of Things (IoTs): Models, Algorithms and

Implementations", CRC Press, 2016

3. Narayanan et al., "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction," Princeton University Press, 2016.

REFERENCE BOOKS:

1. A. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Crypto currencies," 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" 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.
6. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

COMPUTER VISION LAB
(Course code: CS632PC)

B.Tech. III Year II Sem. L T P C
0 0 3 1.5

Course Objectives:

- To Make students acquainted with practical aspects of computing with images.
- To Improve quality of image by applying enhancement techniques.
- To understand Feature Extraction algorithms.

Course Outcomes:

- Understand the basic image processing techniques and enhance images by adjusting contrast.
- Detect edges using various kernels using transformation.
- Apply histogram processing, convert between various colour spaces.
- Partition dataset by classification and clustering.
- Comprehend computer vision system for real world problems.

Description: Use any tool like OpenCV/ Scilab/ python/R Programming etc.,

List of Programs

1. Familiarization of the tool used for computer vision.
2. Implement basic image operations
   A. Loading and displaying an image.
   B. Color formats
   C. Image enhancement.
3. Implement smoothing filters on an image using
   A. Gaussian filter
   B. Median filter
   C. Mean Filter
4. Demonstrate fourier Transformations.
5. Implement histogram calculation and equalization for the given image.
6. Implement morphological operations like dilation, erosion, opening and closing on the given image
7. Implement edge detection on images using any two edge detection masks.
8. Detection of motion from structure.
9. Implement texture extraction of a given image.
10. Implement object detection like recognizing pedestrians.

11. Implement face recognition of an image using K-Means clustering.
12. Implement dimensionality reduction using PCA for the given images.
13. Demonstrate model-based reconstruction using tensor flow.

TEXT BOOKS:

1. Gary Bradski and Adrian Kaehler, "Learning OpenCV", O'Reilly Media, Inc., 1st Edition, 2008.
2. Talita Perciano and Alejandro C Frery, "Introduction to Image Processing Using R:" Learning
3. by Examples, Springer, 1st Edition, 2013.
4. "Computer Vision: Algorithms and Applications" by Richard Szeliski; Springer-Verlag London Limited 2011.

REFERENCE BOOKS:

1. R C Gonzalez and R E woods, "Digital Image Processing", Addison Pearson, 3rd Edition,2013.
2. David A. Forsyth and Jean Ponce, Computer Vision-A Modern Approach, PHI, 1st Edition, 2003.

BIG DATA – SPARK
(Course code: CS623PC)

B.Tech. III Year II Sem. L T P C
0 0 4 2

Course Objectives:

- The main objective of the course is to process Big Data with advance architecture like spark and streaming data in Spark

Course Outcomes:

- Develop MapReduce Programs to analyze large dataset Using Hadoop and Spark
- Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components
- Perform the filter, count, distinct, map, flatMap RDD Operations in Spark.
- Build Queries using Spark SQL
- Apply Spark joins on Sample Data Sets
- Make use of sqoop to import and export data from hadoop to database and vice-versa

List of Experiments:

1. To Study of Big Data Analytics and Hadoop Architecture

   (i) know the concept of big data architecture

   (ii) know the concept of Hadoop architecture

2. Loading DataSet in to HDFS for Spark Analysis

   Installation of Hadoop and cluster management

   (i) Installing Hadoop single node cluster in ubuntu environment

   (ii) Knowing the differencing between single node clusters and multi-node clusters

   (iii) Accessing WEB-UI and the port number

   (iv) Installing and accessing the environments such as hive and sqoop

3. File management tasks & Basic linux commands

   (i) Creating a directory in HDFS

   (ii) Moving forth and back to directories

   (iii) Listing directory contents

   (iv) Uploading and downloading a file in HDFS

   (v) Checking the contents of the file

   (vi) Copying and moving files

   (vii) Copying and moving files between local to HDFS environment

   (viii) Removing files and paths

   (ix) Displaying few lines of a file

   (x) Display the aggregate length of a file

(xi) Checking the permissions of a file

(xii) Zipping and unzipping the files with & without permission pasting it to a location

(xiii) Copy, Paste commands

4. Map-reducing

(i) Definition of Map-reduce

(ii) Its stages and terminologies

(iii) Word-count program to understand map-reduce (Mapper phase, Reducer phase, Driver code)

5. Implementing Matrix-Multiplication with Hadoop Map-reduce

6. Compute Average Salary and Total Salary by Gender for an Enterprise.

7. (i) Creating hive tables (External and internal)

(ii) Loading data to external hive tables from sql tables(or)Structured c.s.v using scoop

(iii) Performing operations like filterations and updations

(iv) Performing Join (inner, outer etc)

(v) Writing User defined function on hive tables

8. Create a sql table of employees Employee table with id,designation Salary table (salary ,dept id) Create external table in hive with similar schema of above tables,Move data to hive using scoop and load the contents into tables,filter a new table and write a UDF to encrypt the table

with AES-algorithm, Decrypt it with key to show contents

9. (i) Pyspark Definition(Apache Pyspark) and difference between Pyspark, Scala, pandas

(ii) Pyspark files and class methods

(iii) get(file name)

(iv) get root directory()

10. Pyspark -RDD'S

(i) what is RDD's?

(ii) ways to Create RDD

(iii) parallelized collections

(iv) external dataset

(v) existing RDD's

(vi) Spark RDD's operations (Count, foreach(), Collect, join,Cache()

11. Perform pyspark transformations
    (i) map and flatMap
    (ii) to remove the words, which are not necessary to analyze this text.
    (iii) groupBy
    (iv) What if we want to calculate how many times each word is coming in corpus ?
    (v) How do I perform a task (say count the words 'spark' and 'apache' in rdd3) separatly on each partition and get the output of the task performed in these partition ?
    (vi) unions of RDD
    (vii) join two pairs of RDD Based upon their key
12. Pyspark sparkconf-Attributes and applications
    (i) What is Pyspark spark conf ()
    (ii) Using spark conf create a spark session to write a dataframe to read details in a c.s.v and later move that c.s.v to another location

TEXT BOOKS:

1. Spark in Action, Marko Bonaci and Petar Zecevic, Manning.
2. PySpark SQL Recipes: With HiveQL, Dataframe and Graphframes, Raju Kumar Mishra and Sundar Rajan Raman, Apress Media.

WEB LINKS:

1.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0133015058445181 2251 8 2_shared/overview

2.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0125838811963883 5242_shared/overview

3.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126052684230082 561692 _shared/overview

ENVIRONMENTAL SCIENCE

(Course code: *MC601)

B.Tech. III Year II Sem. L T P C
3 0 0 0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.

- Understanding the environmental policies and regulations.

Course Outcomes: Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

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, Field visits.

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 resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

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. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **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:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT - V

Environmental Policy, Legislation & EIA: 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 Socioeconomically aspects. Strategies for risk assessment, Concepts of Environmental Management Plan

(EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha forUniversity Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.

2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.